

Country Food Consumption Notices: Assessing Awareness and Preferences of Health and Risk Communication Messages in the Sahtú Region of the Northwest Territories

by

Danielle Brandow

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Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be electronically available to the public.

Statement of Contributions

This thesis presents the work of Danielle Brandow in direct collaboration with her thesis supervisor, Dr. Kelly Skinner and her committee members, Dr. Brian Laird, Dr. Samantha Meyer, and Dr. Deborah Simmons.

Chapter 4 of this thesis was informed by Dr. Deborah Simmons and Dr. Mylène Ratelle. Dr. Simmons was involved in section 4.2, she took extensive notes during the terminology workshop of February 2017 and 2018 and graciously shared the notes in order to be amalgamated with those that I had taken.

Chapter 5 and 6 of this thesis was informed with the help and support of Dr. Mylène Ratelle. A paper by Ratelle and colleagues (2018) was used to inform the written portion of section 5.6, in the participant recruitment section. Dr. Ratelle also helped with the data accuracy and revision of several reports. Dr. Chris Furgal and Dr. Amanda Boyd helped with section 5.3 Survey Development for the Health Messages Survey.

Abstract

Background: Country food consumption by Indigenous peoples is associated with improved nutrition, food security, and lower rates of chronic diseases (Kuhnlein, Burlingame, & Erasmus, 2013); however, these foods can also pose potential risks of exposure to contaminants such as mercury and cadmium (Berti, 1997). Elevated fish mercury concentrations in some lakes in the Sahtú region of the Northwest Territories (NWT) resulted in a series of consumption notices that suggested people limit their consumption of walleye, northern pike, and lake trout from specific lakes in the region (NWT, 2016). Therefore, as part of a health communication component was added. This component was designed to assess participants risk perceptions and awareness of current consumption notices and health messages, to provide baseline data to evaluate the impact of consumption notices, to determine how health messages are currently developed, and to make recommendations to create more targeted communication strategies.

Objectives: The research objectives of this thesis are to: 1) Assess participants' risk perceptions and awareness of current consumption notices and health messages; 2) Provide baseline data to evaluate the impact of consumption notices and health messages over time; 3) Understand how consumption notices and health messages are currently developed and communicated to communities by the Government of the Northwest Territories; and 4) Make recommendations that aim to improve and create more effective communication strategies with focus in the Sahtú Region of the Northwest Territories based on knowledge synthesized from terminology workshop(s), surveys, and interviews.

Methods: This project involves a Health Messages Survey, two terminology workshops, community interviews, and stakeholder interviews. Participants were invited to take part in a Health Messages Survey where they were asked questions about their perceptions of

contaminants, whether they had heard or seen consumption notices, in addition to their preferences for future health messages based on trust and accessibility. Two terminology workshops were implemented in Délı̄nę, where key terms from the human biomonitoring project were identified, in order to translate or interpret into Slavey language. Twelve interviews were conducted with community members in Délı̄nę to document perceptions and stories regarding contaminants. Interviews also took place in Yellowknife with stakeholders from the Government of the Northwest Territories, the Federal Government, the Dene Nation, and the Giant Mine Oversight Board.

Results: Based on the data collected by surveys (n=43), interviews (n=19) and two terminology workshops (n=27) during a two-year period from 2017-2018, we found that country foods are extremely valued in communities for many reasons. Each participant reported eating country foods and many preferred solely relying on country foods rather than: i) store-bought foods; or ii) a mix of store-bought foods and country foods. During community interviews, each participant expressed their gratitude for the country foods that they eat and wished that they could eat it more often. In the terminology workshops, the cultural importance of trapping, fishing, and hunting was discussed. Many participants had heard or seen messages that promoted the nutritional value of country foods and had also learned from their Elders and family members that these foods have been a source of sustenance for thousands of years. The majority of participants had heard or seen messages about fish with high levels of mercury in their country foods from radio, researcher or scientists, and friends and family. These participants also expressed their fear that contaminants may have impacted the country food that they most preferred to eat. The fear that participants expressed invoked change by the Government of the Northwest Territories (GNWT). The GNWT, the primary disseminator of health messages, has

since changed their communication strategy from only consumption notices, to fact sheets and general fish consumption guidelines.

Conclusion: This project demonstrated the importance of country food in the Sahtú region. In the Sahtú country foods connects people to the traditional and cultural practices that were passed on by parents and Elders which provides a sense of community and of belonging. This project provides baseline data based on surveys, interviews and terminology workshops for a clearer picture of how these participants perceive contaminants, where they currently get their health information, and who they would trust to receive this type of information. More research in the area of northern health and risk communication is necessary in order to compare results to other regions across northern Canada and to determine best practices. In order to create more culturally significant and relevant contaminant health messages, researchers and government must invest time into determining ways that will be well received and heard by the communities they are working with and be adaptable based on the region, a community. For instance, in the Sahtú region, this could include using methods such as the local radio, friends and relatives, researchers or other health workers (nurses, etc.) as the most trusted sources to receive this type of information. Another consideration is assuring that these messages are understood when disseminated. In communities of the Sahtú, this means that providing information about contaminants must be translated in local languages or having translators to disseminate results of research projects. We can use these results as a baseline to compare with other health communication projects happening in northern Canada and other circumpolar Indigenous communities and regions. This thesis has provided further context in disseminating contaminant and health and risk communication messaging and suggestions to improve communication strategies.

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Acknowledgement of Land and Personal Perspectives

I would like to start my thesis with a land acknowledgment; I identify as a settler, born in Northern Ontario, Canada. I currently work on the traditional territory of the Attawandaron (Neutral), Anishnaabeg, and Haudenosaunee peoples in the Waterloo region. I have also spent some time working in the traditional territory of the Gwich'in, Sahtú Dene and Métis, the Dehcho people, the Tłı̄chǫ people, the Akaitcho people, and the Inuit and Inuvialuit people of the Northwest Territories. I believe that it is my responsibility to learn about historic and ongoing colonial practices that discriminate against Indigenous peoples. As a Master's student working with First Nations and Métis communities in the Northwest Territories, I strived to actively engage with Indigenous peoples, and listen wholeheartedly to Indigenous peoples including Elders and knowledge holders when they shared their experiences and stories with me. My interest in working with Indigenous peoples arose several years ago when I learned about the impacts of our colonial government on Indigenous peoples across Canada. Many discriminatory laws and practices which have been led by the Canadian government have left Indigenous people to suffer. As a feminist and activist, I strive to engage with my government to bring about a political and social change in the way Indigenous people are treated throughout Canada.

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List of abbreviations

CBPR	Community Based Participatory Research
CDUT	Canada Déłıne Uranium Table
DGG	Déłıne Got'ıne Government
GNWT	Government of the Northwest Territories
HSS	Health and Social Services
IPY-IHS	International Polar Year Inuit Health Survey
NWT	Northwest Territories
NCP	Northern Contaminants Program
PHO	Public Health Ontario
SPHHS	School of Public Health and Health Systems
SRRB	Sahtú Renewable Resource Board
TK	Traditional Knowledge
WHO	World Health Organization

Chapter 1 - Introduction and Overview

1.1 Introduction

The purpose of this chapter is to introduce and explain the health communication and risk perception component of Dr. Brian Laird's larger biomonitoring project. This chapter will also discuss the research objectives and long-term objectives of this thesis. It will also include information about demographics, culture and the importance of research in the Northern Territories (NWT).

1.2 Health Communication and Risk Perception Component of the Research, and Long-Term Objectives

A health communication and risk perception component was added in Year 2 (2016-2017) to Dr. Brian Laird's biomonitoring project (Ratelle et al., 2018). This component aimed to collect data on how communities perceive contaminants, what communities have heard about contaminants, and how to improve messages involving contaminants (Ratelle et al., 2018). This component is the focal point of this thesis. The data collected using a terminology workshop, Health Messages Survey, community interviews, and stakeholder interviews will provide beneficial information about health messages and communication for the larger biomonitoring project, as well as provide preliminary information to government in order to create possible changes to health messaging in the future.

Communication strategies to date have been predominantly disseminated by the GNWT Department of Health and Social Services (HSS) who have a proven track record of working collaboratively with stakeholders and creating effective tools. They have created consumption guidelines and fact sheets about country foods can be found on the GNWT HSS website, under Environmental Health (<https://www.hss.gov.nt.ca/en/services/environmental-health>) using

evidence based data. Under the Environmental Health section of the HSS website there are: i) Fish Consumption Notices; ii) Public Health Advisories; and iii) Country Food Fact Sheets. These tools provide important information for people to use if they have concern or would like to know more about guidelines and nutrient benefits of country foods. Some of the advisories can also be found on billboards at lakes with high levels of contaminants.

Communication strategies that have been used in the past to disseminate the risks of environmental contaminants have shown to cause more harm than benefits (Furgal, Powell, & Myers, 2005). Due to the sociocultural, nutritional, economic and spiritual importance of country foods in the North, the consumption notices and health messages being disseminated about possible consumption risks and high levels of contaminants in country foods becomes especially important (Furgal, Powell, & Myers, 2005). Communication messages can have serious impacts on the health and wellbeing of the northern and remote communities of the Sahtú as a result of the disruption on harvesting, sharing and consumption patterns in response to these messages (Furgal, Powell, & Myers, 2005; Krümmel & Gilman, 2015). Additional challenges including differences in culture, language, knowledge systems as well as working with small and remote communities can be factored in the decision-making process of health and risk communication (Furgal, Powell, & Myers, 2005). In the past, risk communication strategies have been said to result in fear and confusion due to varying messages and lack of comprehension of messages due to language or dissemination source among communities (Weinstein & Sandman, 1993). The need for further investigation into the area of public health advisories, risk communication and health messaging for Canada's northern communities is important. By using the data collected from the following *research objectives*: 1) Assess participants' risk perceptions and awareness of current consumption notices and health messages; 2) Provide baseline data to evaluate the impact

of consumption notices and health messages over time; 3) Understand how consumption notices and health messages are currently developed and communicated to communities by the Government of the Northwest Territories; and 4) Make recommendations that aim to improve and create more effective communication strategies with focus in the Sahtú Region of the Northwest Territories based on knowledge synthesized from terminology workshop(s), surveys, and interviews. The aim of this Master's research project was to identify whether community members have heard or seen messages regarding contaminants, how these communities perceive contaminants because of the messages, and to improve health messages in a more effective, trusted, culturally sensitive way that incorporates Traditional Knowledge.

1.3 Why the Northwest Territories?

It is important that researchers and governments invest in the area of northern research as many major national level surveys and research projects are completed in communities below the 60-degree latitude; which involves all of the provinces and none of the territories. The results and data that are generated from these surveys and research projects that happen below 60 degrees are important; however, are not representative to those that reside in communities of Canada's north. The lack of relevance of those research projects to Canada's North are due to the differences in Canada's northern demography, population, culture, language and varying socioeconomic and health status' (Natural Resources Canada, 2017). For instance, only about 100,000 Canadians live north of the 60-degree latitude, with the majority of Canada's population situated in the southern part of the country, near the American border (Statistics Canada, 2008). There is a strong Indigenous culture and demographic with Indigenous people living across the northern territories, each holding unique cultures, traditions, and diets (Waldram, Herring & Young, 2006). The Mackenzie Valley Athapaskan Dene people, from the Sahtú Region for

example, have a wide variation in their language from community to community and share a culture of harvesting animals, living on the land, respecting the land, water and animals, as well as gathering for drumming ceremonies and Dene games (Government of the Northwest Territories, 2001). The Inuit peoples who reside primarily on the Northern coastline share a different culture of harvesting country foods such as seal, and narwhal (Inuit Tapiriit Kanatami, 2018). Métis nations have also settled and lived in the Mackenzie Valley since the early 19th century. The Métis people are unique and hold a distinct identity and culture because of both European and Indigenous traditions. In addition to the demographic, cultural, and language differences between First Nations, Inuit and Métis of Canada, the Indigenous people of the North also face socioeconomic and health concerns unlike Canada's south; for instance, a poorer health status, lower levels of education, inadequate housing, and lower income (Indigenous Corporate Training Inc., 2012).

There are, of course, other research projects that are taking place in the NWT by multiple groups including but not limited to: Environment and Climate Change Canada, the Environment and Natural Resources Department of the GNWT, and by multiple Canadian universities. Two of our collaborators, Dr. Heidi Swanson (Biology, University of Waterloo), and George Low (Dehcho Aboriginal Aquatic Resources and Ocean Management) have been leading the research and collection of fish samples from across the Dehcho region of the NWT. When returning their fish analysis results, Dr. Swanson and Mr. Low were informed by community members and leadership that they had an interest in implementing a community driven, human biomonitoring component to determine the levels of contaminants in individuals, with the goal of gathering aggregate results for people living in their community. This is when Dr. Brian Laird (School of Public Health and Health Systems (SPHHS), University of Waterloo) began alongside Dr.

Swanson and Mr. Low to complement the existing research by adding a human biomonitoring component.

1.4 Demographics of the Northwest Territories

The NWT is located in the northern half of Canada and is home to approximately 45,000 people (Government of the Northwest Territories, 2018). Of those 45,000, nearly half (19,234) live in the capital, Yellowknife, and the remaining live in small rural communities throughout the territory (Statistics Canada, 2011). The main region this thesis will focus on is the Sahtú region of the NWT, described below. Another important aspect to recognize is the differences in language. The Government of the Northwest Territories (GNWT) recognizes 11 official languages, most of which are spoken by Indigenous peoples' (Government of the Northwest Territories, 2014). According to Statistics Canada, some of the more common languages spoken by Indigenous peoples in the NWT are: Tłı̄chǝ (Dogrib), Slavey (North or South), Inuvialuktun, Dene, Gwich'in, and Inuktitut (2011). The language spoken throughout the Sahtú is primarily North Slavey.

1.5 Sahtú Region

The Sahtú region consists of five communities: Délı̄ne, Tulıt'a, Norman Wells, Kasho Got'ı̄ne, and Colville Lake (see Figure 1) (Government of Canada, 2010). Communities throughout the Sahtú are considered remote and have little to no vehicle access to surrounding communities during summer months. Access to surrounding communities also allows for continued participation in cultural, social, and political events, as well as the opportunity for people to visit family and friends (Association québécoise des transport, 2013). The winter roads, therefore allow community members, and government to stay connected to the rest of the territories (Association québécoise des transport, 2013). Flights leaving communities in the

Sahtú go to surrounding communities and Yellowknife; however, this is a very expensive transportation method. At times this remoteness may cause difficulty when trying to access healthcare, government offices or to visit friends and family in other communities. The remoteness, however, allows communities to continue to foster their deep connection to the land (The Northern Frontier Visitors Association, 2017). From the Sahtú, I will be highlighting Délı̨ne as this community was involved in three of the main components of this thesis, including the surveys, terminology workshops, and interviews.

1.6 Délı̨ne Community Profile

Délı̨ne is a community situated in the Sahtú Region, on Great Bear Lake, around 550 kilometers northwest of Yellowknife. According to the Bureau of Statistics, as of 2016, the population of Délı̨ne was 503 people. Of these people, 95% identify as either First Nations, Métis or Inuit, and 5% as non-Indigenous (Government of the Northwest Territories, 2013). Nearly 80% of community members speak an Indigenous language, over 80% consume country foods, 60% hunt and fish, and 40% produce traditional arts and crafts (Government of the Northwest Territories, 2013). Délı̨ne is a remote "fly-in, fly-out" Dene community and is only accessible by land to other communities during the winter months on the ice-roads.

Délįnę has a history of environmental contaminant concern. Délįnę and the Great Bear Lake region have been affected by impacts of uranium and radium from the Port Radium mine situated on Great Bear Lake (see Figure 2) (Délįnę First Nation, 2005).

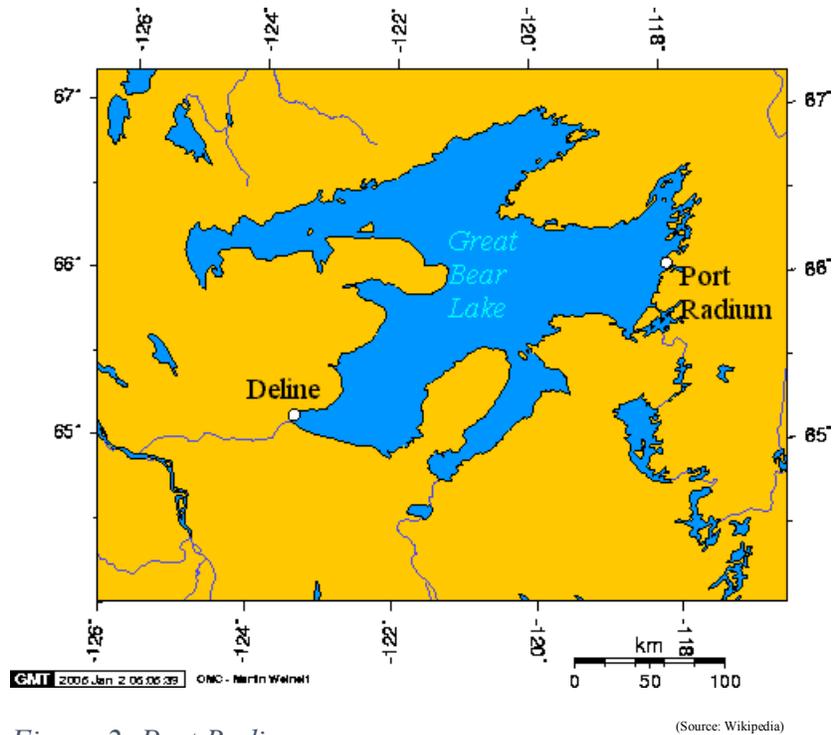


Figure 2: Port Radium

Twenty-five families from Délįnę lived and worked at the mine (Miller, 2015). The Dene men were hired, worked as labourers, carrying bags of radioactive uranium ore, without masks or protective equipment, which is thought to have resulted in several cases of cancer and deaths of these men (Kenny-Gilday, 1998). The uranium ore being transported from Port Radium Mine was also said to have been used to make the atomic bomb which was deployed in Hiroshima, Japan during the Second World War (van Wyck, 2015). There are many skeptics of whether the uranium was used for the atomic bomb; however, people from Délįnę believe this and feel responsible for the events of Hiroshima (Miller, 2015). In an article done by the Canadian Broadcasting Corporation (CBC), Joe Blondin, a resident of Délįnę and former worker at the mine, indicated that “the radium mine has caused a lot of pain, it did a lot of damage and it killed

a lot of people” in reference to the uranium being used for the Hiroshima bomb, as well as the health concerns of the workers from the mine (Canadian Broadcasting Corporation, 2005). In 1999, a major research project involving the Canadian government and the D el ıne First Nation began as a result of pressure from the community of D el ıne as well as media reports from families impacted by their work at Port Radium. This project resulted in a final report titled “Canada – D el ıne Uranium Table – Final Results: Concerning Health and Environmental Issues Related to the Port Radium Mine” (Government of Canada, 2005; Stanley, 2014).

1.7 Canada – D el ıne Uranium Table Final Report

This report includes the Canada – D el ıne Uranium Table’s (CDUT) key findings and recommendations from over 25 studies and activities undertaken by the CDUT since 1999 (Government of Canada, 2005). The work done to complete this report included the gathering of historical data, Traditional Knowledge, health studies, environmental studies, social studies, communication activities and more, carried out with a partnership established between the Canadian Government and D el ıne (Government of Canada, 2005). The Port Radium Mine operated from 1931 to 1982 and the Dene people, who lived around Great Bear Lake, worked transporting radium and uranium from the site (Government of Canada, 2005). Prior to the work done by the Canada – D el ıne Uranium Team, many people in D el ıne learned about the damage that can be caused by radium and uranium mining to human and environmental health from very personal experiences (Government of Canada, 2005). The belief that radium and uranium exposure caused cancer in D el ıne was prevalent and the community was very concerned since they had lost men who worked for the mine to cancer (Government of Canada, 2005).

“All the time we lived at Port Radium, they knew about the danger of radium but they never explain the effects it had on us. It was a very dangerous thing but they never told us

about it. They also never explain why they were taking all the ore from the land and they knew from the beginning that it would be used to build a bomb. Only later on we understood why this whole operation happened. We have lived around Great Bear Lake for a long time and what right do they have to come and do things like that. On top of that they took as they pleased. Knowing how it would damage the environment, they still put all that harmful waste into the lake. We drink the water from the lake and the animals drink from it too. All living things depend on water”

- Paul Baton (Dél̄ıne First Nation, 2005, p.i & p.44).

From this report, there were 26 recommendations that are still spoken about frequently within the Dél̄ıne community. The 26 recommendations take key aspects from each chapter of the CDUT. For instance, one of the 26 recommendations was to include community involvement and traditional knowledge within all aspects of any long term monitoring plans, as well as, any other area that may benefit from this knowledge (i.e. research projects) (Government of Canada, 2005). Some other recommendations include capacity-building and how to incorporate training initiatives and long-term monitoring of the Port Radium site (Government of Canada, 2005). This project also incorporated youth and community members to find opportunities and ways to engage and expose young students and community members in environmental management, environmental science or engineering (Government of Canada, 2005). Recommendations included training staff at the Health Centre to be aware of unique factors within the community which may be related to Port Radium, including cultural, physical and mental health problems (Government of Canada, 2005). Lastly, implementing a long-term monitoring plan of Great Bear Lake to ensure that traditional foods are safe to eat (Government of Canada, 2005). The conclusion of this five year study was that “[There was] no evidence... [to] indicate a significant

increased risk of radiation induced cancer in the community” of Délı̨ne (Government of Canada, 2005). This conclusion stands in contrast to the claims that were made in the CDUT testimony, which included over 130 interviews with family members who were connected in some way to the Port Radium Mine (Stanley, 2014). This community has seen a significant number of cancer deaths, especially amongst ore carriers and their families – the Délı̨ne First Nation records reveal that of the 35 men from the First Nation known to have worked as ore carriers, at least 10 have died from cancers (Stanley, 2014). This story drew interest from Maclean’s magazine in 1998 where they highlighted families from Délı̨ne who had been affected by cancer (Maclean's, 1998). The cancer deaths left many widows who once relied on their husbands as primary support for their family, now reliant on young men for traditional food sources (Kenny-Gilday, 1998). It is said that this community was the first generation of men in this region to grow up without guidance of their fathers, grandfathers and uncles to teach cultural, economic, spiritual and emotional aspects of Dene culture (Kenny-Gilday, 1998).

1.8 Dene Culture

In many Northern Indigenous communities, including Délı̨ne, music, food, and living on the land are part of their extensive culture and history (Sahtú Renewable Resources Board, 2014). For the purpose of this thesis, we focused on the First Nations people from the NWT, who predominantly identify themselves as Dene; however, it is important to note that the Indigenous people living across Canada are diverse in many ways, each group of Indigenous peoples hold their own culture, history, language and societal norms (National Aboriginal Health Organization, 2008).

1.8.1 The Dene Law

Dene people in the NWT also live and refer to their Dene Law. In many of the band offices, community centers, and health centers throughout the NWT, you will come across the “Dene Law” posters (see Figure 2). The Dene Laws state:

1. Share with your people.
2. Help each other.
3. When you lose someone in death, share your sorrow with the relatives of the one you lost.
4. Love each other as much as possible.
5. Be respectful of Elders and everything around you.
6. Sleep at night and work during the day.
7. Be polite and don't argue with anyone.
8. Don't hurt anyone with your medicine power.
9. Young girls and boys should behave respectfully.
10. Pass on this teaching.
11. Be happy at all times.
12. Don't worry.
13. Don't lie about medicine power.

These laws are guiding tools for children, youth, adults, parents, and Elders to follow. These Laws are important to Dene communities, and offer valuable cultural ideology and information that can be passed on through generation to generation as Traditional Knowledge.

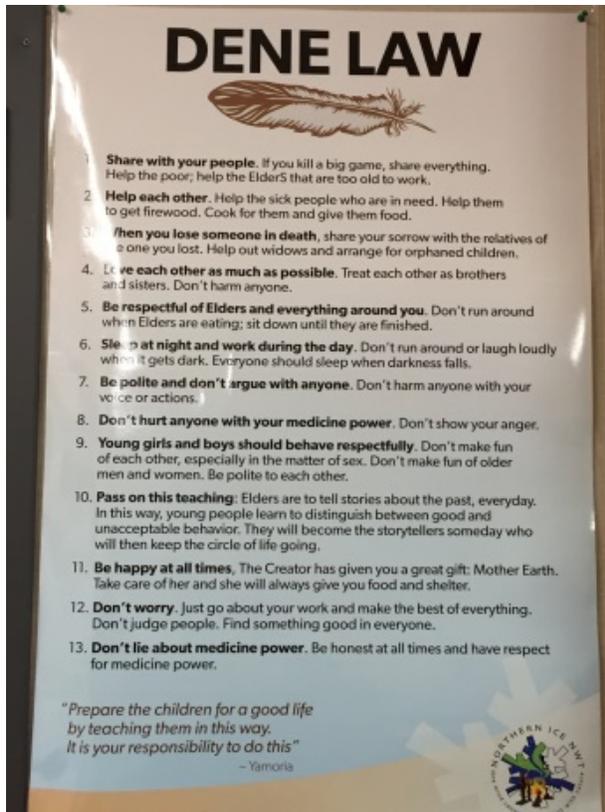


Figure 3: Dene Law

1.9 Benefit to the Communities

The benefit of the overall Human Biomonitoring project is to identify the contaminant levels found in the participants, as well as in the community. We will be able to determine whether these levels are within the “safe” zone based on Health Canada’s Maximum Levels of Chemical Contaminants, the First Nation Biomonitoring Initiative, and the Canadian Health Survey (Health Canada, 2016). This will help us, as researchers, to work with the community in order to provide a baseline for each specific community. The baseline data will help with future research if communities decide to examine their contaminant levels over time. Additionally, this baseline and community data can be used as a tool of governance since the health of the community is directly correlated the environment.

This larger project will also help to determine and to identify groups that are most vulnerable based on age, sex, region, and food and as a result get the information to those who may need it the most. This project will also help to promote the consumption of country foods while being able to limit and measure the exposure to contaminants.

Lastly, this thesis project will be able to determine ways that may be beneficial to researchers and government agencies who will develop public health communication strategies. The results of this research could help to create messages that are community targeted, culturally sensitive and incorporate Indigenous knowledge, in order to benefit communities in the Sahtú Region.

1.9.1 Building Community Capacity

The Human Biomonitoring project will be based in communities and researchers are ready to learn from local people by engaging in community workshops, public meetings, and meeting with local government and stakeholders. We will be there to listen, and learn about community values and priorities. We can be there as a resource to share our knowledge when necessary, by answering questions that may arise regarding contaminants and the biomonitoring project. This project involves the hiring, training, and mentoring of Indigenous community researchers to gain necessary skills to ensure the opportunity of reproducing this project independently (Kovach, 2009). By working together with local government, and by investing time and resources into the communities, the biomonitoring team hopes to build community capacity.

1.10 Research with Indigenous Peoples

It is essential for researchers to acknowledge the differences between Western Science methodologies and Indigenous knowledge (Ermine, Sinclair, & Browne, 2005). In order to build

relationships with Indigenous communities, it is believed that two concepts are imperative: relational accountability and mindful reciprocity (Tobias, Richmond, & Luginaah, 2013). This involves building ethical relationships and research partnerships with communities, being a thoughtful and compassionate researcher, and engaging with community partners and collaborators (Pearson, 2012). According to the Canadian Institutes of Health Research [CIHR], it is essential that western-trained researchers understand, and acknowledge the validity in Indigenous space (Canadian Institutes of Health Research, 2010). Indigenous space refers to the community's principles, values and beliefs (Canadian Institutes of Health Research, 2010). By doing so, as western researchers we must understand, respect and value Indigenous world views, particularly those that revolve around sacred and traditional knowledge (Canadian Institutes of Health Research, 2010). Our project aims to work respectfully with communities by continually engaging with community members and leadership to create a project that is respectful and important for community members. We work with communities as long as the community members and leaders think it is necessary and in an area of research that is useful for their community. We will also work with translators when necessary, and work with community leadership to inform our project throughout the entire process.

1.11 Ethics and Reciprocity

Ethics clearance was received from the University of Waterloo Research Ethics Committee and the Stanton Territorial Health Authority for the larger biomonitoring project. Modifications to the original ethics application were approved for the health and risk communication component for this thesis. The necessary research licenses from the Aurora Research Institute were sought and obtained.

Through this process, we had a dialogue with leaders from each community for the preparation and completion of research agreements that clarify the responsibilities and expectations of the research team and each participating community. Further, these Community Research Agreements define the scope of the work, expected benefits and outcomes, principles of informed consent, as well as the data management plan. Community leaders provided critical advice for several aspects of each agreement, including translation of documents, sampling dates, local research coordinator training, as well as the design of a protocol for the destruction of hair samples in a culturally appropriate manner. Additionally, the agreements informed the development of sampling protocols and training documents for the local coordinators and nurses to work on the project.

Chapter 2 - Literature Review

2.1 Introduction

This literature review will include some terminology that is important to have a full understanding of for this thesis. This terminology is aimed to help the reader have a better understanding of the Indigenous populations that we work with, as well as to justify some terms that will be used in the thesis and that may often be used interchangeably. In addition to terminology, this literature review will include an overview of Dene land, Dene Nation, Indigenous Knowledge, and information about some of the communities and regions from the NWT that we have been working with. Human biomonitoring, wildlife monitoring, and fish monitoring research will be discussed. Another component will be delving into Indigenous perspectives on food and health, the health of Indigenous populations in the NWT, traditional food systems in subarctic populations, and a section regarding communications and language in the NWT.

2.2 Traditional Knowledge

Traditional Knowledge, incorporates a body of knowledge, beliefs, traditions, language, culture, and spiritual aspects of Indigenous life that have been handed down from generation to generation (Canadian Institute of Health Research, 2010; Simeone, 2004) According to the Royal Commission on Aboriginal Peoples, the definition of Traditional Knowledge (TK) is “a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about relationship of living beings with one another and with their environment” (Berkes, 1997). TK is essential to Indigenous culture and survival; knowledge holders have the right to their knowledge within communities (Mauro, 2000). In the past, Indigenous communities have had their traditional practices denounced, devalued, and even outlawed in the Indian Act

(Canadian Federal Government, 2017). In Dene TK, there is a spirituality based moral code of ethic that governs the interaction between the human, natural, and spiritual worlds (Canadian Institutes of Health Research, 2010). An example of Dene TK is that our earth is seen as a living organism, where resources are used within reason and are taken care of in order to ensure continuous use and benefit for their children, and grandchildren (Canadian Arctic Resources Committee, 2017). Within my thesis, I have continued to work together with Indigenous communities in order to learn, and create a culturally appropriate research project, which incorporates TK and I value and respect the TK that has been shared with us.

2.3 Indigenous Perspectives on Health and Food

TK also plays a role in the perspectives on health in Indigenous communities in the NWT. Health in Indigenous communities revolves heavily around the relationships between social, cultural, and spiritual dimensions (Van Oostdam et al., 2005; National Aboriginal Health Organization, 2008). Indigenous models of health are diverse and generally include the health of the community as a whole. This can include the intellectual, spiritual, physical, mental, emotional and environmental aspects of health and wellness within each community (National Aboriginal Health Organization, 2008; Smylie & Anderson, 2006). These models are less of a westernized biomedical model, and more of a holistic model and perspective on health (Smylie & Anderson, 2006). The westernized, biomedical model is widely accepted by government; however, the holistic model is increasingly being used in public health settings by looking at social determinants of health (National Aboriginal Health Organization, 2008). Some communities are initiating their own health models including culturally specific conceptualizations of health, and Indigenous leadership which emphasizes local social

determinants, upstream measures, collective measures and wellness (Smylie & Anderson, 2006).

Within Indigenous populations, food is considered an essential aspect of life to be healthy (Van Oostdam et al., 2005). Indigenous teachings consider health not just in regard to the absence of disease, but as an overall healthy body, mind, and spirit (Health Canada, 1994). The term “country food” is used to describe the food that communities harvest from the land, for instance: land mammals such as moose, caribou, and deer as well as fish, plants, and berries (Van Oostdam et al., 2005). The plant and animal species that were harvested from the land are considered sacred to these communities, and are never wasted (i.e., all parts of the animal are used in some way) or taken for granted (Health Canada, 1994). Country food is important in bringing together communities in terms of cultural, social, spiritual and economic ways (Van Oostdam et al., 2005). Country food harvesting encourages the sharing and coming together of communities (Skinner, 2013). It was the common belief that it is one’s obligation to share with others when animals or plants were harvested (Health Canada, 1994). Foods were chosen so that they could supply the body with the nutrients it needed, while encouraging respect to the land (Health Canada, 1994). The knowledge about essential nutrients that the body needs came through experience from Elders and were passed along throughout generations (Health Canada, 1994). Indigenous communities within the Sahtú region relied on fish due to the abundance of lakes in the area; however, many have now changed diets with less reliance on country foods, partly due to contamination in certain lakes and increased availability of store-bought foods.

Communities from the subarctic regions, generally rely on first and second trophic level which encompasses herbivorous animals and fish (Gauthier, 2013). These foods are generally

higher in contaminants than the primary producers and consumers due to the bioaccumulation within the food chain (Berti, 1997).

2.4 Traditional Food Systems Terminology

First Nations people in Canada have relied on food from the land for centuries, these foods were essential for the survival, health and wellbeing of communities (Assembly of First Nations, 2007). The traditional food system includes all foods that are available for use in particular cultures (Assembly of First Nations, 2007). For First Nation communities, the variations in their food system are depends on their geographical location (Receveur & Kuhnlein, 1998). For First Nation communities in the NWT, food harvested from the land and water are referred to as traditional foods, country foods, or food from the land. For the sake of consistency, this thesis refers to foods harvested from the land and water as country foods.

2.5 Health in Indigenous Communities

The Indigenous peoples of Canada are shown to have a notably lower health status than those who do not identify as Indigenous. This can be due to many of the social determinants of health that may affect them at a higher rate: inadequate or overcrowded housing, lower income or poverty, unemployment, and high rates of addiction, all of which can impact mental, spiritual, and physical health and wellbeing (Adelson, 2005; National Collaborating Centre for Aboriginal Health, 2013; Smylie, 2000; Statistics Canada, 2001).

According to the Health Status Report by the GNWT, the four leading causes of death in the NWT are cancers, cardiovascular disease (heart disease and heart failure), injury (suicide, falls, ATV and motor vehicle collisions), and respiratory disease (Government of the Northwest Territories, 2010). People in the NWT also have problems with affordability and adequacy in housing (Government of the Northwest Territories, 2010), have lower levels of education, higher

levels of smoking, and a low employment rate compared to other Canadian populations (Government of the Northwest Territories, 2010).

2.6 Contaminants in the Northwest Territories

Another way that Indigenous health is impacted is due to environmental hazards that include contaminated sites situated in various areas of the territories. According to Indian and Northern Affairs Canada (INAC), there are over 40 federally managed contaminated sites within the NWT. In the Sahtú Settlement Area, there are currently six contaminated sites, Canol Trail, Contact Lake Mine, El Bonanza, Sawmill Bay, Silver Bear Properties, and Port Radium Mine (Indian and Northern Affairs Canada, 2010).

Human health implications for Indigenous populations in the NWT from exposure to contaminants could have effects due to high levels of persistent organic pollutant, heavy metals, and radionuclides (Van Oostdam et al., 2005). Indigenous communities who rely on country foods in the NWT may have higher levels of environmental contaminants, as opposed to those who do not rely on country food in their day-to-day life (Berti, 1997). Additionally, higher levels than non-country food consumers or communities, could be due to increased bioaccumulation of contaminants within wildlife in the Arctic and subarctic regions (Berti, 1997).

Industrial waste and pollution became a concern, especially among Arctic communities when studies found high levels of polychlorinated biphenyls (PCBs) among many individuals (Kinloch, 1987). These PCBs were used in products such as transformers and electrical equipment, which take a long time to break down, and eventually ending up in the water system, which in turn taints the food supply (Health Canada, 1994; United States Environmental Protection Agency, 2012). Industrial waste can also include mercury, which could be found in batteries, dental amalgamations, and thermometers (World Health Organization, 2017).

In addition to industrial waste, lifestyle factors can also influence contaminant exposure status. Considerations about diet, including alcohol consumption, smoking, genetic predispositions, and socio-economic status may play an important role when determining and analyzing results of contaminants in these regions (Van Oostdam et al., 2005). The Northern Contaminants Program (NCP) was established by Aboriginal and Northern Development Canada (AANDC) and is managed by a committee involving: Health Canada, Environment and Climate Change Canada, and Fisheries and Oceans Canada. This bureau was developed in response to concerns of human exposure to contaminants in fish and wildlife species that are important to the diets of many northern Indigenous peoples (Van Oostdam et al., 2005).

2.7 Biomonitoring and Contaminants in the Northwest Territories

Due to these contaminated sites, contaminants including PCBs, heavy metals (e.g., mercury and lead), and radionuclides have been reported to bioaccumulate in food systems within the Arctic and subarctic organisms (Berti, 1997). Since many Indigenous peoples rely on country foods as a large component of their daily diet, it is possible that they may also have levels of contaminants which could cause some concern in certain communities (Berti, 1997). According to a study assessing diet quality of adult Dene/Métis communities in the NWT done by Receveur, Boulay & Kuhnlein (1997) consumption of country foods showed higher levels of iron, zinc, potassium, riboflavin, vitamin D/E/B-6, selenium, manganese and more. Fish and lean wild harvested game meat, such as moose and caribou, are considered a healthy and important component of diets in northern communities (Abelsohn, 2011). However, fish and certain land mammals are also the main source of exposure to contaminants including methylmercury which can cause neurotoxic effects at high doses (Mahaffey, 2004). Mercury concentrations in two lakes in the Sahtú, Lac St. Therese and Kelly Lake, have been tested in the

past with higher than normal levels of mercury, which has issued consumption notices and health messages (Canadian Broadcasting Corporation, 2010). Below are the four main contaminants of concern (i.e., mercury, cadmium, arsenic, and lead) found in country foods across the NWT including their fact sheets and/or advisory notices issued by the GNWT.

2.7.1 Mercury (see Appendix A)

Mercury is a neurotoxin, and human's exposure and health outcomes vary depending on the form of mercury, the amount of exposure, the length of exposure, the method of exposure, and the vulnerability of the person who is exposed (United States Environmental Protection Agency, n.d.).

2.7.2 Cadmium (see Appendix B)

Cadmium is a metal found in earth's crust; however, it is generally extracted and used as a byproduct in batteries and electronics (Agency for Toxic Substances & Disease Registry, 2012). In certain areas of the NWT, there are moose with high levels of cadmium in their organs (Government of the Northwest Territories, 2017).

2.7.3 Arsenic (see Appendix C)

Arsenic is naturally present, and is highly toxic in its inorganic form (World Health Organization, 2017). Contaminated water used for drinking and food preparation poses the greatest risk on health (World Health Organization, 2017). Yellowknife is predominantly affected by arsenic in the Northwest Territories (Government of the Northwest Territories, 2017).

2.7.4 Lead (see Appendix D)

Lead is a naturally occurring toxic metal found in the earth's crust. Human exposure to lead can be due to environmental contamination such as mining, manufacturing and recycling activities, continued use of leaded paint and gasoline, and the manufacturing of lead batteries for vehicles (World Health Organization, 2017).

2.7.5 Uranium (see Appendix E)

Uranium is a radioactive element used for fuel in nuclear power reactors (Canadian Nuclear Safety Commission, 2012). People that live near hazardous waste sites, near mines or near a uranium waste disposal point may have higher exposure levels than others (Brugge, Lemos, & Oldmixon, 2005). The health effects of concern that have been documented are renal, developmental, reproductive, and cancers (Brugge, de Lemos, & Oldmixon, 2005).

As a way to monitor the contaminants in the NWT, many researchers collect samples to assess. There are research projects that include wildlife monitoring, fish monitoring, and human biomonitoring (Aurora Research Institute, 2014). Dr. Brian Laird's human biomonitoring project is one biomonitoring project currently happening in the NWT (Laird, 2017).

2.8 Health and Risk Communication

Now that we understand the concerns surrounding contaminants we must take a more in-depth look at the health and risk communication work that has been done. Health and risk communication have become an increasingly important aspect of public health (Rimal & Lapinski, 2009). This has been illustrated through the continuous work done by the NCP, who has continued to identify Communication, Capacity and Outreach in their priorities for future research (Health Canada, 2018). The NCP has a mandate to address health, science, and communication issues related to contaminants by working to reduce, and wherever possible, eliminate contaminants in traditionally harvested foods, while providing information that assists in informed decision making by individuals and communities in their food use in Canada's Arctic (Health Canada, 2018). The NCP has invested over 500,000 dollars in their Communications, Capacity and Outreach subprogram of the NCP (Health Canada, 2018). In 2018-2019, the NCP has welcomed proposals which highlight work related to translation and interpretation of contaminants terminology into Indigenous languages (Health Canada, 2018).

Key priorities in this call for proposals includes: 1) Assessment of promising practices in communication and engagement; 2) Delivery of synthesized contaminants messages; and 3) Development and assessment of new tools, resources and approaches for communication, and providing additional funding to researchers in this field. This shows an increased need and desire for future development of work in health communication from the government (Donaldson et al., 2013; Health Canada, 2018). In another instance, the Arctic Human Health Initiative indicated that an important aspect of their International Polar Year Project (IPY-IHS) was education, outreach, and communication (Parkinson, 2013). The IPY-IHS noted that increased dialogue between researchers, policymakers and communities, and an increase of community involvement in research activities to foster a “new” generation of Arctic health scientists were both priorities (Parkinson, 2013). Additionally, it has been shown that having an effective health communication strategy has been beneficial in disease prevention, health promotion, and improved quality of life (Parrott, 2004). As we can see, there has been an increasing push for importance of health communication.

However, since health risk communication is a relatively new area of study, there are limited amounts of empirical research, which makes finding solutions difficult; therefore, there are various ways to create, process, and disseminate messages (Lundren & McMakin, 2009). Health risk communication involves messages and advice designed to reduce harm, maintain and improve health, assuring that these messages are delivered in a culturally and socially respectful manner (Lundren & McMakin, 2009). When developing health risk messages, there are many implications that risk communicators need to consider, for instance: will the source of the message be credible with the intended audience? Have the messages been developed in a way to be easily understood by the audience? What methods are being used to reach the audience? What

attitudes from the audience will affect how the audience perceives the message? Can we plan for effective feedback to evaluate not only the risk communication process but the decision process as well? (Lundren & McMakin, 2009).

In order to communicate the information regarding contaminants found in country foods across the NWT, health communication strategies and frameworks must be considered and involved. According to the World Health Organization (WHO), health risk communication is used to enable people at risk to make informed decisions in order to protect themselves and their communities (World Health Organization, 2018). Health risk communication uses many communication techniques ranging from social media, to mass communications, to community engagement (World Health Organization, 2018). Lastly, the WHO recognizes the importance of developing an understanding of people's perceptions, concerns, and beliefs as well as their knowledge and current practices in order to create the most meaningful health communication strategies.

Some communication work around contaminants occurred from 1999 to 2005, when the Canada-Déline Uranium Table (CDUT) was being implemented in the NWT (Déline First Nation, 2005). As mentioned previously, the CDUT team prepared a comprehensive program of studies and activities; one component of this project was incorporating a TK and communications aspect (Déline First Nation, 2005). Researchers from the CDUT engaged in discussions with communities in order to create an effective health communication plan. Important aspects from community members were to always include a TK component, and that the communication programs should incorporate a community capacity building component (Déline First Nation, 2005). Based on a survey that the CDUT used in Déline, the most effective modes of communication were: 1. Workshops; 2. Public events; 3. The CDUT newsletter; and 4.

Word of mouth (Délıne First Nation, 2005). In addition to these, accurate translation was found to be especially important when discussing scientific information (Délıne First Nation, 2005). It was also found that varying ages required different dissemination tactics and varying methods of communication (Délıne First Nation, 2005). As mentioned, these primary modes of communication were measured between the years 1999 to 2005, at this time social media may not have been as prevalent as it is today. In the 2015 Arctic Monitoring Assessment Programme (AMAP) the application of social media for risk communication in the Arctic was discussed (Krümmel et al., 2015). According to the 2015 AMAP report, dependent on the goals of the risk communication strategy, social media can be an effective tool to enhance health risk communications across the North (Krümmel et al., 2015). When using social media, a ‘two-way’ communication strategy has been shown to represent the greatest shift in risk communication and messaging exchange (Krümmel et al., 2015). According to AMAP 2015 ‘two-way’ communication allows for the exchange of comments, feedback and clarity (Krümmel et al., 2015). Social media has also been shown to build virtual networks which has allowed northern users to connect and socialize with others who have similar concerns or common interests (Krümmel et al., 2015).

Furgal & Rochette’s report “Perception of Contaminants, Participation in Hunting and Fishing Activities, and Potential Impacts of Climate Change” used data which assessed participant’s perceptions of contaminants in country foods in Nunavimmiut, Nunavut (2007). Within this community, 62% of people were aware of contaminants in country foods, and 87% had a desire to learn more (Furgal & Rochette, 2007). Additionally, 14% of participants reported changing their country food consumption patterns based on health messages that they had heard, 11% reduced their consumption, while 3% discontinued eating those foods entirely (Santé

Québec, 1992). The perceptions on country foods varied based on the age of the participant, in this study, which was done in Nunavik, it was found that those between the ages of 25 to 45, had “the most favourable attitude” towards country foods, either because of higher quality, or that they felt it was more healthful and nutritious, in comparison to commercial foods (Furgal & Rochette, 2007). Another study done by Calder, Bromage, & Sunderland looked at Risk Tradeoffs Associated with Traditional Food Advisories for Labrador Inuit (2018). This study states that advisories may have unpredictable effects (i.e. reduced intake of country foods) on dietary intake of traditional foods in Indigenous communities (Calder, Bromage, & Sunderland, 2018). The analysis done in this study has suggested that replacing traditional foods with store-bought foods can increase cardiovascular and cancer risks (Calder, Bromage, & Sunderland, 2018). The decision to replace traditional foods could be influenced by advisories which address higher than normal contaminant levels in traditional foods (Calder, Bromage, & Sunderland, 2018). This report demonstrates the importance and continued efforts by many organizations of protecting northern food systems, and ensuring the promotion of traditional foods – not only issuing advisories (Calder, Bromage, & Sunderland, 2018).

When looking at the literature and current methods found to disseminate health messages, we can see a great need for research within NWT communities about perceptions of contaminants in country food, as well as, preferred communication methods. In order to create a successful health communication strategy, and to eliminate the possible fear and discontinuation of country food consumption invoked by previous health communication messages, a risk communication strategy should be put in place (Health Canada, 2007). According to the Public Health Agency of Canada (PHAC), risks cannot be managed without communication, since, communication has been shown to be the most powerful influence on people’s risk decision-

making and behavior (Government of Canada, 2006). When developing a risk communication strategy in the North, the “Guiding Principles of Strategic Risk Communications” from PHAC can be an informative resource, with modification to a strategy based on community and territory specific needs. These guidelines highlight the importance of working with communities before an incidence occurs, in this case, determining high risk areas for higher levels of contaminants in a specific food (i.e. mercury in fish from a particular lake) during the event, and after. It highlights that risk communications should be transparent, including the decisions on how to disseminate and create these messages, and the importance of continuous improvement of health messaging through evaluation.

These guidelines are an excellent resource; however, researchers, and governments involved in this strategy must begin to understand alternative ways of learning and using Indigenous perspectives not only in their methods of communication, but within their research programs (Martin, 2012). A theoretical framework that uses a “Two-Eyed Seeing” approach, as described below, would allow researchers and Indigenous populations to work together respectfully and with compassion, to create a more meaningful communication tool (Martin, 2012).

“Two-Eyed Seeing adamantly, respectfully, and passionately asks that we bring together our different ways of knowing to motivate people, Indigenous and non-Indigenous alike, to use all our understandings so that we can leave the world a better place and not compromise the opportunities for our youth (in the sense of Seven Generations) through our own interaction”

- Elder Albert (Atlantic Policy of First Nations Chiefs Secretariat, 2012, p. 295)

Incorporating two-eyed seeing in risk management frameworks for human health and environmental risks would be valuable. A review by Jardine et al. examined over 80 international, national, and state agencies, institutions, and advisory councils between 2000 to 2002 which had more than 100 risk documents, some of which have incorporated the two-eyed seeing lens (Jardine et al., 2003). This review included examining frameworks and literature related to northern contaminants in Canada and across the circumpolar nations. Conclusions from this review showed that, in general, risk communication and risk management involves social, cultural, ethical, political, and legal considerations (Jardine et al., 2003). A good risk communication tool will involve views of those who are affected by the decisions being made (i.e., communities of the NWT), this could entail, public views, knowledge, and perceptions are important within any risk communication framework (Jardine et al., 2003). These principles are re-iterated by Jack, Brooks, Furgal & Dobbins, as their study, which focused on interviewing Canadian environmental health researchers, Indigenous organizations, environmental health decision-makers working at Canadian Provincial/Territorial or Federal levels of government, environmental health policy makers employed by an Indigenous community, and organization or agency perspectives who work in Indigenous communities (2010). The results of this study found that collaborative relationships between researchers and decision makers, from start to end of decision making, promote and increase the likelihood of meaningful communication (Jack, Brooks, Furgal, & Dobbins, 2010). This study also identified key elements that could be beneficial in developing health messages, such as: crafting key messages, locating and using credible messengers, determining strategies that could help in cultural brokers, and identifying communication channels most commonly used and trusted (Jack, Brooks, Furgal, & Dobbins, 2010)

When looking further at definitions across Canada, we can consider one from Public Health Ontario (PHO) who combined the following various definitions -

“The process of promoting health by disseminating messages through mass media, interpersonal channels and event.

May include diverse activities such as clinician-patient interactions, classes, self-help groups, mailings, hotlines, mass media campaigns, events.

Efforts can be directed towards individuals, networks, small groups, organizations, communities or entire nations (Public Health Ontario, 2012)”

- to develop their own definition of health communication:

“Where good health promotion and good communication practice meet” (Rootman & Hershfield, 1994)

The PHO 12 criterion for health messaging tools and 12 comprehensive health communication campaign steps, shown below, were used as guidelines in this thesis. These criterion and steps were chosen since they are comprehensive and could be used to be compared with other current health communication literature that has been published in the NWT and Northern Canada, in addition to the data collected throughout this project. The 12 criterions for health messages, were created in order to follow and review to be sure that the health communication messaging tools are effective (Public Health Ontario, 2012):

1. The message must get and maintain attention
 - a. Different techniques will capture different audiences - varying ways must be tested
2. Position most critical information early in the message
3. The message must be clear

- a. The audience must identify main message points
4. The action you are requesting is reasonably easy
 - a. Breaking the behavior into small, easy steps may help
5. Make effective use of incentives
 - a. The audience needs to know: Why? Why now? So what?
6. Provide good evidence for risks and benefits
 - a. Ensure your recommendations will alleviate those threats
7. The messenger must be a credible source
8. Messages must be believable and realistic
9. The message must be delivered using an appropriate tone
10. Use an appropriate appeal
11. The message must not cause harm to the audience
12. Display identity throughout the message
 - a. Identity can include: the mission, vision, positioning statement

When taking a critical approach to looking at health risk messages in the NWT based on these criteria, we must look at how messages are being transmitted, and how they are aimed at changing behavior. To begin with, we must look at the demographics, behaviours and factors related to that (Public Health Ontario, 2012).

The demographics section will look to capture the right audience based on age, education, location of home and work, and cultural characteristics (Public Health Ontario, 2012). The behavioural section will look to identify current behaviour, readiness to change, feelings of susceptibility, attitudes, and self-efficacy (Public Health Ontario, 2012). Lastly, PHO recommends that it is important for communities to get health-related information from role

models, and from messaging that has been created with the values and the beliefs of their target audience in mind (Public Health Ontario, 2012).

Therefore, when looking at the Sahtú, we must determine perceptions of country food contaminants within their communities in order to create effective messaging tools (Berti, 1997). According to Rimal and Real, “the perceived risk, or the belief that one is vulnerable to ill health or disease is a significant indicator of self-protective behavior” (2003). Those with strong efficacy beliefs and high perceived risk can be expected to engage in more extensive prevention behaviours than those with low efficacy beliefs and low perceived risk (Rimal & Real, 2003). When using communication and health messages to try and shift these perceptions, challenges arise. Identifying some foods that may contain high levels of contaminants, and the risks associated with consuming these foods can be a very complex message to disseminate (Usher, 1995). These complexities when disseminating information can be due to inappropriate or incomplete messaging, as well as, lack of communication between researchers and communities (Usher, 1995). These poor communication strategies often result in an unnecessary change in diet and/or a reduction of country food consumption (Usher, 1995). These dietary changes can result in a lack of nutrient dense country food consumption, in exchange for dense store-bought food (Usher, 1995). In order to create more effective health messaging tools, the additional 12 steps can be followed, which have been developed by PHO as their comprehensive health communication campaign steps, these steps can also be combined and compared with the fundamental ethical, guiding principles and values that Jardine et al., demonstrated to make them more applicable to northern and remote communities (Jardine et al., 2003; Public Health Ontario, 2012):

1. Project Management

- a. Engage in meaningful conversations with stakeholders (Elders, Local government, community members)
2. Revisit your health promotion strategy
 - a. Consider measurable objectives at the individual, network, organizational, and community level
 - b. Ensure your objectives are realistic, clear, measurable, and attainable
3. Analyze and segment audiences
 - a. Break down a large audience into smaller groups to create more tailored messages
4. Develop inventory of communication resources
5. Set communication objectives
6. Select channels and vehicles
 - a. Choose best channels and vehicles for the situation based on reach, cost, and effectiveness
 - b. Consider a mix of communication strategies
7. Combine and sequence communication activities
8. Develop the message strategy
 - a. What? A clear indication of what the message is about
 - b. So what? Reasons the audience should care
 - c. Now what? Next steps for the audience
9. Develop project identity
10. Develop Materials
11. Implement your campaign

12. Complete your campaign evaluation

The above steps can be used to critically evaluate current health messages that have been disseminated in the past throughout the NWT. This comprehensive set of values is used to ensure the reliability of risk messages, the assurance that the perspectives of interested and affected communities are incorporated, and the commitment to open communication with stakeholders (Jardine et al., 2003).

2.9 Health and Risk Communication in the Arctic

The definition of health communication that was used by PHO is comprehensive; however, a critical look at Arctic communication is essential. As mentioned previously, there are a wide variety of contaminants that can be ingested through the consumption of traditional foods, yet these foods are also excellent source of nutrients, promote community connection, and reinforce cultural ties with the land (Donaldson et al., 2015). This phenomenon can be referred to as the “Arctic Dilemma”. This “Arctic Dilemma” brings complexities when it comes to health and risk communication (Krummel & Gilman, 2016). Health and risk communication in communities of the Arctic can be especially complicated due to the information sharing methods that take place between communities, news media, interest groups, and risk assessors/managers (Krummel & Gilman, 2016). When looking at how researchers and governments have been tackling these complexities, the research shows that it was not until the third round of the AMAP report in 2009, that the discussion around health communication was thoroughly examined (Donaldson et al., 2015). In the 2009 AMAP report, we can see the beginning discussions of recommendations and evaluation of health communication strategies in northern communities (Ayotte et al., 2009). According to a collaborator on this project, Dr. Chris Furgal, there has not been a consistent pattern to health communication publications in an over 20-year period, starting in 1992

(Krummel & Gilman, 2016). This indicates, and can be argued, that much less research has been completed and shared, as compared to research south of the 60-degree latitude, on how to best inform Arctic communities (Donaldson et al., 2015). Since the establishment of the NCP in 1991, there have been continued communication challenges, and gaps in the risk communication practices within Canada (Donaldson et al., 2015). Examples described by Donaldson and colleagues indicate that in some cases, contaminant results have not been shared with communities, levels of concern were not flagged to public health officials by researchers, and regions are lacking their own toxicologists to assess the information and are therefore relying on federal toxicologists to communicate information instead (Donaldson et al., 2015). Since being aware of these gaps, the NCP has developed an integrated risk communication group, that aids in the recommendation of strategies and methodologies, and the evaluation of risk communication initiatives (Donaldson et al., 2015).

The diagram of aspects relevant for risk communication in the Arctic shown below (see Figure 3), shared in the AMAP report of 2015, described by Odland et al. can be followed to influence behaviour, and reduce risks to health (Donaldson et al.; 2015, Krümmel & Gilman, 2015; Odland, 2009).

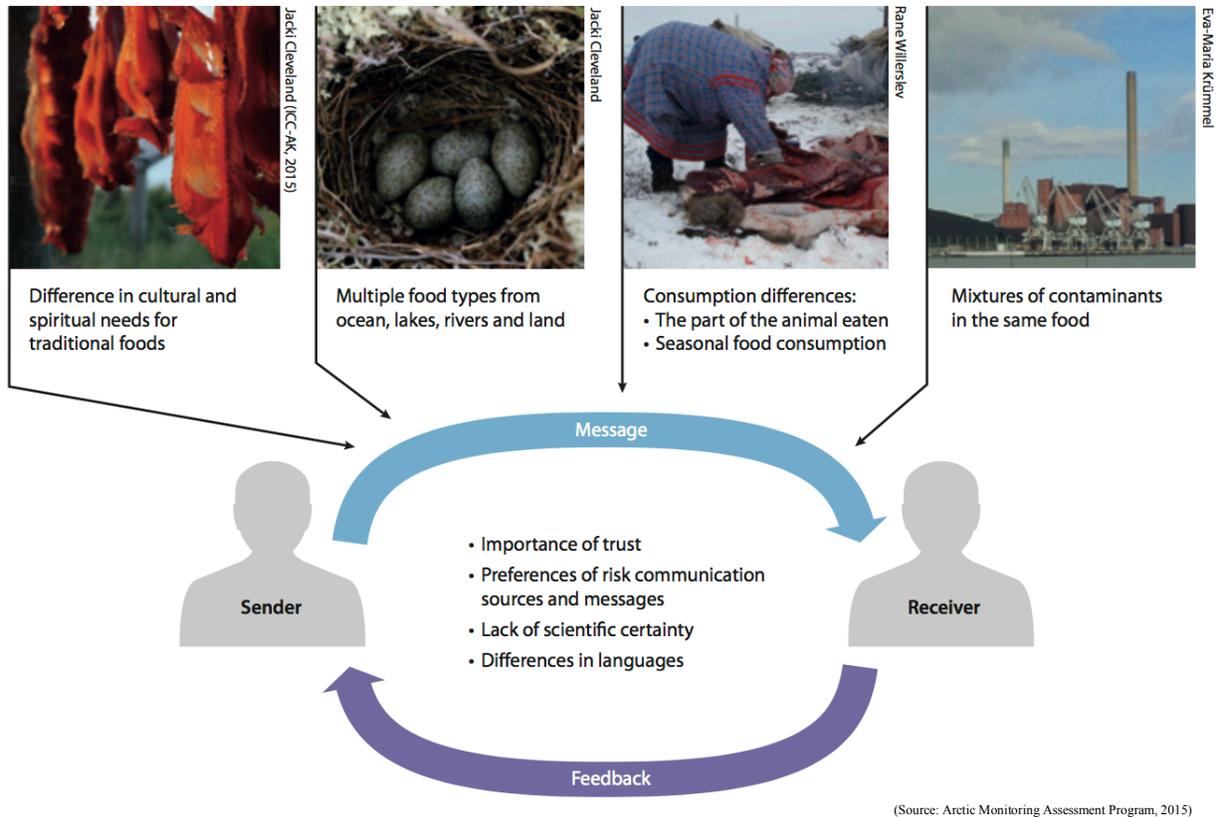


Figure 4: General aspects relevant for risk communication in the Arctic

These general aspects shown above, which are tailored to address Arctic complexities can be used in conjunction with the PHO 12 steps to developing a health communication campaign. According to Tinker, “good risk communication is best formed within an interdisciplinary frame and expertise is required in various fields such as program planning, evaluation, communications theory, marketing, and public health” (1996). The government has increasingly recognized that they have a responsibility to improve risk communication practice (Driedger, Cooper, Jardine, Furgal, & Bartlett, 2013). The government has also begun to recognize that the use of “one-size fits all” messaging is ineffective (Driedger, Cooper, Jardine, Furgal, & Bartlett, 2013). Therefore, in order to create effective health messaging, we must create a level of trust, and an understanding of cultural importance within the communities that are receiving the messages (Driedger, Cooper, Jardine, Furgal, & Bartlett, 2013).

2.10 Conclusion

The literature review completed for this thesis has provided context on TK, country foods and food systems in arctic Indigenous communities, and why having a communication strategy that ensures the direct input of communities, cultural competency and trust is essential. This literature provides a foundation for the methodology and how the components of this thesis were brought together.

Chapter 3 - Methodology

3.1 Introduction

The following chapter represents the methodology done for this thesis project, which includes both quantitative and qualitative components. A mixed methods approach was chosen in order to address the research objectives and to provide context that could not be gathered using solely a quantitative component. There are many identified rationales for following a mixed methods approach, some of those which are relevant to this study include: 1) Triangulation: using quantitative and qualitative methods so that findings can be confirmed and justified by more than one data source; 2) Expansion: furthering the findings of quantitative data that may need additional explanation; and 3) Completeness: providing further information on the topic (Doyle, Brady, & Byrne, 2016).

This project has fulfilled the research objectives by implementing four components to gather data and inform this project. To begin with, two Terminology Workshops were held, one in February 2017 and one in February 2018, both in Délı̄nę, where we worked with community members, local government and Elders to help myself and our team to build an important understanding around relevant terms and facilitate more meaningful language use. The terminology workshops also helped to inform this thesis by providing additional context in terms of values and beliefs within Délı̄nę.

We also held the Health Messages Survey, which generated 43 respondents in three communities of the Sahtú: Délı̄nę, Tulít'a and Kasho Got'ı̄nę. This survey gathered information on: *attitudes, behaviors, and opinions* regarding consumption notices and/or *health messages* that have been previously released to the public. This survey also looked at *how* participants currently *receive health messages* who participants *trust* to receive *health messages*.

Following the Health Messages Survey, we held 12 community interviews in Délı̄ne in 2018. Which were designed to gather further information about perceptions related to contaminants, how people receive health messages and consumption notices and who they would trust to receive messages about contaminants in the future.

The last component was 7 interviews with stakeholders including government, and Dene organizations which were seen to be important in the creation and dissemination of health messages. The interviews were held to address a gap in knowledge that was identified in my literature review, which was to determine current health communication strategies, how health messages are created and disseminated, who the main players are in the creation and dissemination of health risk messages including consumption notices for country foods. By using surveys, interviews, and terminology workshops, information could be gathered to determine current perceptions of contaminants, whether participants had heard or seen contaminant consumption notices and health messages that had been released in the past, and their preferences for how to receive future health messages. These methods allowed for the opportunity to learn about community concern regarding contaminants, who they trust to receive health information, and to learn about the established health communication strategy currently followed by the GNWT. Data for each component were collected across communities during different time periods (see Table 1). This table is included as a way to show a clearer picture of what was done, in which communities, and at what point of the research project.

3.2 Components of the Research Project

Table 1 is a visual way to represent and display all of the components that were mentioned previously and included in this thesis project.

Table 1: The location and timeline for the components of data collected

Component	Conducted – Where?	Conducted – When?
Health Communication and Risk Perception Survey (Former Health Messages Survey)	Déline	February 2017
Feedback on the Health Messages Survey	Déline	February 2017
Health Messages Survey	Tulit'a Kasho Got'ine	December 2017 March 2018
Terminology Workshops	Déline	February 2017 February 2018
Health Messages Interviews	Déline	February 2018
Consumption Notices and Perceptions Interviews	Yellowknife	May 2018

3.3 Community-Based Participatory Research

Community-Based Participatory Research (CBPR) was a method that was used a guideline for this research. It is a form of research that focuses on putting research in the hands of the community, rather than just the researcher(s) (Cornwall & Jewkes, 1995; Minkler & Wallerstein, 2010). CBPR emphasizes the participation, sharing of knowledge and perspectives of local community members and stakeholders (Cornwall & Jewkes, 1995; Minkler & Wallerstein, 2010). According to Cargo & Mercer, “participatory research shares a core philosophy of inclusivity and of recognizing the value of engaging in the research process (rather than including only as subjects of the research) those who are intended to be the beneficiaries, users, and stakeholders of the project” (2008). Using CBPR in northern Indigenous communities can bring about research that is more accountable to community priorities and can realign traditional power relations between researcher and participants (Israel, Schulz, Parker, & Becker, 1998). Long-term goals of this research could include improving research quality, empowering community members, improving the capacity of local communities, and creating more sustainable health interventions (Jagosh et al., 2012). Indigenous communities have experienced

a history of research exploitation, and colonizing practices throughout the research process by researchers, universities and government (Simonds & Christopher, 2013). CBPR was developed in the Western scientific world, and although demonstrates more egalitarian, and culturally sensitive integration, it still must be modified in order to fit with the values and priorities of each community you are working with (Simonds & Christopher, 2013; Wallerstein & Duran, 2010). When using CBPR, the inclusion of communities in the research process from the beginning of project planning, to implementation, to data collection, to analysis, and to the end of dissemination of results is crucial (Minker & Wallerstein, 2011; Tobias, Richmond, & Luginaah, 2013). In the future, efforts could be made to ensure this project embraces decolonizing and cultural sensitivity, for instance, although it is resource intensive, including communities in the creation of the surveys and interviews prior to implementing them could have ensured that the questions were developed with community priorities, and cultural significance at the forefront. Additionally, having both the survey and the interviews translated to the North Slavey language could have helped the communities to understand the benefits of this project to their communities. With further application of CBPR, as mentioned, researchers, in collaboration with the community in which they are working, could potentially make more meaningful connections and improve the health and wellbeing of individuals in the communities (O'Toole, Aaron, Chin, Horowitz, & Tyson, 2003). CBPR is viewed as more than just a set of research methods. It focuses on building relationships between academic and community partners, utilizing the principles of co-learning, mutual benefit and long-term commitment which, encompassing community participation and values (Wallerstein & Duran, 2006). Prior to beginning the research, this project team has collaborated with communities to learn more about the values and priorities of the communities. As researchers on this team, we recognize the importance of the

intellectual, physical, emotional and spiritual dimensions of knowledge that the communities we have worked with have to offer (Canadian Institutes of Health Research, 2017). One of the ways that we have tried to learn more from these communities and improve the communication of the research is by holding terminology workshops (see chapter 8). CBPR's principles and recommendations can be used, and is just one methodological approach that can create a collaborative research project with Indigenous communities (Ritchie et al., 2013). Recognizing the value of CBPR in its movement towards more equitable relations is important; however, being critical of its limitations and to what capacity this methodology has been used in this research is essential. (Darroch & Giles, 2014). Some of the limitations of this methodology, from a researcher's perspective, can include its long and comprehensive consultation process which can be negatively influenced by time constraints, finances, and resources of the research project (Israel, Schulz, Parker, & Becker, 1998).

3.4 Limitations

Limitations to note with this methodology would be that living in a distant province made continued community engagement a challenge. The opportunity to be in the community was limited to one week at a time, where we would have several aspects of the project to work on, not just the health and risk communication component. This normally left about a day or two that would be taken up with specific work for the health and risk communication component, whether that be terminology workshops on a Saturday with community members or holding surveys in conjunction with returning results.

Chapter 4 – Terminology Workshops

4.1 Introduction

As part of the qualitative methodology, I have included two terminology workshop that were both held in Délı̄nę in February 2017 and February 2018. These workshops were important for the context and development of this thesis. The terminology workshops allowed for the opportunity to develop a more thorough understanding of community perspectives of contaminants and engage in meaningful discussion with members of the community of Délı̄nę.

4.2 Terminology Workshops

During the terminology workshops there were many discussions that helped me to understand the connection that communities like Délı̄nę have with the land, the importance of country food consumption and health, and how important language is to keep their communities' culture alive. These terminology workshops were also beneficial to the larger biomonitoring project, since we could better understand how the meaning of words change during translation and we were able to use the translation of key words in major documents that were released to communities (i.e., posters, presentations). The importance of these terminology workshops were not only about the words that were being translated but also about the communication between cultures and meaningful communication between researchers and communities. These discussions have been essential when designing recommendations for appropriate health communication messages and strategies for this thesis.

4.2.1 Terminology Workshop 1

The first terminology workshop was held February 11, 2017 from 9:30am - 5:00pm in Délı̄nę.

Facilitation Team: Michael Neyelle (translator English - North Slavey), Deborah Simmons, Mylene Ratelle, Danielle Brandow, Walter Bezha (Délı̄nę Got'ı̄nę Government)

Knowledge Holders: 11 people (names withheld to keep their participation confidential.)

During the month of February 2017, Dr. Brian Laird and his team travelled to the NWT to help to recruit new communities into the human biomonitoring project, in addition to continual communication with previous participating communities. In the community of Délı̄ne, a terminology workshop was held with 11 participating Elder's from the community. The aim of the first terminology workshop was to find ways to express key words from the human biomonitoring project in Sahtúot'ı̄ne Yatı̄ (North Slavey) with help from local Elders to share their knowledge with us to help with the communication process of the project.

The first terminology workshop was developed and spearheaded by our collaborator, Dr. Deborah Simmons, prior to our arrival in Délı̄ne. A slide-show presentation with mostly infographics was created by Dr. Mylène Ratelle and myself in order to tell the story of the human biomonitoring project within the NWT. The beginning slides demonstrated a 'short story' of our project, showing "Dr. Brian Laird" as a stick-man on the land harvesting moose, geese, and fish, please see Figure 5 below. While being on the land, Dr. Laird encounters a health advisory stating that the lake had an advisory for fish with high levels of mercury. Dr. Laird then starts to wonder 'What does eating country foods mean for his own health?'. This slide was developed to use plain language to explain how the biomonitoring project came to be.

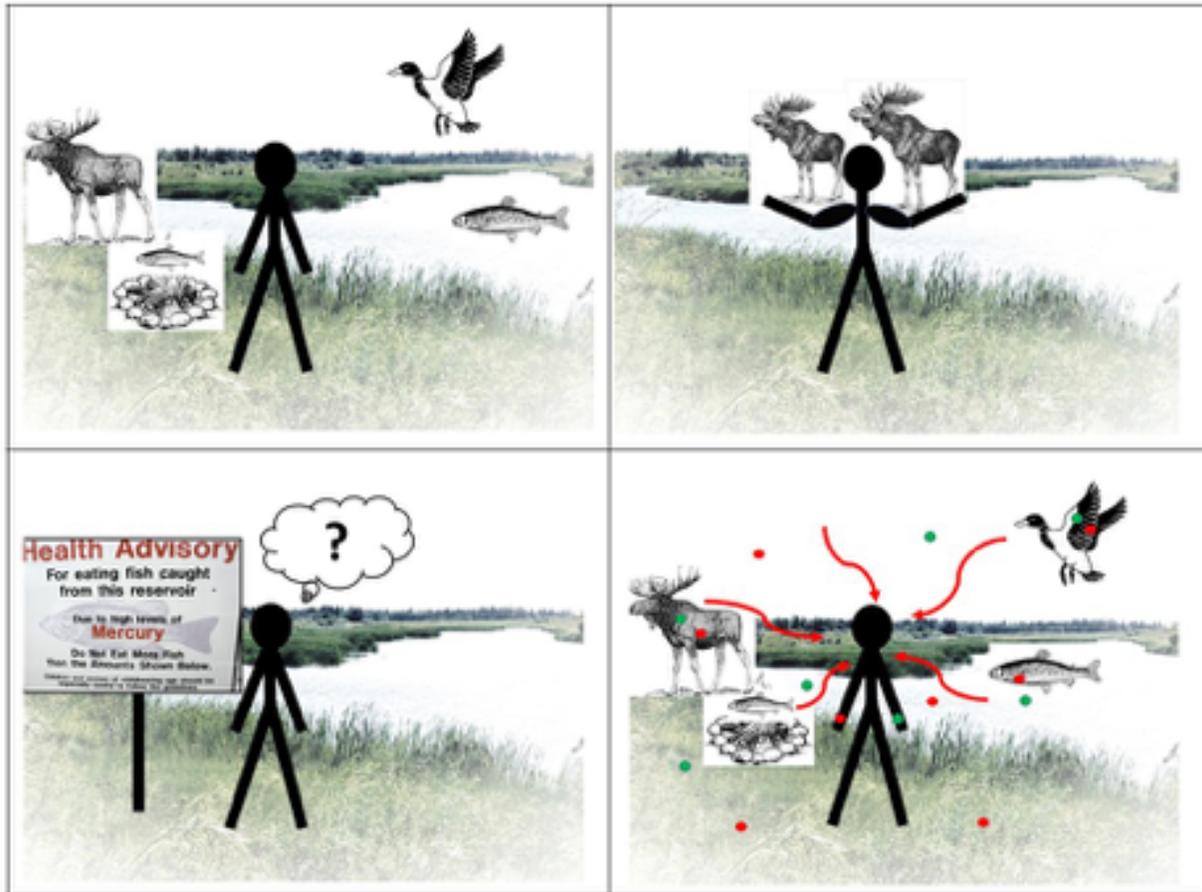


Figure 5: Animated "Story" of human biomonitoring project

(Source: Dr. Mylène Ratelle)

The slideshow was planned to be around 15 to 20 minutes; however, ended up lasting about 2 hours. This was because during the presentation, it was necessary to stop after each slide to discuss terminology before moving on to the next slide. Many of the slides generated meaningful conversation and sharing of stories from the knowledge holders. After each slide, there was also a translation of what I had said into North Slavey. While the presentation was happening, many key words were written down that knowledge holders deemed as important to translate. When the slide show was finished, we began with the translation of terms. The first term to be translated was the word *mercury*. The term mercury is currently perceived as a harmful contaminant; however, Dr. Mylène Ratelle and I wanted to ensure that knowledge holders and translators were aware that there are many forms of mercury, the most harmful type of mercury

is methylmercury which can be found in fish such as: walleye, northern pike, and lake trout. We wanted to be sure that knowledge holders and translators knew that all people have some levels of mercury in their bodies, and those levels are not always associated with harmful health implications. We also spoke about methylmercury, and how it can be especially harmful for babies in the womb who are developing. We communicated that in excess, methyl mercury can potentially be harmful to the development of the baby, the central nervous system, the immune system, and the cardiovascular system particularly in adults.

The next word to be translated was the word *contaminant*. The word contaminant is translated in North Slavey to “something that kills”. Dr. Ratelle and I made it clear, as best as we could, that translators were aware that contaminants can be *natural* (mercury) or *human made* (pesticides, flame retardants) and that contaminants are found in everything (water, food, air). It is normal for everyone to have small levels of contaminants in your body, and that your body can rid of these contaminants naturally. After much discussion, the term contaminants were translated to “something got in it”, which is a better translation since there is not always a negative outcome of ingesting a contaminant. What helped to come to this translation was using the preparation of soup as an example. For instance, when you start to make soup, you start with a pot of water, next you might add salt, in this case, salt isn’t bad as it is adding flavor, but it is *contaminating* the water. Another major translation that occurred was the title of the human biomonitoring project in North Slavey, participants in the terminology workshop chose an unofficial name which translated to “How are we doing?”, (see appendix O).

In addition to the words mercury and contaminant, we created a list of difficult words we wanted to be translated and discussed in the future; however, did not have time to work on these during the terminology workshop.

Difficult words to be translated:

1. Aggregate
2. Bacteria
3. Baseline
4. Biobank
5. Biomonitoring
6. Bugs
7. Contaminant Levels
8. Contaminants
9. Exposure
10. Flame retardant
11. Guidelines
12. Human health scientist
13. Pesticides
14. Principle
15. Quantify
16. Results
17. Risk
18. Risk Level

Notes from the Terminology Workshop:

The terminology workshop was a full day and very few words were actually translated. There were many reasons for this. Many of the words that we were looking to have translated generated discussions and stories before coming up with a final translation. These stories and discussions were highly intuitive and were done in a way that could confirm that the translation was being done properly so that community members could understand the project happening in their community. Another detail to note is that the Slavey language is much different than the English language. The Slavey language only has one structural tense: future, the Slavey language does have some noun words; however, they are not frequently used since most sentences formed in

Slavey are in the form of an action. This causes difficulty when it comes to translation of words. Many community members work together to have the best translation possible; however, these translations are not always direct.

A concern at the terminology workshop was to not create new words, and instead use words to establish a basis for cross-cultural understanding. Some of the Délı̨ne Got'ı̨ne Government (DGG) claimed that by creating new words, we are conforming to the colonization of Indigenous language.

4.2.2 Terminology Workshop 2

The second terminology workshop was held February 5, 2018 from 9:30am - 5:00pm in Délı̨ne.

Facilitation Team: Michael Neyelle (translator English - North Slavey), Deborah Simmons, Mylene Ratelle, Danielle Brandow, Kelly Skinner

Knowledge Holders: 4 people (names withheld to keep their participation confidential.)

During the month of February 2018, Dr. Ratelle, Dr. Skinner, and I travelled to NWT to help to return results for the larger human biomonitoring project. This included a public meeting, where a presentation about the biomonitoring project and the aggregate results were presented. In the community of Délı̨ne, we also held a second terminology workshop where four participating Elders from the community reviewed the slide show that we had prepared for the public meeting. The aim of the terminology workshop was to find ways to express key words from the human biomonitoring project in Sahtúot'ı̨ne Yatı̨ (North Slavey) with help from local Elders to share their knowledge with us to help with the communication process of the project.

As with the first workshop, the second terminology workshop was developed and spearheaded by our collaborator, Dr. Deborah Simmons, prior to our arrival in Délı̨ne. As mentioned, a slide-show presentation was created in order to share the community aggregate results of their

participation in the biomonitoring project from February 2017. Two main questions that were going to be addressed were:

- 1) How do we talk about Délı̄ne’s results from the 2017 biomonitoring project?
- 2) How do we communicate about health and risk of contaminants in Délı̄ne?

Unlike our first terminology workshop in Délı̄ne we did not go over difficult words one-by-one; however, we did review the words that were discussed in the terminology workshop that was held one year prior such as “contaminant”. In this second terminology workshop, we went through the slide show that was to be used at the public meeting. Stories were shared about personal experiences with mining and contaminants. One of the crucial messages from the Elders was about the CDUT and the 26 recommendations that were written for that project. With the support of the four Elders, Michael Neyelle as translator and Dr. Deborah Simmons as our official transcriber we had a translated slide show to present at the public meeting.

4.3 Reflections on Terminology Workshops

The terminology workshops were extremely beneficial to my overall understanding of the culture of Délı̄ne and of Dene people. There were many discussions revolving how language is used and how the North Slavey language differs from English. There was one discussion which was particularly striking which revolved around risk and how that word should be translated. An example that was brought up by Dr. Simmons about knowing about when it is safe to go on the ice. According to Basso, who wrote about ice travel among the Fort Norman Slave, risk was facilitated by the analysis of native classification systems (Basso, 1972). Basso indicated that when speaking about travel on the ice (and in turn, taking a *risk*) there were categories of ice which were distinguished as ‘potentially dangerous (*bı̄dgoniji*)’, ‘suitable (*nèzó*)’, and ‘unsuitable (*nèzole*)’. The details of this particular article were not discussed in the terminology

workshops; however, I believe that it could have been a beneficial addition to the conversation and how people classify risk in the context of country food consumption. The terminology workshops also brought up a lot of the history of Délı̨nę and the priorities of research in the field of contaminants and country foods. It was interesting to hear about the concerns that participants had and how it might impact their day-to-day life. Some members shared stories of their experiences on the land hunting and fishing, these discussions were extremely insightful and meaningful to be part of. I am very grateful to have been part of the terminology workshops and value all of the stories and information that each participant shared.

4.4 Concluding Remarks on Terminology Workshops

My experience at both terminology workshops was extremely positive. These workshops have helped to build my understanding of some aspects of the Dene culture, way of life, of primary methods of communication in communities, how important language is, and the difficulty that lies when translating documents into North Slavey. These workshops have been an important learning tool during the writing of this thesis and have developed meaningful communication between researchers and communities.

Chapter 5 – Development and Analysis: Health Messages Survey

5.1 Introduction

The purpose of this section is to demonstrate how the quantitative component of this thesis, titled the Health Messages Survey was developed, conducted and analyzed in three communities across the Sahtú.

5.2 Health Messages Survey

In order to determine current perceptions of messages that have been released in the Northwest Territories, the Health Communication and Risk Perception Survey was developed as part of the larger biomonitoring project. This survey was used in three communities: Fort Providence, Kakisa, and Délı̄ne from January 26th to February 16th, 2017. A revised version of the Health Communication and Risk Perception Survey, re-named the Health Messages Survey was used in: Samba K'e, Tulıt'a, and Fort Good Hope (Kasho Got'ı̄ne) from November 22nd, 2017 to March 23rd, 2018. Since my thesis will focus only on the Sahtú region, the data collected from the Health Messages Survey in three communities of the Sahtú: Délı̄ne, Tulıt'a, and Kasho Got'ı̄ne, will be included. In the revised Health Messages Survey, there were two major components that were changed, 1. Language and 2. Question format. The questions modified by using plain language in all instances, for example rather than using Omega-3 fatty acids, healthy fats was used. The question format was changed for certain questions that were less user friendly, and may have been less easy to understand how to respond to the question being asked. For instance, removing questions that could be unclear and lead to less precise responses such as those which asked whether you “Strongly Agree – Agree – Neither Agree nor Disagree – Disagree – Strongly Disagree”, or “Trust a lot- Trust some – Neither trust nor not trust – Trust a little – Don't trust at all” and changing these questions to “Select all that apply” or collapsing

responses to only have four response options (i.e. Trust a lot – trust some - neither trust nor not trust – don't trust at all"). These questions could possibly lead to less precision since many participants chose middle answers, which could demonstrate that the participant did not feel strongly about the question or they weren't sure what to answer and leads to incomplete data collection which may need to be supplemented. Surveys were administered using a platform, titled the Quicktap Survey and were done on iPads. The Health Messages Survey was designed to assess messages that had been previously released by the GNWT Department of Health and Social Services over the past 10 years. The messages that have been released generally addressed contaminants in country foods (i.e., caribou, fish, moose etc.), and in lakes where country food was being harvested. The Health Messages Survey had four sections (shown below) which asked about current country food consumption patterns, awareness of consumption notices and health messages, perceptions of contaminants, personal dietary changes based on the health messages, and preferences for communication strategies.

The original Health Messages Survey consisted of the following four sections:

- Part A: Country foods;
- Part B: Behavioural Change and Awareness Advisories;
- Part C: Risk Perceptions and Personal Efficacy;
- Part D: Communication Preferences.

The revised Health Messages Survey consisted of the following four sections:

- Part A: Country foods;
- Part B: Behavioural Change and Awareness of Health Messages
- Part C: Risk Perceptions and Personal Choices; and
- Part D: Communication Preferences

5.3 Survey Development

To create the Health Messages Survey a team of experts were brought together to work on the project: Dr. Chris Furgal (Trent University), Dr. Amanda Boyd (Washington State

University), and Dr. Kelly Skinner (University of Waterloo). These experts began by looking at previous surveys, such as the Inuit Health Survey, created to examine health communication and risk perception in communities throughout Nunavut (Egeland, 2010). These surveys, created predominantly by Furgal and Boyd, helped build a foundation for determining the kind of questions that would be used in the Health Messages Survey for communities in the NWT as part of Dr. Laird's larger biomonitoring project. Survey questions were also developed and shaped based on previous consumption notices in areas that were known for mercury contamination, in addition to consumption notices targeting specific lakes, fish, and mammals. The team's objectives when developing the Health Messages Survey was to get an idea of the health behaviors and health knowledge in country food consumption and contaminants overall. This would be a way to understand how much participants knew about consumption notices and health messages, their perceptions of contaminants, as well as how these messages might be shaping their behaviours. Long-term objectives for the health communication and risk perception component of the project would be to generate baseline data which aims to determine ways to create effective public health communication strategy that can be used to reduce contaminant exposure, maximize nutrient status, while also endorsing country food consumption throughout the NWT.

5.4 Health Messages Survey Question Design

Part A: Country Foods. This section asked one question using a "yes or no" style for instance, question: "Do you eat country foods?" Possible answers: "yes. no". The following questions used a multiple-choice style of question, where the question and options were developed to be as clear, and direct as possible. Question: "What type of food do you prefer?",

Possible answers: “Country foods. Store foods. A mix of both”. Please see Appendix H to view the question design.

Part B: Behavioural Change and Awareness Advisories, Part C: Risk Perceptions and Personal Efficacy, and Part D: Communication Preferences. These sections focused on using “yes or no” style questions, along with multiple choice style questions with multiple answers, and matrix questions with a Likert scale. Some examples included questions such as: “Where or who did you hear that information from? Please choose all that apply”, with possible answers: “Friends. Family. Elders. Community Chief...”. The matrix using Likert style questions were as follows, question: “We would like to know if you have changed the way you think or any activities you perform since hearing the messages about moose and cadmium. Please indicate the extent to which you agree or disagree with the following statements: Since hearing the messages about moose and cadmium:”, with possible answers “I have decreased the amount of moose meat I eat. I have reduced the amount of moose kidney I eat from Mackenzie Mountains...” using a Likert scale “Strongly Disagree - Disagree - Neither Disagree nor Agree - Agree - Strongly Agree (see Appendix H). Other matrix using Likert style questions revolved around trust. For example, question: “We would like to know who you would trust if you wanted to get information about contaminants in the environment and country foods. Please note your answer will remain confidential”, with possible answers: “Elders. University Researchers. Community Chief...” using a Likert scale: Don’t trust at all - Trust a little bit - Neither trust nor not trust - Trust some - Trust a lot (see Appendix H).

Since the first round of sampling, we have removed all of the Likert style questions besides the one regarding trust. We found that the Likert style questions were very difficult to understand when using the Quicktap program, many people had trouble seeing the options as the

font was extremely small and was not able to be changed. We changed all of the questions that had to do with personal efficacy into a simplified version which now uses a multiple-choice platform (see Appendix H).

5.5 Survey Administration

The original Health Messages Survey was conducted between January 26 and February 16, 2017 and the revised Health Messages Survey between November 23rd, 2017 to March 23rd, 2018. The survey was conducted on iPads using the QuickTap Program in the biomonitoring contaminant clinic, where participants were invited to also give blood, hair or urine samples and complete demographic questions and dietary surveys. The QuickTap Survey program was only available available surveys were offered in English only; however, participants had the option of having a trained community member to translate if needed in each community. The average participant took between 10 and 20 minutes to complete the survey from start to finish.

5.6 Survey Sampling and Recruitment

For the larger biomonitoring project, in each community, details of the project were disseminated through posters placed in public spaces throughout the community, local radio interviews and media appearances also occurred (see Appendix N and O) (Ratelle et al., 2018). In communities such as Délı̄ne, Tulı́t'a, and Kasho Got'ı̄ne, with a population of over 100, participants were recruited by telephone with a random sample of households which was created using a random number generator (Ratelle et al., 2018). When the local coordinator would reach someone, they would invite all members of these households to participate in the biomonitoring project (Ratelle et al., 2018). These telephone numbers were collected from band office or local government. At the end of each day, researchers verified the age and sex distribution of the sample to date, and the local coordinator was invited to do targeted recruitment of any under-

represented groups by phone calls. These steps helped to promote the representativeness and generalizability of results (Laird et al., 2017). Once participants arrived at the clinic, each participant was invited to complete the Health Messages Survey and would sign a consent form indicating that they would like to participate (Laird et al., 2017).

5.7 Informed Consent

Each of the participants was asked and required to read and sign an informed consent letter before participating in the research project, (see Appendix I, J, K, L) for adult and minor information letters and consent forms. Each participant had the option to participate in one or all of the components of the study depending on their preference and had the option to withdraw at any point throughout the process.

5.8 Survey Analysis

For the Health Messages Survey, categorical data was used in order to group results based on communities, as shown in Table 1. Descriptive frequencies are used in order to provide summaries of the data collected across three communities: Dél'ine, Tulít'a, and Kasho Got'ine.

Aggregate results for each community have been gathered and presented to each community except Kasho Got'ine, who will receive their results in winter 2019. It should be noted that this analysis will not include a direct comparison among communities as making comparisons between communities is not appropriate and can cause concerns for members of each different community. There will, however, be a section including the data collected in Dél'ine as this community took part in three components of this thesis project. There are many reasons why comparisons among communities are not appropriate. For starters, the research agreement that is signed by communities prior to starting the research states that results will be presented at an aggregate and regional level. Breaking this research agreement would go against

the contractual agreement that this project has with communities and would go against the ethical values that this project leads. Additionally, northern communities that have participated in this project are diverse and have a unique stories, priorities, and histories; by comparing the data, communities may have concerns over why some communities may “have seen or heard” of more messages, whereas others may not. Comparisons using solely quantitative data can undermine the diversity and specific challenges that each community may face.

Chapter 6 – Results of Health Messages Survey

6.1 Introduction

The purpose of this chapter is to share a summary of the results from the Health Messages Survey in the three communities that were sampled in the Sahtú region, Délı̨ne, Tulı́t'a, and Kasho Got'ı̨ne. Aggregate results are shown across the three Sahtú communities in order to share results of the Health Messages Survey from 43 participants across this region. Results from Délı̨ne are also presented as this community was the focus of this thesis and involved in the terminology workshops and Health Messages Interviews with community members.

6.2 Response Rate

Table 2 below represents the final response rates from the Health Messages Survey across the three communities of the Sahtú region who were involved in this thesis project between January 26 and February 16, 2017 and November 22nd, 2017 to March 23rd, 2018.

Table 2: Response rates of Health Messages Survey in Sahtú NWT communities

Total Participants in Sahtú	n=43
Sahtú Community participation	
Délı̨ne	13
Tulı́t'a	21
Kasho Got'ı̨ne	9

6.3 Results of Health Messages Survey

6.3.1 Aggregate Results from Across All of the Sahtú

Results of the Health Messages Survey in the Sahtú showed that 100% of respondents (n=43) consume country foods, and that 49% prefer to solely eat country foods (rather than store-bought or a mix of both country and store foods). Few participants (5%) indicated their preference for store bought foods, rather than country foods. This result could underline the

importance of country foods, and how country foods are favoured in the diets of the Sahtú residents. Participants not only preferred country foods, but indicated they were aware of the many nutritional and health benefits of eating country foods. For example, 91% of respondents said that they had heard or seen the message that “country foods can provide a significant variety and amount of nutrients”, and 86% indicated that they had heard or seen that “eating fish contributes to a healthy, nutritious diet” and “fish is an excellent source of good omega-3 fatty acids”. While only 39% of participants had heard or seen “Pregnant women should avoid eating lake trout and northern pike that are larger than 60cm” and 28% of participants had heard or seen “Children under the age of 12 should avoid eating lake trout and northern pike that are larger than 60cm”.

Part B of the survey focused on health messages that have been released in the past 10 years throughout the Northwest Territories. Seventy-two percent of respondents from the Sahtú indicated that they had heard or seen messages about fish that had high levels of mercury. Most of these individuals reported that they had been informed of these messages by radio (52%), researcher or scientists (48%), friends (39%) and family (32%) participants also indicated hearing information from public meetings. When asked about specific lakes being affected, over 50% indicated that they had heard or seen messages in particular about Kelly Lake, and Ste Therese Lake. When asked “Since hearing the messages about fish and mercury: In general I have “decreased the amount of fish I eat” by choosing Strongly Agree – Agree – Neither Disagree nor Agree – Disagree – Strongly Disagree, 55% participants disagreed, and 10.3% strongly disagreed. Additionally, since hearing these various messages, 45% were concerned about the fish they eat, 31% reduced their consumption of fish, and 21% reported changing the location of where they usually fish.

Although mercury was the leading contaminant of concern among participants (86%), it was followed by lead (74%), uranium (70%), and chlorine in drinking water (67%) as also contaminants of concern for participants in the Sahtú. It is important to note that some participants (16%) indicated that they did not know enough about contaminants in country foods to protect their own health, as well as their family's health. Participants were less familiar with the messages related to moose with high levels of cadmium. Only 16% of participants indicated having heard or seen these messages, of the 16% that has heard about the moose consumption, the messages that have been heard or seen most often were "you should reduce your consumption of moose kidneys from the Mackenzie Mountains" and "Moose from Mackenzie Valley have low levels of cadmium".

In Part D of the survey, respondents were asked about communication preferences and their access to information. Most participants had access to an e-mail address (86%), a cellphone (81%), the internet (81%), a landline phone (72%), and a Facebook account (62%). The most frequently used mode of communication, where Sahtú participants check daily, was local TV (69%), local radio (54%), national TV (46%), social media (46%). When participants were asked "We would like to know who you would trust if you wanted to get information about contaminants in the environment and country foods" with the options of Trust a lot – Trust Some – Trust a little – Neither Trust nor Not Trust – Don't Trust, Friends and Relatives (54%), Elders (49%), Doctors (44%), University Researchers and other health workers (nurses, etc) (40%) were reported to be trusted "a lot".

Table 3: Results from Health Messages Survey from Three Communities in the Sahtú

<u>Statement</u>	<u>Rate (%)</u>
<u>Part A: Country Foods</u>	
Eat country foods	100%
Have heard this message: <i>Country foods can provide a significant variety and amount of nutrients</i>	88%
<u>Part B: Behavioural Change and Awareness Advisories</u>	
Have heard or seen advisories on <i>Fish and Mercury</i>	71%
Have heard or seen advisories on <i>Moose and Cadmium</i>	18%
<u>Part C: Risk Perception and Personal Efficacy</u>	
Strongly Agree or Agree: <i>I am more concerned about the fish I eat</i>	25%
Strongly Agree or Agree: <i>I have concerns about the quality/safety of the country foods I eat</i>	62%
<u>Part D: Communication Preferences</u>	
<i>Access in home</i>	
Access in home to <i>email address</i>	86%
Access in home to <i>cell phone</i>	81%
Access in home to <i>the internet</i>	81%
Access in home to <i>landline phone</i>	72%
Access in home to <i>Facebook account</i>	62%
<u>Part D: Communication Preferences</u>	
<i>Trust a lot</i>	
Friends or Relatives	54%
Elders	49%
Doctors	44%
Other healthcare professional (nurse, etc)	40%
University Researchers	40%

6.3.2 Summary of Survey Data in the Sahtú Communities

The results in section 5.3.1 perpetuates similar results to what was seen in the literature, which is that the importance of country foods and how many people prefer eating country foods over store bought foods or a mix of both is prominent in the diets of Sahtú communities. When asked questions regarding messages and whether participants have heard or seen messages the messages that were heard or seen more often were primarily related to the benefits of eating country foods, for instance “country foods can provide a significant variety and amount of nutrients” which was heard or seen by almost all participants, rather than consumption notices.

6.3.3 D  l  ne Results

The results from D  l  ne are shown independently since this community partook in three of four components of this thesis. Their results are valued as this community has informed this thesis in many ways including sharing cultural values, beliefs and also sharing stories with me that were beneficial to the analysis of this data and to this thesis as a whole.

D  l  ne

Thirteen people from D  l  ne participated in the original Health Messages Survey. *Part A: Country Foods*, showed that 100% of participants indicated eating country foods, 62% preferred to solely eat country foods, 31% preferred a mix of both, and 7% preferred store-bought foods (Figure 6).

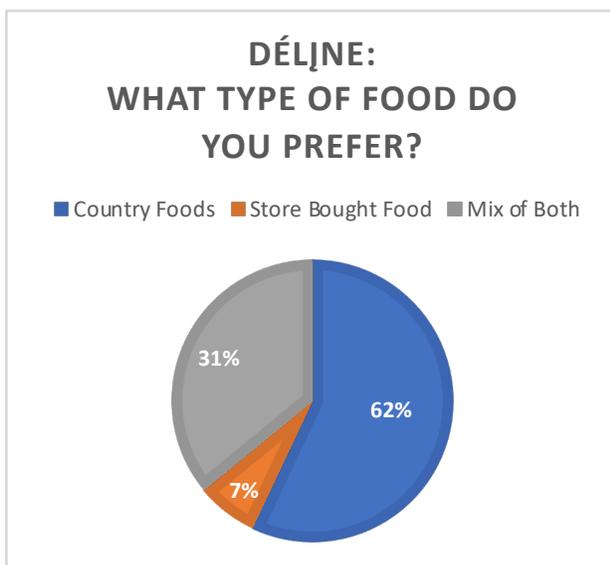


Figure 6: Food Preference in D  l  ne

In *Part B: Behavioural Change and Awareness Advisories*, participants were asked "Have you heard any advisories or messages about fish that had high levels of mercury?" where 62% of participants had seen or heard advisories, predominantly from researchers and scientists (63%), radio (50%), and Elders (38%). Thirty-eight percent of participants had heard that

Ste. Therese Lake had high levels of mercury. When asked “since hearing the messages about fish and mercury”, 50% of Déline participants strongly disagreed or disagreed that they were more concerned about the fish they eat, 67% strongly disagreed or disagreed to changing the location of where they fish, 67% strongly disagreed or disagreed to decreasing the amount of fish they eat, and 83% strongly disagreed or disagreed that they eat smaller fish.

When asked about moose and cadmium advisories, only 23% of participants had heard any advisories or messages about moose with high levels of cadmium. Those who had heard these messages had different means of hearing or seeing messages, some from radio, some from friends, and some from researchers or scientists. Of the participants who had heard advisories or messages, the majority had not heard “Moose from Mackenzie Valley have low levels of cadmium”, or “Moose from Liard Valley have low levels of cadmium”, or “You should reduce your consumption of moose kidneys from the Mackenzie Mountains”; however, over half had heard “You should reduce your consumption of moose liver from the Mackenzie Mountains”, and “Moose meat from Mackenzie and Liard Valleys is a health food choice”.

In *Part C: Risk Perception and Personal Efficacy* participants were asked if they had or had not heard additional advisories regarding contaminants and country foods. When showed a message stating: “Country foods can provide a significant variety and amount of nutrients”, and “Fish is an excellent source of good omega-3 fatty acids” 77% of participants indicated that they had heard or seen these messages. Also, 69% of participants had heard or seen “Eating fish contributes to a health, nutritious diet”. Most participants had not heard messages: “Children under the age of 12 should avoid eating lake trout and northern pike that are larger than 60cm” (8%), “Pregnant women should avoid eating lake trout and northern pike that are larger than

60cm” (31%), and “In general, regular fish consumption by pregnant women and nursing mothers is beneficial for health prenatal and early childhood development” (46%).

Following, these questions, further questions using a Likert-type or rating scale were asked by stating “Please indicate the extent to which you agree or disagree with the following statements”. When asked whether “Most First Nations and Métis adults in the Northwest Territories do not need to be concerned about contaminant related effects from country food consumption” 54% of participants disagreed or strongly disagreed, which potentially shows their concern about country food consumption and contaminants. This statistic was further supported when 62% of participants agreed or strongly agreed to the statement “I have concerns about the quality or safety of the country foods I eat”. Only 38% indicated that they knew about contaminants (like lead and mercury) in country foods to protect themselves and their family’s health. These statements could indicate the concern for the country food they are consuming, but also potentially demonstrate their concern on how to protect themselves from exposure to contaminants. Mercury and lead were the leading contaminants of concern (85%); however, many participants also indicated concern for: heavy metals and uranium and antibiotics in meat (69%). When determining various means of exposure to contaminants, participants indicated that store bought foods (100%), smoking (69%), moose organs (46%), other country foods (46%), and fish (38%) were all factors. Participants also indicated concern for emissions from water, motor vehicles, diesel power plants, small engines, and other small animals that are harvest for example rabbits and ptarmigan.

Part D: Communication Preferences, was used to determine communication preferences and how participants normally received health information. In Délı̄ne, the majority of participants had access to a cell phone (90%), a landline phone (70%), and the internet (70%) in

their home; however, local TV (69%), local radio (54%), national radio (46%), national TV(46%) and social media (46%) were the most common sources of information that participants accessed daily. When participants were asked questions in regards to trust and who they would like to get information about contaminants from Elders (69%), Friends or Relatives (62%), Doctors (54%) and Other Health Workers (nurses, etc.) (46%) were trusted “a lot”. Lastly, 46% of participants who trusted university researchers, and 23% trusted federal government “a lot”.

6.4 Survey Limitations

When using a CBPR approach, development of survey questions should be consulted with communities. When I started this project, the development of the survey was already underway, and in order to incorporate community voices in Délı̄nę I sat with some participants while they completed the survey in order to gather feedback on the ease of the survey while participants were completing it and modified the survey for the following year based on the comments. Based on the comments we received in Délı̄nę the survey had questions that used difficult words, and sentences which could have impacted our data in terms of comprehension. Some questions were worded where participants indicated they felt as though they were being quizzed, this also could have impacted our survey data if participants responded to questions based on what they thought they wanted us to hear. The use of the Likert scale, which on this survey, demonstrated to be ineffective as many people chose the most neutral choices (i.e., neither agree nor disagree). These answers therefore did not give us data that was leaning to one way or another. Additionally, there were questions that were included in the survey which were not necessarily relevant to the Sahtú region, (i.e., questions regarding Mackenzie Mountains – which is a region very far from the Sahtú) where participants could have answered while being unsure. Lastly, it is

important to note that this data may not be representative of the Sahtú in its entirety, since only three (Délıne, Tulıt'a and Kasho Got'ıne) of the Sahtú's five communities (Délıne, Tulıt'a, Kasho Got'ıne Norman Wells, and Colville Lake) were surveyed and analyzed for the human biomonitoring project.

6.4.1 Small Sample Size

Another limitation to the Health Messages Survey was the small sample size in the Sahtú. There are many reasons why the sample size for the Health Messages Survey in the Sahtú was small. To begin with, in order to complete all aspects of the human biomonitoring clinic, participants could be in the clinic for two to three hours. This could mean that participants may have consented to complete the Health Messages Survey; however, experienced research fatigue, or had to leave throughout the clinic and chose to opt-out of completing the Health Messages Survey. Individuals who distrust research and/or researchers could be underrepresented. Since our clinic was held during the winter, older adults who may have mobility issues may have less represented in the results (Newington & Metcalfe, 2014). Also, a lack of representation from people who may have time restraints or competing priorities due to jobs, caregiving, etc could impact the sample size. The implications of having low representation from the Sahtú for the Health Messages Survey could mean that these results are not reflective of the entire population. Therefore, in order to determine whether what we heard in the surveys was accurate, we held Health Messages Interviews in Délıne.

Chapter 7 – Development of Interviews

7.1 Introduction

This thesis project incorporated two types of interviews with different groups and purposes: 1) **The Health Messages Interviews** were beneficial for furthering our understanding and interpreting the experiences and perceptions of contaminants in Délı̄ne, personal concerns about contaminants, who participants trust to receive information, and how they would like to receive information in the future on contaminants. Dr. Kelly Skinner and I conducted Health Messages interviews in February 2018, in Délı̄ne, NWT with 12 participants from the community. The second set of interviews, the 2) **Consumption Notices and Perceptions Interviews** were conducted to gather information on how consumption notices have been developed in the past, and what is currently being done to communicate benefits and risks of country foods to communities throughout the NWT. These interviews took place in Yellowknife in June 2018 with 7 key decision makers in the Northwest Territories. These interviews specifically helped to complement the research that was gathered from the Health Messages Survey and Interviews in Délı̄ne as well as add a more thorough understanding of communication strategies of the NWT.

7.2 Health Messages Interviews

Interview questions were developed in order to further our understanding of current perceptions of contaminants in the Northwest Territories, how participants had heard or seen consumption notices or health messages about contaminants, and who they would trust to receive information in the future. The interviews were performed in February 2018 in the community of Délı̄ne.

7.2.1 Health Messages Interview Questions:

1. What does contaminants mean to you? Would you like to tell me a story?
2. What messages have you heard about contaminants?

- What can you tell me about those risks?
 - Where have you heard these messages?
 - Do you believe the messages you have been hearing?
 - Have you tried to access more information about contaminants?
 - What type (if any) concerns about contaminants do you have in your community?
3. Who do you trust to receive health information?
 - Why do you trust them?
 - Are there any people who you would not trust to receive health information? If so, why?
 4. Who or how would you like to receive information about the country foods you are eating?
 - Are there specific ways that you would like to have information about contaminants and country food presented to you and to your community?

7.2.2 Interview Development

Development of the qualitative interview questions were based on the Health Messages Survey and areas we felt were important to gather further information on. The interview questions were also influenced by oral feedback from participants of the Health Messages Survey in Délı̄nę. The feedback was gathered while sitting with participants who were completing the Health Messages Survey and writing down the comments and questions that they made and posed while going through the iPad survey. The questions were developed and were reviewed by Dr. Skinner, Dr. Laird and Dr. Simmons before being used, the revisions done by Dr. Skinner, Dr. Laird and Dr. Simmons were done in order to ensure that our questions aligned with the objectives of this thesis project. For instance, in order to learn more about the community history of contaminants, our first question “*What does contaminants mean to you? Would you like to share a story?*”. The Health Messages Survey was used as a baseline, therefore the questions that were developed in the survey could be used and expanded into open ended and story-based questions for the Health Messages Interview. Story based interviewing is particularly well suited to CBPR with Indigenous peoples, since this method may be more

culturally appropriate and sensitive to communities (Christensen, 2012). Indigenous knowledges have a tradition in sharing knowledge and story-telling, therefore a conversational or story-telling approach to interviews “aligns with an Indigenous worldview that honours orality as means of transmitting knowledge” (Kovach, 2010). According to Thomas, using storytelling as a method in research helps to build strong relationships with participants (2005). We determined that we would like to focus predominantly on people’s perceptions of contaminants, whether they had heard or seen any messages associated with contaminants and country foods, and where people had been hearing messages, whether they trusted the messages they are hearing, and how to improve messages in their communities. These were priorities in determining community values and importance of contaminant messages in their communities. The questions (as shown above) tried to gather as much information as possible by using open-ended semi-structured questions and encouraging participants to share stories.

7.2.3 Interview Recruitment

Some of the recruitment for the Health Messages Interviews happened before we arrived in Délı̄nę, with help of the local coordinators from last year’s clinic. Posters in both English and in North Slavey (see Appendix N, O) were placed in visible locations throughout the community (i.e. local grocery store, government and band offices) with help from our local coordinators and our collaborator, Dr. Deborah Simmons (Sahtú Renewable Resources Board, NWT). The recruitment for the Health Messages Interviews in Délı̄nę were done primarily throughout the return of results for the biomonitoring project as well as community members who were interested in doing an interview after seeing the posters. Dr. Mylène Ratelle, Dr. Kelly Skinner and I were located in Délı̄nę for a one-week period, where we had set up in the Délı̄nę arena from 9am to 6pm daily in order for participants of the February 2017 biomonitoring clinic to

pick up their individual results packages. Once these participants had gone through their results packages with a member of the team, they were invited to participate in the Health Messages Interview with Dr. Kelly Skinner or I. In addition to inviting participants based on who had come to pick up their results packages, we also used a snowball sampling technique. Snowball sampling is a technique that is used with the help of research participants by asking if these participants could ask their friends/family and social networks (Oregon State University, 2010). This type of sampling aids researchers in recruitment of participants (Oregon State University, 2010). Once we arrived in Délıne, we recruited participants to the interviews that took place by meeting with local leadership and government and having our interviews advertised on local radio as well as having a \$40 gift card from the local co-operative grocery store. Our goal was to complete between 10 and 12 interviews of 30 minutes to 1 hour in length, we ended with 12 interviews which each lasted between 20 to 45 minutes in length. The snowball sampling recruitment worked well, the \$40 gift card enticed several people who had heard from family and friends. The interviews were conducted by myself and Dr. Kelly Skinner.

7.2.4 Materials

In order to perform the interviews and maintain confidentiality, we worked in a semi-private area. We had two corners, furthest from the point of entry in the community gym, which were used in order to ensure as much privacy as possible. An audio-recorder was necessary so that no part of the interview was missed; however, when we went through consent forms to confirm that participants were comfortable with using an audio recorder, two participants chose to not be audio recorded. For these interviews, handwritten notes were taken on paper to record the conversation. The consent forms also confirmed that the interviews that took place were voluntarily.

7.2.5 Health Messages Interview Limitations

As mentioned in the survey limitations, in order to perform a full CBPR project you must work with the community prior to implementing any component of the research. Therefore, prior to holding the interviews, including the community in the development of the questions would have been very beneficial. Although we used community feedback from the Health Messages Survey to inform the development of the questions, this was not comprehensive nor was it community based. Having the SRRB, the Délı̄ne Got'ı̄ne Government (DGG), and community members from Délı̄ne in the interview revision process and development of questions could have helped to build a more directly relevant and culturally inclusive survey. It could have also offered the opportunity to have the survey translated into North Slavey.

7.3 Consumption Notices and Perceptions Interview

After doing the data collection with surveys and interviews in the Sahtú region, interviews with seven key informants from the GNWT, stakeholders at the Dene Nation, the federal and territorial government level and with the Giant Mine Oversight Board were conducted in Yellowknife. The questions, shown below, were developed in order to gather information about the state of contaminant health messaging in the NWT, how messages are developed, who leads the development of these messages, any limitations of past messaging and how these messages have been adapted in recent years.

7.3.1 Consumption Notices and Perceptions Interview Questions:

1. What is your role at the Government of the Northwest Territories?
 - Are you involved in the development and/or communication of contaminant advisories for the NWT? If yes, what is your involvement?
2. What can you tell me about how contaminant advisories are developed?
 - Do most advisories get created as a proactive tool for protection or are they created after you know for sure that certain areas have higher than normal contaminant levels?
3. What can you tell me about how contaminant advisories are communicated?
 - What are the current dissemination tools that are being used?

4. Is there an evaluation method that is being used to determine how the contaminant advisories are being received?
 - If so, what evaluation method is being used?
5. What are some barriers and facilitators to the current tools that are being used?
6. Have you had the opportunity to speak to communities about advisories?
 - If so, what barriers and facilitators of the dissemination tools did you hear about?
7. Do you know of other agencies or places that release advisories besides the GNWT?
 - If so, who are they and do you communicate with these other agencies?

7.3.2 Interview Development

Development of the Consumption Notices and Perceptions Interview questions were based on a gap identified by the literature review performed in this thesis. In the literature review, it was difficult to find information about how consumption notices, health messages, and fact sheets from the GNWT were being developed and disseminated. Another question that arose during the literature was based on the removal of several consumption notices off of the website between 2014 and 2016. Determining the communication strategy that the GNWT was using, and why the removal of so many consumption notices occurred could help to inform this research and create a more adequate picture of the history of health and risk communication in the Northwest Territories. The decision to include other key informants was based on learning more from researchers, the federal government, and organizations that hold expertise and knowledge in the area of contaminants and in communication throughout the territory. The Consumption Notices and Perceptions Interview questions were used in each interview, but were modified according to the organization or institution that was being interviewed.

7.3.3 Interview Recruitment

Interview recruitment began in May, 2018 by making cold calls to 10 potential interviewees, these calls were done to introduce myself and this thesis project. The list that was created for interviewees, and that I used for cold calls was developed by Dr. Mylene Ratelle and

Dr. Brian Laird, based on work that they've done in contaminants in the NWT and their connections to people working at the GNWT. If I reached the possible interviewee on the cold call over the phone, I introduced myself, the project, and determined whether they would like to receive a follow-up e-mail with further details about the project, as well as possible dates for my interviews. If I did not reach the possible interviewee over the phone, I left a message and also sent the same follow-up e-mail to their work e-mails. From the responses that I received from the emails with the availability of these key interviewees, I determined that the best time for me to do interviews was the beginning of June, based on availability of key decision makers in Yellowknife.

7.3.4 Consumption Notices and Perception Interview Selection

The Consumption Notices and Perception Interviews took place in June 2018 in Yellowknife. These 7 interviews were done with stakeholders including government, and Dene organizations which were seen to be important in the creation and dissemination of health messages. These interviews were held to address a gap in knowledge that was identified in my literature review, which was to determine current health communication strategies, how health messages are created and disseminated, who the main players are in the creation and dissemination of health risk messages including consumption notices for country foods. The list of potential participants was developed with the help of Dr. Brian Laird and Dr. Mylène Ratelle. The interviews took place with stakeholders listed below:

The Dene Nation

The Dene Nation was chosen as an important organization to interview about current messages and preferences based on their political, legal, social and cultural influence on matters

that may affect Dene people. The Dene Nation is made up of six regional councils from across the NWT (Dene Nation, 2017).

Federal Government: Giant Mine Remediation Project & the Contaminants and Remediation Division

Several advisories to date have focused on the Giant Mine, therefore, gathering data from the Giant Mine Remediation Project team and the Contaminants and Remediation division in Yellowknife was essential. These divisions of the federal government have had experience in the area of health communication and were chosen to be valuable interview participants.

Giant Mine Oversight Board

Including members of the Giant Mine Oversight Board was chosen in order to gather information on how this organization has played a role in the dissemination of health messages in relation to the Giant Mine. Some members of this organization were known to have played roles in previous advisories which could provide important input for this thesis.

Government of the Northwest Territories: Department of Health and Social Services

The GNWT HSS was chosen as a participant as there were many questions that needed to be addressed to the GNWT that could not be answered by finding information online. The GNWT is how many of the advisories and health messages are released and were very important to interview.

Government of the Northwest Territories: Environment and Natural Resources

This department within the GNWT has done some work with cadmium advisories in the past. It was important to gather information from this division to determine how their work has been done and whether there has been any recent work. Learning from this departments experiences in the past was deemed as a meaningful way to inform this thesis.

7.3.5 Materials

In order to perform the interviews and gather valuable data, we worked in an area chosen by the interviewee, generally in their offices in Yellowknife. An audio-recorder was necessary to confirm that no part of the interview was missed; however, we went through consent forms (see Appendix P) to confirm that participants were comfortable with using an audio recorder. These consent forms also ensured that the interviews that took place were voluntary.

7.4 Conclusion

The development and recruitment of both the community and stakeholder interviews led to the conduction of a total of 19 interviews in total for this thesis. The analysis and results are shown in the following chapter.

Chapter 8 – Analysis and Results of Interview Data

8.1 Thematic Analysis of Interviews

Thematic analysis was used in the analysis of this thesis as a purpose of identifying patterns of meaning across the interview transcriptions in order to provide answers to the research objectives (The University of Auckland, 2006). It is a method for identifying, analyzing, organizing, describing, and reporting themes (Braun & Clarke, 2006). Thematic analysis was chosen for this project because of its rich and detailed, yet complex account of data, which was necessary to analyze the interviews comprehensively (Braun & Clarke, 2006). In order to thoroughly understand the interviews that were performed, themes were established within the data by finding important information that related to the research objectives (Braun & Clarke, 2006). The themes were not always established based on the prevalence of the information that was provided, the themes were also established when a topic was discussed that captured something important in relation to the overall research objectives (Braun & Clarke, 2006). This method was chosen since this thesis is providing information specific to health messages. By looking at importance of themes rather than prevalence within the discussion, the analysis provided a more thorough outlook on the research objectives identified in this thesis. This decision was important, as some interviews would end up off topic and talking about other important concerns of community members, but the information that they provided about health messages was still extremely valued and reflected in this analysis. When doing the analysis of the interview data, an inductive approach was taken. A “bottom up” approach was chosen, where the analysis was done as a process of coding the data without trying to fit it into a pre-existing framework or using preconceptions; this form of thematic analysis is data driven (Braun & Clarke, 2006; Nowell, Norris, White, & Moules, 2017). The bottom up approach was chosen and

used since the data was to be collected before creating themes or ideas of themes. By going over the data with a blank slate the themes could be developed while eliminating preconceived notions. The advantages of using a thematic analysis can include its flexibility, its possibility of generating unanticipated insights, and its allowance for social and psychological interpretations of data (Braun & Clarke, 2006).

8.2 Thematic Analysis Process

As previously stated an inductive approach of thematic analysis was used, which means that the coding and theme development are directed by the content of the data (The University of Auckland, 2006). The analysis of the qualitative interviews according to Thomas (2006) aimed to: a) condense raw data into summary format; b) establish clear links between research objectives and the raw data; and c) develop a framework of the experiences that are evident in the data. Once the data were gathered from the interviews, open coding, axial coding, and focused coding was performed (Merriam & Tisdell, 2015). Open coding is the first stage of the analysis process and involves tagging pieces of data that might be relevant (Strauss & Corbin, 2015). The open coding analysis included the development of categories and the labeling of categories within the interviews (Khandkar, n.d.). However, even prior to open-coding the transcripts of each interview were read several times to identify commonalities. The open coding also helped to break down interview transcripts, and established the beginning of a line-by-line coding process, which built more comprehensive concepts and categories within the transcript. The line by line coding helped establish new codes. When a new code was established, the interviews were re-read and reviewed again with the new code in mind. Once the open coding was complete, axial coding analysis was performed. Axial coding was used in order to refine and determine relationships between concepts that were highlighted in the open coding

process (Böhm, 2004). This stage put together codes into categories, which helped to conceptualize themes after many revisions of the transcripts. Finally, focused coding is a stage at which core categories or hypothesis are derived (Merriam & Tisdell, 2015). The focused coding helped to develop the themes as mentioned below, which were condensed several times to find the most suiting and appropriate themes which capture important aspects of the interviews in relation to the research objectives.

Once the inductive approach was complete, participant's interview transcripts were also linked and compared to the data in the Health Messages Survey results. This link between survey-interview determined whether their answers had remained consistent or varied between the survey and the interview, and whether we could pull themes from the results from the survey with the responses from their interview transcripts.

The qualitative analysis intended to “build a complex, holistic picture, analyze words, reports detailed views of informants, and conducts the study in a natural setting” as said by Creswell (1998).

8.2.1 Using a Reflexive Journal to Inform Qualitative Research

Since February 2018, my first trip to the Sahtú, a reflexive journal was kept. According to Ortlipp, “keeping a self-reflexive journal is a strategy that can facilitate reflexivity, whereby researchers use their journal to examine personal assumptions and goals and clarify individual belief systems and subjectivities” (2008, p. 695). The journal that was kept holds many reflections of time spent in the NWT and stories that I heard from community members and from participants of the biomonitoring project. These stories have helped to inform my understanding of Dene culture and way of life. My reflections were written based on the stories that were told, from my perspective and understanding of the Dene culture. Harrison, MacGibbon, & Morton

state that reflexive journals can “make it clear how the researcher’s own experiences, values, and positions of privilege in various hierarchies have influenced their research interests, the way they choose to do their research, and the way they choose to represent their research findings (2001, p. 325). One of the reflexive pieces that I wrote about in this thesis based on my biases was presented in the beginning, in the Acknowledgement of Land and Personal Perspectives section. This section was written to share my values and experiences that could have an influence throughout this thesis. In other instances, such as section 7.5 Personal Reflection on Health Messages Interviews, I have written about the preconceived notions and assumptions that I had made prior to performing the interviews. The purpose of writing to this was to make these thoughts and reflections visible to the reader, and to not be used as an attempt to control bias. Keeping a reflexive journal has, above all, helped for critical reflection of how I interpreted my time and experiences throughout the NWT, and how this time and these experiences may have reflected my analyses.

8.3 Results of Health Messages Interviews

There were four major themes that were brought out from coding the Health Messages Interviews done in Délı̄nę:

- 1) Importance of Country Foods
- 2) Telling Stories about Port Radium
- 3) How Participants have Learned about Contaminants
- 4) Trust in Receiving Health Messages

The first major theme that emerged from the analysis, **Importance of Country Foods**, highlighted once again that country food are a very important aspect of peoples’ diet.

Participants mentioned the importance of eating a lot of country foods, in particular fish and

caribou. Most participants indicated that they would prefer to eat traditional foods such as fish and caribou daily if they had the opportunity.

“It’s good. And they eat it too. It’s good cooking.... Yeah. I like caribou meat, moose meat, all kind of meat. Beaver. Muskrats. Ducks. Yeah.” (Participant #2)

“I just love country foods and I always eat country foods. But I got to take a break in between, like with store-bought food. And then yeah, I always eat country foods like fish, caribou meat, moose meat – as much as I can get it. And then I’ll have – if I run out of country food, I got to store bought food.” (Participant #3)

These participants mentioned that many people within the community enjoyed going on the land and either hunting or setting nets for fish in both winter and summer.

“I fish too. I laid the other skinny one [net], really low catch. I wanted to check today...hopefully I’ll get a good catch. There’s a lot of people asking for fish.” (Participant #3)

Many people spoke about having a hunter within their families who shared their harvest with them when they could.

The second theme that was brought out was **Telling Stories about Port Radium**. Participants shared their experiences living and growing up at Port Radium, working at Port Radium, or had heard stories from family and friends about Port Radium. One participant shared a story that they remember from living at Port Radium and substances that were spilt into the lake.

“We used to live in Port Radium. Where we used to live there was a mine – that I could remember. They were cleaning up, but they spilt some – they spilt some things into the water. So right now, they’re watching it and they’re looking after it.” (Participant #9)

Another participant shared a story that they had heard numerous times from family and friends about Port Radium.

“I heard a lot of stories about Port Radium, what they’ve been doing over there since [the] 40’s. My husband was there, working there too... I was born there too. We didn’t know anything about the uranium until... they were working over there [Port Radium] and they dumped a lot of waste in the water. And they said it’s not good. It’s the waste of like uranium. So that’s what I heard. A lot of stories about it.” (Participant #10)

Some participants also talked about hearing about stories related to contaminants in the Port Radium area, including the uranium council that was developed and was used to create recommendations for the future.

“I guess they throw all those wastes in the water and all that. They said – I don’t know why they’re talking about Port Radium. Just they’re talking about it, telling them. Finally, they make a council, a uranium council. They talk about it and said “this should do something about there”, because every time people get sick, they said they got cancer. And then people say probably that Port Radium.” (Participant #10)

Concerns related to the many stories participants had heard and shared of workers that had to take a brief safety lesson with foreman on the tarmac of the airstrip near Port Radium and that after the lesson were given very little or no protective equipment to wear, including not always having access to a mask when dealing with certain substances and not having covering for their skin. One participant said they would work with [uranium] dust which they would inhale every day.

“Training, we took all the courses. Asbestos. All kinds of courses. Right on the airport strip. Sometimes... I had a breathing apparatus. Not apparatus, like a mask.” (Participant #1)

These participants mentioned that because of Port Radium they had concerns about the water; they mentioned that they heard that they put big barrels of contaminants in the water and were

now worried that those barrels may have leaked and made the fish unhealthy and/or contaminated.

“My sister, she caught the whitefish. And then she said “There’s something wrong with inside the fish.” So we went over to see it. Just big lump inside the stomach. I said, “Just leave it. It’s not good. It’s not safe to eat... the fish eat from the ground underneath. And the water they used to [Port Radium Mine employees] throw a lot of waste in the water.” (Participant #10)

Those who had previously worked at Port Radium had generally shared the stories about their experiences working with family, which they then indicated could have worried their spouses or children. One participant expressed that her and her husband went to Port Radium and she felt very scared; she said that everything seemed dead there and there were big signs saying not to enter. She had heard many stories and knew many people in her family and in her community had died of cancer because of the materials that were used at the mine without proper protective equipment. One participant went to Ottawa to speak with the federal government about his experience working the mine and having many of his family members die of cancer [after working at the mine].

“There’s a lot of people talking about that. Even make a movie. They went to Ottawa. My husband went. And some people went to Japan to talk with the Japanese people because of that atomic they made from our land. And they said – they apologized that it’s not them who made those bombs... they did a lot of things for Port Radium.” (Participant #11)

The third theme was **How Participants have Learned about Contaminants**. Many of the participants said that they had heard or seen messages about mercury in fish, mostly from Elders but also from the Délı̄nə Got’ınə Government and the Health Centre.

“ “[contaminants] never come to my mind... I never think about things like that, but when I hear about stories... I heard from other people, like meetings, sometimes they [The First Nation, like before the self-government ever started], have meetings, and they always talk about Port Radium.” (Participant #3)

Participants indicated hearing messages mainly from family and friends, but also from Elders, and the Délı̄ne Got'ı̄ne Government.

The last theme was, **Trust in Receiving Health Messages**. When asked about where (or who) they would like to hear about messages from, many people indicated that they trusted Elders, those who know the content matter best such as researchers or nurses, and their friends and family.

“... One of the Elders were talking about the past. And there's some area on the lake. They were talking about the elders – two elders there fishing and hunting it... I heard stories...”
(Participant #4)

When participants were asked about trust and receiving health messages, there were many mixed feelings. Due to the dark history that surrounds Port Radium, and its impact on the community, there are many people that did **not** trust big companies, for one participant it was specifically oil companies and another was mining companies.

“Oil companies are just kind of bad, you know. Don't trust them” (Participant #4)

“I don't like what they did on our land... They don't want anything to happen like that again...So the mining people [I don't trust].” (Participant #10)

Other participants said that they would only trust their family and friends for health information.

“Well, the only thing I can do is some people, some of my friends, I trust them. But my brothers too.”(Participant #6)

“But the only people that I trust is in my family...My kids say I can trust them. They’re doing their best. Doing their job so we have to trust them with it.” (Participant #9)

One participant said that they would trust to receive messages and contaminant information from researchers and their government most often.

“From you guys, it could be. Researchers. From the Délı̄nę Got’ı̄nę Government... the real government. The people from here.” (Participant #8)

8.4 Délı̄nę Community Interview Conclusions

The community in which these interviews were performed has a unique and complex history with contaminants and these interviews demonstrated the impact that mining and personal experiences with cancer has had on their community. The close proximity to the Port Radium Mine, and the familial experience with fathers, children, uncles, or grandfathers who had worked at this facility made for these interviews to be rather emotional. Some interviewees had worked at the mine, whereas others had heard stories from family and friends. This community has suffered from many cases of cancer which has caused loss, scare and trauma when discussing contaminants. It was clear that many people find that Délı̄nę and Great Bear Lake are safe; however, as soon as they approach the Port Radium region they feel a sense of darkness, and fear. Since this trauma has occurred, interviewees expressed that people may have been turned away from the biomonitoring because they would rather not know about their contaminant levels; however, many interviewees expressed their thankfulness for the human biomonitoring project and in determining the quantity of various contaminants that are found within their bodies. Many were especially grateful that we were returning their results as we had promised. This history is important when assessing the impact of health and risk communication. Words

must be chosen very carefully and assuring that this information is coming from a trusted source can prove to be essential.

8.5 Cross Analysis between Survey and Interview Data

For the purpose of this analysis I have only examined the survey data from Délı̄nę, as this was the only community where both the interviews and the survey were held. Each participant of the Délı̄nę interviews expressed the importance of country foods in their diet, this was comparable to the survey which showed that 100% indicated eating country foods, and over 55% of participants would prefer to solely eat country foods. One participant expressed that they could eat country food every meal if they could:

“It’s one of my main food I’ll have every day. Any time of the day... I can have caribou meat and fried eggs. In the morning. And afternoon, for lunchtime, I’ll do rice and meat. Like diced meat and onions. I do that for the family. Suppertime, I can do a stir fry. Stuff like that. I’ll never get tired of caribou. So, I barely buy store-bought meat.” (Participant #7)

Another participant, who is also a hunter said that not only does he love eating caribou he also gets asked for caribou meat from others within his community when he harvests one.

“I shot about five caribou this year...People are just like wanting all the time, give me caribou, please (they’ll ask) ...I like eating all the traditional food like caribou.” (Participant #8)

As mentioned, a major topic of discussion throughout the Health Messages Interviews was in relation to Port Radium and its impacts on Délı̄nę. One participant talked about the uranium and the stories they had heard about Port Radium:

“They were working over there [Port Radium] and they dumped a lot of waste in the water. And they dumped a lot of waste in the water. And they said it’s not good. It’s the waste of like uranium. So that’s what I heard. A lot of stories about it. And they even made a movie of that, Port Radium. So that’s what I know – uranium, eh?” (Participant #10)

Another participant spoke about stories that their father had shared when they worked at Port Radium:

“I heard stories about it and I hear people talk about it. And that’s how I know about stuff like – a little bit of contaminants and uranium and Port Radium. My dad used to work at Port Radium... Yeah. And he died of cancer. He tells us stories about that place. Like how they never had anything covered on their mouth when they were hauling all these ores”. (Participant #3)

The impact and experiences that were shared during the interviews was not visible in the survey data; however, one of the major contaminants of concern in Délı̄ne was listed as uranium, which was not listed as a top concern throughout other communities. Throughout both the interviews and in the surveys, Elders were discussed and chosen as a trusted source. A story was shared in one interview, which a participant had heard from some Elders:

“The Elders were talking about the past. And there’s some area on the lake...And I heard stories about Lac Ste. Therese I think it’s called, in the lake. It (the lake) [used to] get trout that big, right?... I heard it’s all contaminated with mercury. So, people stopped fishing there. You hear the Elders talking about it.” (Participant #4)

In another interview, another participant expressed hearing stories through their Elders:

“You hear all the stories that are being told [about contaminants] to you and you question yourself all this when you hear the stories or you’re listening to your Elders. But it doesn’t really bother me because contaminant, like there’s all kinds of things that’s contaminated, you know?” (Participant #7)

One interesting finding was based on trust of doctors, in the Health Messages Survey, 44% of participants said they trust doctors “a lot” and 37% said they trust “some” which ended up being

chosen as one of the most trusted sources to receive health information; however, in the interviews, there was a bit of discrepancy related to trust with doctors.

One participant seemed to have had negative experiences with doctors, which had led them to mistrust the information that was given to them by a doctor.

“No, I don’t trust him [the doctor], I’ve seen about ten doctors. Yeah.” (Participant #5)

Another participant said she liked hearing health information straight from a physician because of the confidentiality.

“And like you have to meet with one of you alone, which is confidentiality, which is good. I like someone telling me about my results. Like the only results I go through the health centre is the doctor. That’s it.” (Participant #7)

Also, although most participants said they did trust doctors, it was also one of the sources that they were least likely to get information from. This could be because doctors only come into each community during certain weeks of the month and participants may have had limited access to regular appointments with doctors.

It was clear in both the survey and with the interviews that friends and family were highly trusted to receive information. Every participant of the survey spoke about their family and the stories that they may have heard from an Elder in their family, from their husband, or from their children – the value and importance of family is apparent.

8.6 Limitations of Health Messages Interviews

A limitation of our interviews in Délı̄nę was that neither Dr. Kelly Skinner nor I speak Slavey. This could have impacted the information that was given to us during the interviews. Since we did the interviews at the same time that results were being returned, we had a translator working at the community hall where the return of results and interviews were happening. However,

nobody chose to use the translator during these interviews. This also made it difficult when transcribing the interviews as some words or phrases were difficult to understand due to language barriers. Another limitation and reason why some of the data from the surveys differs from the interviews could be that the survey questions were asked anonymously on iPads where participants may have felt more comfortable answering truthfully, whereas in interviews the participants may have felt obligated to say researchers since we were the ones asking the question.

8.7 Personal Reflection on Health Messages Interviews

When beginning the Health Messages Interviews, I was confident that the questions Dr. Skinner and I had developed were written in a way that would gather the information we had set out to gather – including, where people had heard or seen consumption notices and health messages, their perceptions of contaminants, and how and who they would like to receive these messages from in the future. However, by choosing to start our interviews with a question that encouraged participants to share a story related to contaminants, the information and stories that were shared ended up being primarily about the important community history and impacts that Port Radium has had on families and community members in Délı̄ne. Although hearing intimate stories and details about participant’s personal experiences either working or growing up at Port Radium was not part of the original intent or objectives that were set out for these interviews, it was extremely valuable to learn and understand this history. This introductory question ended up guiding and informing the majority of the interviews. Naturally, this led to less information about the primary objectives of these interviews, and more stories shared about the history of Port Radium and Délı̄ne’s involvement in Port Radium. While performing the interviews, Dr. Skinner and I both asked the questions that were developed and prepared. When interviews started to

drift into different discussions that seemed unrelated, we both tried to re-direct the conversation by repeating the same question or by rewording the question to be more direct. When analyzing the interviews, one challenge was not making assumptions or pre-conceived notions and not extracting information that was based on comments and emotions that I was feeling in body language or in expression of language, but that had not exclusively been verbalized. Another challenge was the barrier in language. It is important to note that the first language of participants in the interviews is North Slavey, not English. This could have created a barrier between Dr. Skinner and I as interviewees and participants. This could have also impacted the information that participants gave us if they did not understand the questions we asked, or if they did not feel comfortable expressing themselves in English. Therefore, it could have been favourable to have performed these interviews in North Slavey and translated to English. Consequently, more information is still needed to determine exactly how participants of this interview had heard or seen consumption notices or health messages, and community preferences as to future consumption notices and health messages.

8.8 Results of Yellowknife Interviews

There were 4 major themes that were brought out from coding the Yellowknife interviews, which were:

1. Organization Mandate and Role in Health Messages
2. Providing Health Messaging
3. Trusted Sources in Disseminating Health Messages
4. Best Practices for Communication with Public

8.8.1 Interview Results Organization

The interviews that were done in Yellowknife have been organized into sections based on **who** the interviews were done with. Since the first theme is based on organization mandate and role in health messages, it was found to be clearer when the interviews were organized according to the interviewee's affiliation. This organization also helps to create more of a story of what took place in each interview so that the reader could paint a clear picture of each interview. The themes within each interview will be bolded for clarity.

Giant Mine Remediation Project - Federal Government

The **Organization Mandate and Role in Health Messages**, the giant mine remediation division provides statistical and observational data and information to the GNWT who would then be the spokes people for health messaging. In general, most of the people within this unit do not have health expertise and would not be the best for media and health communications. Overall, they **Provide Health Messaging** and additional information when the GNWT asks or would provide information if they had found information that was surprising.

“Generally, all of the health messaging is done by the territorial health advisories, so in terms of any health messaging from Giant it's done by the Department of Health GNWT.” (Participant #1)

Northern Contaminants Program - Federal Government

The **Organization Mandate** of this bureau is about cleaning-up sites surrounding Yellowknife, such as the Giant Mine site. This participant expressed that their **Role in Health Messages** lies on the reliance that they have on local health authorities to develop messages and disseminate them. These messages will be reviewed in order to not cause concern; however, will be left mostly in the hands of either the GNWT or other local health authorities. This participant described themselves more as “*the facilitator and trying to get information from the researchers to the health authorities in a timely way so they can make their assessment with Health Canada and develop the message*” (Participant #6). In terms of **Best Practices for Communication with Public**, the work that they do with the Giant Mine and other sites will often be followed up by public meetings and hearings. Additionally, a **Best Practice** that this bureau has found useful is the use of twitter to inform the public in a timely manner. Trying to make things in a more “*public-friendly, plain language, making things relatable*” (Participant #6) is a priority in order to get the messages out in the best way possible and to ensure that this federal bureau is one of the **Trusted Sources in Disseminating Health Messages**.

Giant Mine Oversight Board

The **Organization Mandate** of the oversight board is “to be an independent oversight body to oversee the project from both the technically as well as the non-technical perspective – mostly technical”. This group provides feedback to the project team and parties within the agreement. Part of their mandate does include communication to some extent. Their **Role in Health Messages** has been to provide health messaging with school groups that come into their central office in Yellowknife, which explores the history and general information about the Giant Mine. This participant mentioned that some **Best Practices for Communication with Public** have been to do tours with not only kids but with adults, many of these participants in the tours were

very shocked and happy to learn more about their hometown and the giant mine that is so close to them. By being transparent, this organization has becoming a **Trusted Sources in**

Disseminating Health Messages.

“Part of our mandate is communication and to some extent, teaching. I think a lot of the teaching is handled by two workers here. School groups come in, people come in just off the street and they get a lot of information either through discussions with the two workers or from the materials we have around the office” (Participant #2).

Mid-interview, the participant invited another worker from the Giant Mine Oversight office, who works with the participant and does a lot of the primary contact with people who come in the office. She mentioned that some people can be very fearful of learning more about the contaminant exposure that has been caused by Giant Mine oversight, and said

“People who attend our meetings, who attend the Giant Mine forums, who really want to know what’s going on. But then there’s others that are like ostriches. They stick their head in the sand and they don’t want to hear anything about it.” In particular, it was noted that *“there’s a range of people who are very fearful... there are people who have a definite fear of contaminants and their sense of risk is very, very high”*. This fear has been due to arsenic exposure in Yellowknife and as this participant noted *“a more existential perspective it’s a fear of getting cancer, right? Because one of the known health effects of arsenic is certain types of cancer” (Participant #2).*

This participant spoke about the importance of developing **Trusted Sources when Disseminating Health Messages** and speaking to communities and assuring you have a communication strategy that is in lay terms. In terms of **Best Practices for Communication with public**, he believes that working with communities from the start and ensuring you’re incorporating traditional knowledge into the work you are doing. Ensuring that you are following

the needs of the community is important, in some cases communities may want you to **Provide Health Messages** such as placing signs put up on lakes, while in others some may want to hear from their Elders about the community contaminant results. *“Such a strong belief system you need to respect and you need to take into considerations when talking about these issues from the science side”* (Participant #2).

Dene Nation

The Dene nation’s **Organizational mandate** is a political organization that represents Dene people and can be a resource for communities in times of need. The Dene Nation is not an organization that has a mandate to **Provide Health Messages**. According to the Dene Nation, it is important for researchers to be aware of the language that they are using when talking to communities. They have expressed that many researchers will go to communities and use *“long complicated words”* that are very difficult to understand. In order to develop **Trusted Sources when Disseminating Health Messages**, it was also expressed that it’s important to *“immerse yourself in a community in order to understand how the community operates”* (Participant #3).

Another important consideration that was brought up was that *“Dene people do not think the same as the European people, they think totally different. They have a whole different way of thinking; and it’s very frustrating sometimes to other people when they can’t really pick up on how they think or why they think that way, it’s just eons that they’ve been thinking that way”* (Participant #3). This re-enforces the importance of developing relationships and building trust with communities and immersing yourself in their way of life and their perspectives before beginning your research, especially when beginning to **Provide and Disseminate Health Messages**.

Government of the Northwest Territories – Environment and Natural Resources

The **Organizational Mandate** of the Environment and Natural Resources does not normally

include a **Role in Health** Messaging. However, because of concerns of contaminants in the country food that people were eating, the participant and his team collected many moose samples in order to determine the levels of contaminants in food. The results lead to the understanding that certain parts of the moose may have higher than normal levels of cadmium. In turn, this bureau was tasked to develop, **Provide and Disseminate** the first consumption notice that was released regarding higher than normal levels of cadmium related to moose kidney consumption (see Appendix Q & R). This consumption notice was very scientific and was not clear for community members on what one serving was, and how much was too much kidney. The participant and his team expressed their concern with the high language and the lack of understanding of the consumption notice from the community which led to people being worried.

“We try and put it in a very understandable plain English version” (Participant #4).

A **Best Practice for Communication with Public** was expressed by community members, which was the importance of understanding the topic from a cultural and applicable manner before creating notices. In this case, it was brought up that the portion size included on the consumption notice was not a realistic amount and far beyond what anyone would ever eat – this raises questions about whether it is even essential to release a consumption notice if it will only cause worry. *“No human would have been eating a kidney every week for the year. Well nobody does that, not even people that love kidneys you know. Plus, you can’t get – I mean when a moose is taken there’s two kidneys in there and those are some of the first things that are gone, divvied up and shared out, you know” (Participant #4).* Another **Best Practice for**

Communication with Public was to ensure that it is in a unit that can be understood or visualized, in this case they made a poster that showed how much cadmium was in one kidney in

relation to cigarettes. This method tended to help community members understand in an amount that was relevant to them. Above all else, this participant mentioned that they have **Trusted Sources when Disseminating Health Messages** from the communities they work with, which has made the communities more receptive to the information that is being disseminated. *“We have got complete trust from the community and the folks we’ve worked with and all the different Chiefs we’ve working with because we’ve been working with them together for years and years and years” (Participant #4).*

Government of the Northwest Territories – Health and Social Services
The **Organizational Mandate and Role in Health Messages** of the Department of Health and Social Services includes the dissemination of health messages and consumption notices to the public. The GNWT has shifted their **Best Practices for Communication with Public** from “Public Health Advisories” to “Fact sheets and consumption notices”. When you do a quick search now for a contaminants and country food you will find a list of several fact sheets (see Appendix Q & R) associated with contaminants in animals (country food). This was intentional, says the communication officer, as they wanted to shift the dynamic from fear to education. The GNWT now has about 40 or 50 fact sheets (see Appendix A, B, C, D) that will be supplemented with consumption notices when absolutely necessary. The GNWT says they are taking a much more conservative approach, yet assuring that their population, including vulnerable populations such as pregnant women and nursing women and children will be safe. *“We have a very conservative approach... if you don’t know the risk, if you follow these guidelines you’ll be fine” (Participant #5).* Another **Best Practice for Communication with Public** was to develop these messages with visual imagery and plain language so that they could be understood by communities.

“And then fact sheets, it’s very hard to plain language contaminant fact sheets. So, there’s a lot of visual picture. We tried to use simplest language as possible...” (Participant #5).

It was mentioned that there is still a lot of work to be done, some feedback the GNWT had received and an additional role to **Providing Health Messages** could be to incorporate information about contaminants and environment could be beneficial to add into the school curriculum. According to the GNWT, the fact sheets that have been developed could be very useful for teachers if they decided to add a contaminant discussion in science class. One participant in the GNWT interview said when she attended a Health Living fair, teachers were invited.

“At the Health Living Fairs there were teachers from the high school, nobody knew about that we had these fact sheets and everyone was really excited about them... I had a bunch of teachers who were saying oh... we could really use these” (Participant #5).

The GNWT recognizes that **Providing Health Messages** and teaching children about contaminants at a young age could help with country food safety and contaminant knowledge for their upcoming years. The turnover of teachers however, is an issue in communities, so the education would not be consistent year after year. Another method for **Providing Health Messages** to people in the NWT is at Healthy Living Fairs, which attract media attention, local government attention, and hunter and trappers associations and build their reputation as a **Trusted Source for in Disseminating Health Messages**. Additionally, the Chief Public Health Officer ends up being a spokesperson and **Providing Health Messages** for any major issues or updates in the NWT. Another aspect that was discussed with the GNWT is with research and researchers. The GNWT is normally heavily involved in the research that is happening across the NWT; however, it is noted that researchers need to be so cautious. Sometimes, media will pick

up aspects of researchers that they find interesting and generally, shocking “*you know, like the mercury level has doubled or increased by so many percentage points and... when it has no impact on health. But, you know, that’s what gets reported*” (Participant #5). It was said that many environmental researchers may report on health data and say that “this is a significant public health risk”. As stated by Participant #5: “*And so that’s also... like they have to be careful how they end their research, because it’s like trying to bring in significance when there isn’t or they can’t get funded. Then it gets us in trouble because we have to look at imperfect data and try to come to a conclusion*”. According to one participant, “*There’s a lot of environmental monitoring data out there, it’s easy to do, but the people walk away and write it could be of significant public health concern, on their paper and then walk away and we’re stuck with that. It’s very irritating*” (Participant #5). There was a **Best Practice for Communication with Public** which was to be very careful when making statements such as “this could be a significant public health concern”. This statement could cause concern in communities, and the GNWT noted that they end up having to pick up the pieces of possible fear in communities because of messages that have been disseminated that may not be scientifically sound at a human health level. “*Yeah. And then it’s, like back peddling what the research says.*” The most important thing when **Providing Health Messages** was stated as “*Reducing stress about food is the priority, while also assuring the best health status of NWT residents*” (Participant #5).

8.9 Yellowknife Interview Analysis using a Flowchart

A flow chart was created to better visualize the process that goes into deciding whether or not to release a consumption notice or health message.

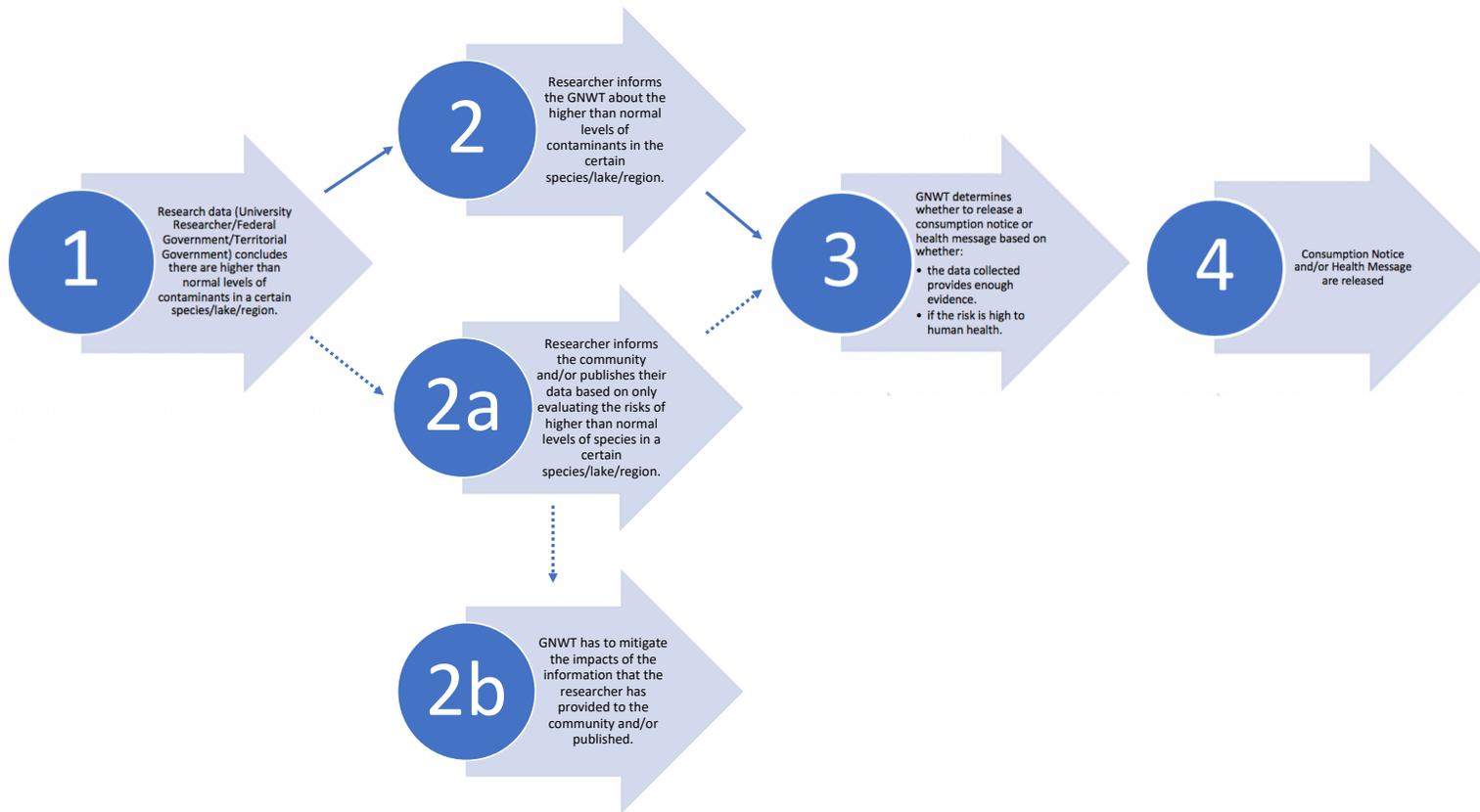


Figure 7: Flowchart Analysis of Yellowknife Interviews

8.10 Yellowknife Interview Conclusions

The interviews that I performed in Yellowknife gave me a greater understanding of the health and risk communication work that has been done, and is being done in the Northwest Territories. It was clear from all interviews that most of the work in terms of health and risk communication is done by the GNWT and that many of these stakeholders will provide important data to inform the guidelines or the advisories that are then created by the GNWT. The GNWT has a proven track record of working collaboratively with stakeholders and with the federal government. They do their best to create guidelines and health messages that are based on the best evidence based scientific data that are available. Additionally, they have made a continuous effort to improve their health communication strategies by completely removing all of the prior consumption notices and health messages that could be found on the internet and replacing them with fact sheets and general consumption guidelines. Health communication has become an important part of their work and they are trying to find new ways to disseminate information without scaring communities away from consuming country foods.

Chapter 9 - Discussion

The objectives of this master's project were to: 1) Assess participants' risk perceptions and awareness of current contaminant consumption notices and health messages; and 2) Provide baseline data to evaluate the impact of contaminant health messages over time. This was done using a Health Messages Survey, terminology workshops and community interviews. The results found from the data that were collected demonstrated that participants have heard or seen messages that were released by the GNWT in the past 10 years; especially positive messages related to country food consumption and mercury contaminant consumption notices for fish. All participants completing the Health Messages Survey stated that they consumed country foods and many indicated a preference for primarily consuming country foods. The importance of country foods for sustenance in the diets of Sahtú Dene for cultural, spiritual and health was proven in the communities as well as many other studies in the literature (Halseth, 2015). Based on the literature in this field, we can see the clear linkages between country food consumption and health benefits, including protein and omega-3 fatty acids, as well as lower food costs, cultural identity, and connection to the land (Kuhnlein & Chan, 2000). During the interviews, participants also brought up their preference for consuming country foods when they were available and their connection to hunting and fishing throughout the Sahtú. It has been suggested by many researchers that country foods can be a main source of contaminants in Indigenous peoples from Northern Canada (Berti, 1997), and participants in the Sahtú have heard this. The consumption notices that were released by the GNWT that stressed the reduction of eating fish from certain lakes due to higher than normal levels of mercury tended to be heard by the majority of participants.

Furthermore, asking questions in both the survey and interviews on where participants have heard or seen messages related to country foods, or consumption notices was also an important component of determining the most effective ways to communicate contaminant messages, which informs objective 4) Make recommendations that aim to improve and create more effective communication strategies with focus in the Sahtú Region of the Northwest Territories based on knowledge synthesized from terminology workshop(s), surveys, and interview. In the Sahtú Dene communities, radio, researcher or scientist, and friends were the primary way to be informed of these messages. This result did not come as a surprise, since our research team was often invited to go on the community radio to inform the communities we were visiting about our presence and our project, and during our clinics the local coordinators would listen to the radio every morning. However, in terms of who the participants trusted the most to receive health information and contaminant messages, Friends or Relatives and Elders were chosen the most to be trusted “a lot”. Other common ways that participants said they would hear or see health messages or consumption notices was through both the interviews and the surveys was through researchers, friends, family, and public meetings. Participants in the interviews supported what we saw in surveys, which was that many participants would hear stories that had been passed down and shared with them from their Elders or the fishers/hunters in their family. These major findings from the data collected from surveys and interviews can now be used in the future by providing baseline data, which can help to evaluate the impact of health messages and consumption notices over time.

In order to fulfill objectives the other two research objectives: 3) Understand how contaminant consumption notices and health messages are currently developed and communicated to communities by the Government of the Northwest Territories; and 4) Make

recommendations that aim to improve and create more effective communication strategies with focus in the Sahtú Region of the Northwest Territories based on knowledge synthesized from terminology workshop(s), surveys, and interviews, consulting with key stakeholders and decision makers in the Northwest Territories was essential. Doing interviews in Yellowknife with major stakeholders and decision makers such as the GNWT, the Dene Nation, the Giant Mine Oversight Board, and the Federal Government, this project was able to determine and understand how consumption notices and health messages are currently developed and communicated to communities. The most important finding from these interviews were that the majority of groups (including the Federal Government, Dene Nation, Giant Mine Oversight Board) were providers of information to the GNWT, who were then the primary disseminators of information. The GNWT has worked hard to develop and disseminate messages to reduce fear and promote and encourage consumption of country foods. They have switched from a primarily advisory focused communication plan to a more fact sheet or guideline approach. These notices were intended to give the opportunity to residents of the NWT to be aware of the contaminant levels in their country foods and to enable them to make informed decisions on the country foods they are eating, which, based on our discussions is extremely important to the GNWT (Jardine, 2003; Burger & Gochfield, 1996). The GNWT discussed the importance of disseminating messages that are understood, that are relatable issues and that are valuable messages to communities across the NWT. As we have seen based on the results of this project, the health messages and consumption notices can vary on whether they have been heard and/or seen, where they have heard or seen the messages and whether they are trusted. The dissemination of the results can be a key aspect for reaching target audiences (i.e., Sahtú communities) in a trusted manner, this is an essential aspect of communication strategies put together by organizations

such as the GNWT and is critical to implementing change and health outcomes (Canadian Institutes of Health Research, 2018).

The creation of a communication strategy for research projects with key stakeholders such as the GNWT can help to ensure that implementation or improvement of population health, which is unlikely with just the creation of new knowledge from research (McDonald et al., 2016). Effective communication of research results is an integral component to implementing policy change and knowledge that can be used to integrate with current knowledge systems, assumptions and practices (Ninomiya et al., 2017). When working with Indigenous communities in Northern Canada, it is important to note that disseminating contaminant and health messages is about sharing knowledge in a context that is relevant and valued based on community needs – which may prove to be different than the priorities of the researcher (Ninomiya et al., 2017; Smylie, Olding, & Ziegler, 2014). As we have learned throughout the interviews and terminology workshops, there are distinct understandings of knowledge, especially related to the environment and traditional practices (Smylie, Olding, & Ziegler, 2014). Assuring that research findings, in this case consumption notices and health messages are translated into practical application should be essential to the development of a communication strategy. Below I have highlighted some key recommendations that I developed based on the literature and based on the results from the data that were collected.

Above all, this thesis project has placed an emphasis, and worked on a key priority for the NCP, which is the importance of communication and engagement (Health Canada, 2018). We have done our best to create a project that was comprehensive and stringent when developing our data collection tools; however, we must think critically about its limitations. To begin with, there are very limited resources with regard to health communication in the Northwest Territories with

only few key researchers contributing to scientific journal publications. My literature review took into account all of Northern Canada, which still has limited research; however, it seems like the importance of this research is gaining momentum with more interest and dialogue happening across Canada and through the Federal Government. This will help to build up additional research in this area. Being a ‘foreign’ researcher coming from the south of Ontario to do research in Northern communities can be a limitation for many reasons. One limitation was my inability to spend more time in the communities in which we were working because of the 5,000km distance between Waterloo, Ontario and the Sahtú region of the NWT. Our team did spend quite long periods of time in the NWT during winter months and I personally spent over 8 weeks across two years in the Sahtú; however, when learning about culture, language, and the Dene way of life much more time must be spent in order to understand to my fullest ability. Additionally, we often did not have concrete timelines on when we would be in communities until just a few weeks before we left, which meant that many aspects of the work that would be implemented would be done in quite a short period of time. Some quick decisions had to be made regarding the Health Messages Surveys and community interviews, and therefore only allowed for limited review from committee members and community. Based on Green and Mercer’s definition of CBPR, participants are there to give “more than just informed consent”: they share their knowledge and experience in helping to identify key problems to be studied, formulate research questions in culturally sensitive ways, and use study results to support relevant program and policy development or social change (2001). Therefore, a true community based participatory action approach was not fully taken. Other limitations include the inclusion of only Délı̨nę in our community interviews. The decision to only include Délı̨nę was based on time, and based on previous terminology workshops that had been done in this community, since

Déłıne had participated in the first and second terminology workshops, as well as the Health Messages Survey, and since I had spent several weeks in this community, we thought that it would be the most appropriate. In order to improve and validate the results of this study it would be important to consider doing interviews in other communities across the Sahtú region. By doing additional interviews, we could provide additional contextual information to complement the Health Messages Survey such as the significance of contaminants in each community, how they have heard or seen messages, who they trust to receive messages, and how they would like these messages to be disseminated in a more conversational manner.

In order to continue developing research in this area we must have more scientists, researchers, government bodies, and funding agencies recognizing the importance of health communication and the dissemination of health messages. This importance draws from the mobilization of knowledge and turning the research and work being done into outcomes for the communities and regions you are working with, as well as, determining the impact that these results may have on the people, communities, and regions. Ensuring that funding agencies are providing adequate resources into the necessary steps to begin the processes of this is essential. This type of work must be a priority for the funding agencies and must be enforced upon researchers and recipients of their funding. This type of work must be available in all fields, including environmental and human biomonitoring similar to what Dr. Brian Laird has done in his northern contaminants project.

Chapter 10 - Recommendations

Based on the final objective of this project: Make recommendations that aim to improve and create more effective communication strategies with focus in the Sahtú Region of the Northwest Territories based on knowledge synthesized from terminology workshop(s), surveys, and interviews with community members and the Government of the Northwest Territories workers who develop and communicate health messages, it is important to draw clear recommendations, based on the above findings of the research. The recommendations developed below were based on the surveys and interviews that this project has completed along with literature from health communication researchers (i.e. Chris Furgal, Cynthia Jardine) and both the 12 criteria to ensure communication tools are effective, and the comprehensive communication campaign steps designed by the PHO (Public Health Ontario, 2012). The PHO criterion and steps are shown under each recommendation to show where each recommendation would fall, if applicable, based on their strategy. These recommendations could be useful for other researchers in northern communities, health workers, and policy makers of the provincial and territorial north.

Recommendation 1. Invest time into creating a communication strategy. As a researcher or governmental agency, it is important to ensure that you have a mechanism in place to share important health information and results to communities. Developing a strategy can ensure that the information that you are providing to communities is effective, and will not do any harm. PHO comprehensive communication campaign step #2 Revisit your health promotion strategy; #5 Set communication objectives; #8 Develop the message strategy.

Recommendation 2. Use locally relevant information. In the Sahtú region, there are only some areas that may have warnings on lakes with high levels of contaminants or high levels of

contaminants in fish. Determine whether the community you work with is part of that area, or harvest from that area before releasing information that may cause alarm. PHO comprehensive communication campaign step #1 Project Management, engage in meaningful conversations with stakeholders (Elders, Local government, community members).

Recommendation 3. Ensure that local native language is used. Having communication tools that are created in both English and the language dialect of the community is essential for a better understanding and for a lack of confusion and misinformation of messages. Within the Sahtú communities, different dialects of North Slavey are used. While holding two terminology workshops in Délı̨ne with the help of translators, community members, and representation from local government was able to put together some materials that were used for our project with proper translation. These materials helped for the community to understand what our team was doing in their community and how they could become involved. PHO health communication messaging tools criterion #10 Use an appropriate appeal.

Recommendation 4. Engage and work with local translators, government, and community members. In order to be confident in the information you are providing to the community, and knowing that is appropriate, you must engage various stakeholders into the creation of communication tools by having a dialogue between creator and receiver. This can ensure that all stakeholders are a part of the work and that your messages will be better understood. PHO health communication messaging tools criterion #5 set communication objectives.

Recommendation 5. Indigenous knowledge and local community knowledge should be integral to inform the development of your communication strategy. The importance of engaging local translators, government, and community members brings about the opportunity to develop a communication plan that uses Indigenous knowledge and practices of the community. This can help with uptake and trust of messages that are disseminated. PHO comprehensive communication campaign step #1 Project Management, engage in meaningful conversations with stakeholders (Elders, Local government, community members).

Recommendation 6. Use means that are appropriate to the community you are working with. Radio was an important aspect to the daily communication means. In order to reach a wide audience and share information that is relevant to community members, radio may be a key method of disseminating health messages. Our research team used this mean to share the presence of our team in community and to talk about the research that we were doing. We'd be sure to mention the public meeting that we would hold and invite all community members to join. Also, using social media to engage communities could also be beneficial. PHO health communication messaging tools criterion #1 The message must get and maintain attention; #7 The messenger must be a credible source; and #9 The message must be delivered using an appropriate tone. PHO comprehensive communication campaign step #6 Select channels and vehicles, choose channels and vehicles for the situation based on reach and effectiveness.

Recommendation 7. Ensure that the language used does not cause harm. Incorporate the above recommendations while assuring that these messages are not causing harm. Ask yourself, is this message essential to the wellbeing of the community? Will this message cause harm to the

community, their values, their culture, or their food availability? Does this message provide evidence for risks and benefits? When asking yourself these questions you can determine whether you will encounter future mitigation of risks or whether the message is completely necessary. PHO health communication messaging tools criterion #3 The message must be clear – the audience must identify main message points; #6 Provide good evidence for risks and benefits – ensure your recommendations will alleviate those threats; #11 The message must not cause harm to the audience.

Recommendation 8. Ensure that the messages or advisories being released are translated into practical application. Determine a way to create messages that have practical application and understanding of what they mean. This can help to allow viewers of the message to make informed decisions on the country foods they are eating. PHO health communication messaging tools criterion #4 The action you are requesting is reasonably easy, breaking down behavior into small, easy steps; #8 messages must be believable and realistic.

Recommendation 9. Determine a way to evaluate your communication strategy. In order to ensure that the messages you are disseminating are being well received one consideration is continuing to work with communities to see whether these messages or consumption notices were seen or heard, were well received, and how to improve. PHO comprehensive communication campaign step #12 Complete your campaign evaluation.

Chapter 11 - Conclusion

To conclude, this project demonstrated once again that the importance of country food in the Sahtú region is far more than just something to eat. Country food provides sustenance; “the means of sustaining health or life” (Collins, 2018). In the Sahtú this captures a cultural connection to the land which could be through hunting, trapping, fishing, and picking berries. It also connects people to the traditional and cultural practices that were passed on by their parents and by their Elders. All of which provide a sense of community and a sense of belonging. As we can see, through the data collected in this region, country food has been proven to bring people together spiritually, emotionally and makes people feel whole. Therefore, understanding the importance must be considered for researchers who are working on the land, or with main sources of sustenance in the lives of people in the Sahtú (i.e. country foods). As researchers we must educate ourselves in the cultural practices and values of the communities that we are working with in order to be confident that the work that we are doing is ethically sound. This research project held terminology workshops which were found to be beneficial to learning more about the community culture and priorities. When we connect these results and conclusions to the dissemination of results and the creation of health messages, especially with country foods, we must be cautious on how we frame the results and incorporate the culture and values of the community as important. We have noted that in general, participants from the Sahtú have heard or seen many of the health messages through their community radios or through family and friends; however, said that they would trust to receive contaminant related messages by researchers and also by other health professionals (nurses, etc). We can use these results to ensure that messages that are being created can be disseminated via means that are most appropriate to the area and specific communities we are working in. When creating appropriate

messages one must consider the language spoken in this region and the importance of proper translation. This project hired translators to aid in the comprehension of the participants who took part in any component of the project, these translators helped to build a bridge between non North Slavey speakers and the North Slavey speakers of the Sahtú, they were pivotal to our work. Establishing relationships with strong translators in communities will help to develop messages hand in hand with communities and will help to create messages that can be understood.

Throughout stakeholder interviews, it was well established that the GNWT is an integral component of disseminating consumption notices and health messages. The GNWT is said to receive information from various key decision makers (i.e. University Researchers, Federal Government etc) and use this scientific evidence-based information to then create health messages or guidelines for the benefit of the NWT communities and residents. Therefore, building a relationship with the GNWT as a researcher prior to beginning environmental monitoring or human monitoring is important when it comes to the dissemination of results. It has been said that the GNWT can sometimes not only create proactive tools to protect their residents, but also fall into the role of backpedaling messages that may have gotten to communities before being reviewed by the primary disseminator of health information in the NWT - the GNWT. This leaves the GNWT in a difficult position that leaves communities confused and unsure of who to believe. With that being said, researchers must establish a relationship with the GNWT in order to work with the GNWT and determine that information being provided to communities aligns with messages that are currently being disseminated by the GNWT and not cause further confusion. When moving forward in creating messages that can be disseminated by culturally appropriate and language appropriate ways and with means that are

proven to be a community preference (i.e., radio or other health nurses (nurses, etc.) would be extremely effective. Creating a communication strategy that involves several means of dissemination tools can help with the visibility of messages, with hopes that the disseminated messages will be heard or seen by a larger group. It can also help to certify that messages are being delivered and understood, that way when they are being passed on to family and friends they are sound and reliable messages.

It can be concluded that more research in the area of northern health and risk communication is necessary in order to compare results to other regions across northern Canada and to determine best practices. We now know that in order to create more culturally significant and relevant contaminant health messages, researchers and government must invest time into determining ways that will be well received and heard by the communities they are working with. For instance, in the Sahtú region, this could include using methods such as the local radio, friends and relatives, researchers or other health workers (nurses, etc.) as the most trusted sources to receive this type of information. Another consideration is assuring that these messages are understood when disseminated. In communities of the Sahtú, this means that providing information about contaminants must be translated and delivered both orally and written in North Slavey based on community or having translators to disseminate results of research projects. These conclusions can be timely and costly; however, the value of the messages that are disseminated will be far more trusted and well received by communities. This type of research can provide value to the research being done in not only consumption notices but also all health messages that can be drawn from both environmental and human biomonitoring. These results can help to bring awareness to the importance of community-based research which includes time devoted to learning about culture and values of the communities that are involved in research.

We can use these results as preliminary and baseline results to compare with other projects happening in northern Canada and to circumpolar Indigenous communities and regions. This thesis has provided further context in disseminating contaminant and health and risk communication messaging and the importance of determining a proper communication strategy that will be culturally appropriate based on the community that is being affected.

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Glossary of Terms

<i>Indigenous Peoples...</i>	Original inhabitants of North America and Canada in addition to their descendants. The government of Canada recognizes three groups of people under Indigenous: First Nations, Métis and Inuit.
<i>Aboriginal Peoples...</i>	A term constructed by the government in order to describe Indigenous Peoples, frequently used interchangeably with the term “Indigenous Peoples”.
<i>First Nation Peoples...</i>	Original inhabitants of Canada, lived on the land for thousands of years before European explorers arrived. Survived by hunting and gathering available resources such as plants, meats, fish which were used for food and medicinal purposes.
<i>Métis Peoples...</i>	Métis people are of mixed European and Indigenous ancestry.
<i>Dene People...</i>	Dene people are a group that falls under First Nations people, this term means “people” in their languages. Under the group of Dene people there are seven subgroups: Dogrib, Yellowknives, South Slavey, North Slavey, Gwich’in, and Sahtú Dene.
<i>Sahtú Region...</i>	The Sahtu region is home to five communities: Kasho Got’ıne, Colville Lake, Norman Wells, Tulıt’a, and Délıne. These communities account for 6% of the NWT’s population (Northwest Territories Tourism, 2016).
<i>Risk...</i>	Scientist: “hazard times exposure equals consequence” Average person: “the probability of something bad happening” (Brown, 2014).
<i>Risk Communication...</i>	Creating an effective risk communication tool means determining the many factors that contribute to an individual risk perception and aims to help combine personal decisions with evidence so people can make a healthy option.
<i>Risk Perception...</i>	Risk perception is shaped by circumstances, and situations and how one will deliberate on decision making (Brown, 2014).
<i>Public Health Advisory...</i>	“A statement containing a finding that may pose a significant risk to human health with recommendations in order to lower exposure, eliminate exposure and therefore mitigate the risk to human health” (Merriam-Webster, 2017).
<i>Contaminant...</i>	A polluting substance or poisonous substance that makes something impure (Merriam-Webster, 2017).

<i>Bioaccumulate...</i>	The accumulation of a substance in a living organism (Merriam-Webster, 2017).
<i>Mercury...</i>	A naturally occurring element found in the earth's crust.
<i>Methylmercury...</i>	Methyl mercury is formed when mercury combines with carbon (Young-Seob, Yu-Mi, & Kyung-Eun, 2012). Methylmercury is a hazardous substance that can affect human health by ingestion of food containing methylmercury. Generally, found in aquatic systems. These foods can bioaccumulate within the body and cause adverse effects to the development, central nervous system, immune system and the cardiovascular system (United States Environmental Protection Agency, n.d.).
<i>Arsenic...</i>	A natural component of earth's crust. Is widely distributed throughout the environment in the air, water and land. Highly toxic in its organic form (World Health Organization, 2017).

Appendices

- Appendix A: Mercury Fact Sheet
- Appendix B: Cadmium Fact Sheet
- Appendix C: Arsenic Fact Sheet
- Appendix D: Lead Fact Sheet
- Appendix E: Radionuclides Fact Sheet
- Appendix F: Photo of advisory seen at Ekali Lake
- Appendix G: Photo of advisory seen at Frame Lake in Yellowknife
- Appendix H: Copy of Survey
- Appendix I: Example of Information Letter and Consent Letters for Participants 18+
- Appendix J: Example of Consent Form for Adult Participants
- Appendix K: Example of Information Letter for Minor Participants
- Appendix L: Example of Consent Form for Minor Participants
- Appendix M: Example of Result Letter
- Appendix N: Recruitment Poster (English/North Slavey)
- Appendix O: Example of Recruitment Poster (English)
- Appendix P: Interview Consent Form
- Appendix Q: Cadmium Consumption Advisory
- Appendix R: Example of Public Health Advisory from GNWT HSS
- Appendix S: GNWT Health and Social Services: Public Health Advisory webpage



MERCURY

ENVIRONMENTAL HEALTH – CONTAMINANTS FACT SHEETS

WHAT DO WE KNOW ABOUT MERCURY?

Mercury is a heavy metal found naturally in the environment. It can be released by forest fires, volcanoes, and as rock wears down.

Human activities, such as burning coal, release additional mercury into the environment. Most of the mercury in the NWT is carried long distances from other parts of the world by air currents in the atmosphere. Some mercury comes from local sources, such as gold mines.

More than one form of mercury exists. One of these forms, called inorganic mercury, can be changed naturally by

microorganisms into another form, called methylmercury. Methylmercury can then be absorbed by plants and animals.

Mercury levels become higher in animals as we move up the food chain. This process is called biomagnification. Aquatic food chains are usually longer than land food chains. This is why fish, ringed seal and beluga whale tend to have higher levels of mercury than land animals. Many land animals eat plants and are low on the food chain and so they do not accumulate high levels of mercury.

HOW DOES MERCURY AFFECT HUMAN HEALTH?

At high levels, methylmercury can cause problems with the brain which may include changes in personality, changes in vision and hearing, loss of memory, loss of normal muscle function, intellectual impairment, tremors and death. Mercury can also damage the liver and kidney. Children and the developing fetus are the most sensitive to mercury.

Methylmercury is the form of mercury that we are most concerned about when consuming traditional foods. Details on other forms of mercury and their health effects can be found on the Health Canada website.

Note that very high levels of mercury exposure are required in order to produce these health effects.

For most people, it takes 50 days for half of the mercury in your blood to be eliminated by your body. Small amounts of mercury are usually consumed every day, and so there will be some elimination and some absorption every day. The balance between elimination and absorption determines how much mercury is in a person's body.

ARE TRADITIONAL FOODS SAFE TO EAT?

Yes! Traditional foods are safe to eat. They are also some of the healthiest foods available. The benefits of consuming traditional foods are much greater than the risks of low levels of mercury exposure. Check the GNWT Health and Social Services website for current consumption advice.

By following consumption advice, you can safely enjoy all traditional foods.

Higher levels of mercury may be found in larger and older animals, and animals that are higher up in the food chain (predators). To reduce exposure to mercury, eat a variety of foods and include animals that are younger, smaller and non-predatory.

To see NWT fish consumption notices, please visit www.hss.gov.nt.ca.

If you would like this information in another official language, contact us at 1-855-846-9601. Si vous voulez ces informations dans une autre langue officielle, téléphonez nous au 1-855-846-9601.



These fact sheets may be updated in the future as new information on contaminants is found. Current versions of all fact sheets can be found at www.hss.gov.nt.ca.

Government of
Northwest Territories



CADMIUM

ENVIRONMENTAL HEALTH – CONTAMINANTS FACT SHEETS

WHAT DO WE KNOW ABOUT CADMIUM?

Cadmium is a heavy metal found naturally in the environment and can be released as rock wears down and by volcanoes.

Cadmium is also released into the environment through human activities, such as mining and burning fuel and garbage. It can be carried long distances by air currents

in the atmosphere. Cadmium is found in tobacco smoke, batteries, some dental fillings, electronic devices, mirrors, and televisions.

Some plants, such as lichens, will absorb cadmium that is found in the environment. Land animals that eat these plants will then take up the cadmium, which is stored mainly in the kidney and liver.

HOW DOES CADMIUM AFFECT HUMAN HEALTH?

When cadmium enters the body, it is not released for many years. Most of the cadmium will be stored in the kidneys. The kidneys are very important organs as they help keep bones and blood healthy. High levels of cadmium can cause problems with kidney functions and may lead to issues such as kidney stones or soft bones that break easily. When inhaled, cadmium can cause problems with the lungs and make it difficult to breathe.

Cadmium is also a known human carcinogen. Most of the evidence suggests an elevated risk of lung cancer in a

work-related exposure; however, links between cadmium exposure and other cancers (such as kidney, breast, and prostate cancers) have also been made.

In the Northwest Territories, smokers have the highest blood cadmium levels. During the 2007-2008 Inuit Health Survey, it was found that 70% of people smoke and that blood cadmium levels were much lower in non-smokers. Cadmium exposure from tobacco smoke is much higher than exposure from eating traditional foods. To lower your exposure to cadmium, stop smoking and avoid second hand smoke.

DO TRADITIONAL FOODS CONTAIN CADMIUM?

Traditional foods are safe to eat. They are also some of the healthiest foods available. The benefits of consuming traditional foods are much greater than the risks of cadmium exposure.

The Chief Public Health Officer recommends that only a small amount of liver and kidney from moose in the southern Mackenzie Mountains (in the Dehcho) be

consumed. Moose in this region have much higher cadmium levels in their organs. Check the GNWT Health and Social Services website for details on current consumption notices (<http://www.hss.gov.nt.ca>). **By following consumption notices, you can safely enjoy all traditional foods.**

If you would like this information in another official language, contact us at 1-855-846-9601. Si vous voulez ces informations dans une autre langue officielle, téléphonez-nous au 1-855-846-9601.





ARSENIC COMPOUNDS

ENVIRONMENTAL HEALTH – CONTAMINANTS FACT SHEETS

WHAT DO WE KNOW ABOUT ARSENIC?

Arsenic is a metalloid found naturally in the environment and can be released as rocks wear down. Arsenic levels are naturally higher in some areas of the Northwest Territories compared to other regions of Canada due to the geology. Arsenic can be found in water, snow, air, soil, plants, rocks and wildlife.

Arsenic is also released into the environment through human activities. Gold mining in the North has released a lot of arsenic from the ground, particularly in mines in the Yellowknife area (e.g. Con and Giant). Both Newmont Mining Corporation (Con Mine) and the Giant Mine Remediation Project are undertaking remediation activities of their Sites.

For more information on the Giant Mine Site Remediation Project, visit the Indigenous and Northern Affairs Canada website: <https://www.canada.ca/en/indigenous-northern-affairs.html>.

For more information on the Con Mine Remediation visit the Mackenzie Land and Water Board public registry website: <http://www.mvlwb.ca/Registry.aspx?a=MV2007L8-0025&c=Miramar%20Northern%20Mining%20Ltd>.

Every Canadian is exposed to some level of arsenic because it occurs naturally in our food and drinks and in the air. Additional exposure can occur through accidental ingestion of contaminated water or soil, but absorption through the skin is minimal. Arsenic is also present in tobacco and is inhaled with cigarette smoke.

HOW DOES ARSENIC AFFECT HUMAN HEALTH?

As far as we know, the human body does not require arsenic for any function.

At high levels of exposure, some forms of arsenic can be toxic. The health effects of exposure to arsenic in humans vary depending on the chemical form, the amount we are exposed to and the duration of exposure. Although it is generally accepted that the inorganic forms of arsenic are of greatest concern for potential health effects, there is now evidence indicating methylated organic arsenic compounds may also potentially cause health effects. One organic form of arsenic, which can be found in varying amounts in shellfish and certain mushrooms, is known to be non-toxic.

Effects from short-term overexposure (a brief exposure to an extremely high level) to inorganic arsenic may include vomiting, abdominal pain and diarrhea. Numbness and tingling of the extremities, muscle cramping and death may also occur in extreme cases.

Chronic exposure to elevated levels of toxic forms of arsenic over a long period of time can cause bladder, kidney, liver, lung and skin cancer and other problems with the skin. These may include skin lesions (wounds), changes in the color of the skin, and hard patches on the palms and soles of the feet.

Arsenic exposure has also been associated with developmental effects, cardiovascular disease, neurotoxicity and diabetes.

If you would like this information in another official language, contact us at 1-855-846-5601.
Si vous voulez ces informations dans une autre langue officielle, téléphonez nous au 1-855-846-5601.



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Government of
Northwest Territories

ARSENIC COMPOUNDS

ENVIRONMENTAL HEALTH – CONTAMINANTS FACT SHEETS

ARE TRADITIONAL FOODS SAFE TO EAT AND IS WATER SAFE TO DRINK?

Traditional foods are safe to eat; however it is recommended to avoid harvesting wild edible plants near sites where past industrial activity has occurred. There are also certain areas around the Giant Mine Site (near Yellowknife) where the NWT's Chief Public Health Officer has recommended to avoid harvesting berries, mushrooms or other plants, and to avoid fishing and recreational lake use as part of a precautionary public health advisory (<http://www.hss.gov.nt.ca/en/newsroom/arsenic-lake-water-around-yellowknife>). These areas are shown on the GNWT Health and Social Services website. As new information becomes available, these recommendations may change.

The City of Yellowknife draws water from Yellowknife River, where arsenic levels are below Health Canada's Guidelines for Drinking Water Quality (10 µg/L). The tap water in the City of Yellowknife, N'dilo and Dettah is safe to drink. Untreated water should not be used as a drinking source anywhere in the NWT because it may be contaminated with germs.

WHAT ARE THE RISKS FROM AIR, SOIL AND SEDIMENT EXPOSURE?

Absorption of arsenic through the skin is very minimal. However, future studies will investigate the type and bioavailability of arsenic in lake sediments and soils in order to help further understand the risks that exist for human health.

Air quality in Yellowknife and the surrounding area is safe and not affected by arsenic levels. Air quality is monitored and information is available to the public through the

NWT Air Quality Monitoring Network. The Giant Mine Remediation Project's Air Quality Monitoring Program ensures remediation activities at the mine site do not cause adverse effects to people or the environment. It is anticipated to be in operation for the duration of the remediation project.

If you would like this information in another official language, contact us at 1-855-846-9600.
Si vous voulez ces informations dans une autre langue officielle, téléphonez-nous au 1-855-846-9600.



LEAD

ENVIRONMENTAL HEALTH – CONTAMINANTS FACT SHEETS

WHAT DO WE KNOW ABOUT LEAD?

Lead is a heavy metal that is found naturally in the environment and can be released as rock wears down and by volcanoes. Human activities such as mining and smelting release additional lead into the environment.

Lead is found in several products, including medical equipment, electronics, lead-acid batteries, ammunition (lead shot), and lead fishing jiggers and sinkers. Leaded gasoline and other lead-containing products (e.g. house

paint, food cans) have been banned in Canada, which has reduced lead concentrations in the environment. For management of lead waste in the NWT, see the GNWT Environment and Natural Resources guidelines (<http://www.enr.gov.nt.ca>).

Although blood lead levels of Canadians have also declined significantly over the past 30 years, evidence indicates that health effects are occurring at levels much lower than were previously thought to be safe. Additional measures to further reduce exposures to lead are needed.

HOW DOES LEAD AFFECT HUMAN HEALTH?

Low levels of lead exposure may affect fetal brain development and brain functioning in children and infants. This can lead to problems with attention, general activity level, emotional characteristics and social behavior. High levels of lead exposure can cause anemia (unhealthy blood),

headaches, vomiting, stomach pain, poor attention span, learning difficulties, slowed speech development and hyperactivity.

Much of the lead in the human body is stored in bone and takes several years to be eliminated.

ARE TRADITIONAL FOODS SAFE TO EAT?

Yes! Traditional foods are safe to eat. They are also some of the healthiest foods available. The benefits of consuming traditional foods are much greater than the risks of lead exposure. Check the GNWT Health and Social Services website for current consumption notices (<http://www.hss.gov.nt.ca>). **By following consumption notices, you can safely enjoy all traditional foods.**

Lead exposure may be elevated in traditional foods caught using lead shot, especially if the animal is not cleaned carefully soon after it is shot. It is safer to use steel, bismuth or iron shot to hunt. In the Northwest Territories, **non-toxic shot (not-containing lead) must be used** to hunt migratory game birds. In Canada's National Wildlife Areas, lead shot is prohibited for all hunting, including migratory birds and upland game birds.

If you would like this information in another official language, contact us at 1-855-846-9601.
Si vous voulez ces informations dans une autre langue officielle, téléphonez-nous au 1-855-846-9601.





RADIONUCLIDES

ENVIRONMENTAL HEALTH – CONTAMINANTS FACT SHEETS

WHAT DO WE KNOW ABOUT RADIONUCLIDES?

Radionuclides are substances that release energy called radiation. Some radionuclides are made by humans, such as cesium-137, and others occur naturally, such as potassium-40 and lead-210. Radionuclides can be found everywhere in small amounts and the greatest exposure to radiation comes from naturally occurring radionuclides. These come from the Earth's crust and from cosmic radiation (from outside of Earth's atmosphere).

Man-made radionuclides come from above-ground nuclear weapons testing (which was banned in the 1960's), and from nuclear accidents like Chernobyl (1986) and Fukushima (2011). Radionuclides can travel long distances from where they were released because they are carried in the air. Natural radionuclide levels can also be increased by human activities, such as uranium mining.

In 1978, the Cosmos 954 satellite crashed into Great Slave Lake and released some radioactivity into the environment. This level of radionuclides was found to not be of concern.

Radionuclides in the air deposit in the ground, where other natural radionuclides are also found. These radionuclides are absorbed and stored in lichen. Caribou then feed on the lichen and store the radionuclides in the body. Caribou have been monitored for radionuclides since the 1960s, when concerns over the high levels of man-made emissions were present. Fortunately, since the 1960s there has been a sharp decline in cesium-137 levels in caribou. Muskoxen were sampled in 1987 and had very low levels of cesium-137 and so it is not a contaminant of concern in this animal. Mountain goats were sampled for radionuclides (2011-2013) and the levels were also very low and not of concern to human health. Another recent study looked at Cesium-137 in beluga and in caribou after the Fukushima nuclear accident occurred in 2011 (in Japan). Levels were low and were not impacted by the incident.

Humans in the Northwest Territories have also been tested for Cesium-137. Levels were high in the 1960's but have dropped drastically, which encourages people that traditional foods are safe to eat.

HOW DO RADIONUCLIDES AFFECT HUMAN HEALTH?

High levels of radionuclide exposure can damage the cells of the body and cause cancer.

If exposure is severely high, early symptoms can include skin damage, cataracts, and in extreme cases, death. These exposure levels are not what one would find in the NWT.

ARE TRADITIONAL FOODS SAFE TO EAT?

Traditional foods provide many essential nutrients that can lower the risk of chronic diseases. Marine mammals tend to have the highest levels of POPs, particularly in the fatty

tissues. However, most people do not need to be concerned about contaminated-related effects from traditional food consumption. Generally, the benefits of eating traditional foods outweigh the risks from contaminant exposure

If you would like this information in another official language, contact us at 1-855-846-9101. Si vous voulez ces informations dans une autre langue officielle, téléphonez nous au 1-855-846-9101.



These fact sheets may be updated in the future as new information on contaminants is found. Current versions of all fact sheets can be found at www.hsi.gov.nt.ca.

Government of Northwest Territories

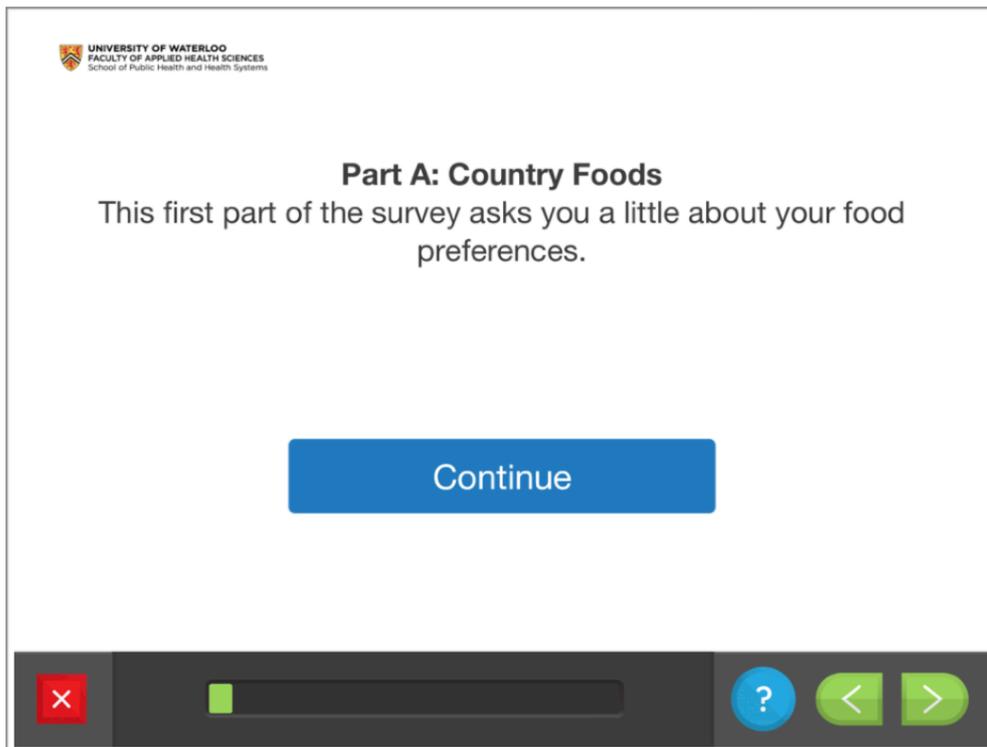
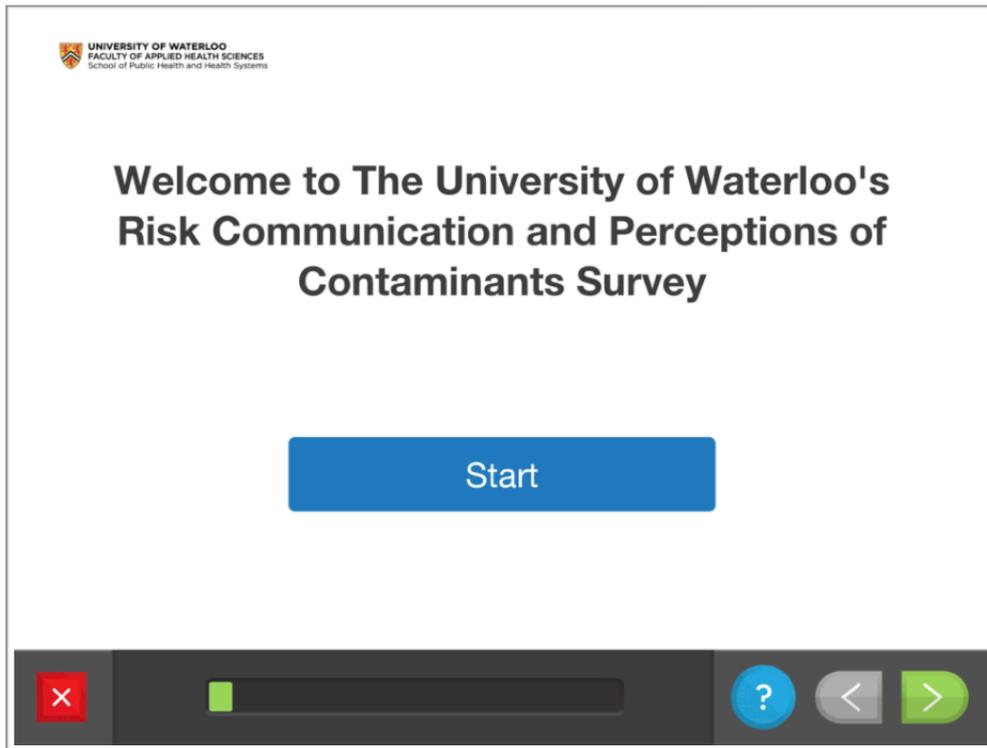
Appendix F: Photo of advisory seen at Ekali Lake



Appendix G: Photo of advisory seen at Frame Lake in Yellowknife



Appendix H: Copy of Survey



What type of food do you prefer?

Country foods

Store foods

A mix of both



Do you eat country foods?

Yes

No



Part B: Behavioural Change and Awareness Advisories

The next part of the survey will focus on health messages. During the past 10 years, the Government of the Northwest Territories Health and Social Services Department has released some advisories on contaminants in country foods.

Continue



B1: Fish and Mercury Advisories. Have you heard any advisories or messages about **fish** that had high levels of **mercury**?

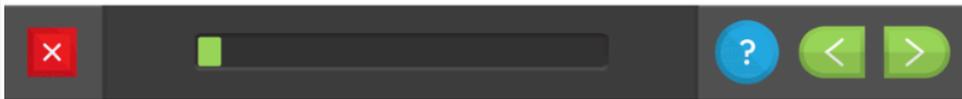
Yes

No

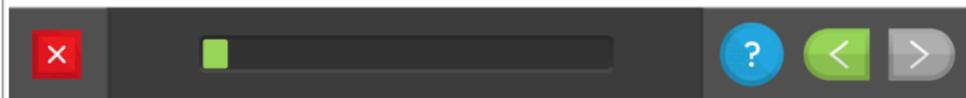
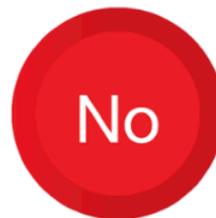


Where or who did you hear that information from? Please select all that apply.

Friends	Family	Elders
Community Chief	Doctor	Nurse
Researcher or scientist	Poster or pamphlet in public spaces	Newspaper
Radio	Television	Social media, like Facebook or Twitter
On a website	Don't know	Refusal
Other		



Did you hear about a specific lake or area that was affected?



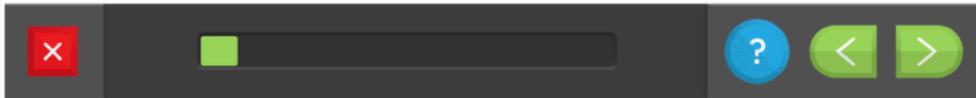
Which lakes did you hear about that had the **fish** with high levels of **mercury**? Please select all that apply.

Ekali Lake (Kelly Lake)	McGill Lake	Deep Lake
Fish Lake	Nonacho Lake	Stark Lake
Trout Lake	Cli Lake	Ste Therese Lake
Thistlewaite Lake	Don't know	Refusal
Other		



We would like to know if you have changed the way you think or any activities you perform since hearing the messages about **fish** and **mercury**. Please indicate the extent to which you agree or disagree with the following statements.

Continue



Since hearing the messages about **fish** and **mercury**:

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
In general, I have increased the amount of fish I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In general, I have decreased the amount of fish I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have reduced my consumption of only some kinds of fish (e.g. whitefish, trout) that I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have changed the way I prepare fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

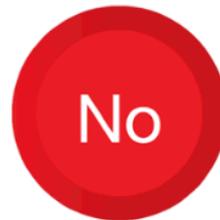
Navigation bar with a red close button (X), a progress indicator (green bar), a blue question mark button, and green left and right arrow buttons.

Since hearing the messages about **fish** and **mercury**:

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
I eat smaller fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat less predatory fish (examples of predatory fish are walleye, lake trout or northern pike)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have changed the location where I usually fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am more concerned about the fish I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am less concerned about the fish I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Navigation bar with a red close button (X), a progress indicator (green bar), a blue question mark button, and green left and right arrow buttons.

B2: Moose and Cadmium Advisories. Have you heard any advisories or messages about **moose** with high levels of **cadmium**?



Where or who did you hear that information from? Please select all that apply.

- | | | |
|-------------------------|-------------------------------------|--|
| Friends | Family | Elders |
| Community Chief | Doctor | Nurse |
| Researcher or scientist | Poster or pamphlet in public spaces | Newspaper |
| Radio | Television | Social media, like Facebook or Twitter |
| On a website | Don't know | Refusal |
| Other | | |



You are going to read some messages associated with contaminants and moose. Please indicate *if you have or have not heard* this message:
Moose from **Mackenzie Valley** have *low* levels of cadmium.

Yes

No

Don't Know



Please indicate *if you have or have not heard* this message:
Moose from **Liard Valley** have *low* levels of cadmium.

Yes

No

Don't Know



You are going to read some messages associated with contaminants and moose. Please indicate *if you have or have not heard* this message:
Moose from **Mackenzie Valley** have *low* levels of cadmium.

Yes

No

Don't Know



Please indicate *if you have or have not heard* this message:
Moose from **Liard Valley** have *low* levels of cadmium.

Yes

No

Don't Know



Please indicate *if you have or have not heard* this message:
Moose from **Mackenzie Mountains** have *high* levels of
cadmium.

Yes

No

Don't Know

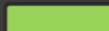


Please indicate *if you have or have not heard* this message:
You should reduce your consumption of **moose kidneys** from
the Mackenzie Mountains.

Yes

No

Don't Know

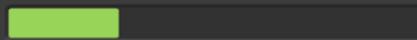


Please indicate *if you have or have not heard* this message:
You should reduce your consumption of **moose liver** from the
Mackenzie Mountains.

Yes

No

Don't Know

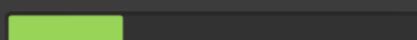


Please indicate *if you have or have not heard* this message:
Moose meat from **Mackenzie and Liard Valleys** is a healthy
food choice.

Yes

No

Don't Know

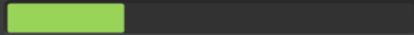


Please indicate *if you have or have not heard* this message:
The most effective lifestyle choice you can make to reduce
cadmium in your body is to eliminate your exposure to
cigarette smoke.

Yes

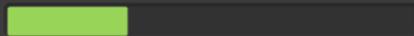
No

Don't Know



We would like to know if you have changed the way you think or any activities
you perform, since hearing the messages about **moose** and **cadmium**.
Please indicate the extent to which you agree or disagree with the following
statements.

Continue



Since hearing the messages about **moose** and **cadmium**:

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
I have decreased the amount of moose meat I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have reduced the amount of moose kidney I eat from Mackenzie Mountains	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have reduced the amount of moose liver I eat from Mackenzie Mountains	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have increased the amount of moose meat I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have changed the way I prepare the moose meat I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Since hearing the messages about **moose** and **cadmium**:

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
I have changed the way I prepare the moose organs I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am more concerned about the moose meat I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am more concerned about the moose organs I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am less concerned about the moose meat I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am less concerned about the moose organs I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



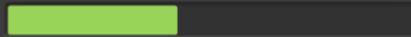
B3: Additional Advisories. You are going to read some more messages associated with contaminants and country foods. Please indicate *if you have or have not heard* this message:

Eating fish contributes to a healthy, nutritious diet.

Yes

No

Don't Know

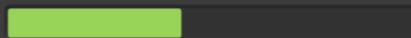


Please indicate *if you have or have not heard* this message: Fish is an excellent source of good omega-3 fatty acids.

Yes

No

Don't Know

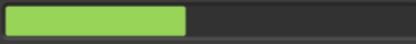


Please indicate *if you have or have not heard* this message:
In general, regular fish consumption by pregnant women and
nursing mothers is beneficial for healthy prenatal and early
childhood development.

Yes

No

Don't Know

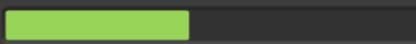


Please indicate *if you have or have not heard* this message:
Pregnant women should avoid eating lake trout and northern
pike that are larger than 60cm.

Yes

No

Don't Know



Please indicate *if you have or have not heard* this message:
Children under the age of 12 should avoid eating lake trout and
northern pike that are larger than 60cm.

Yes

No

Don't Know



Please indicate *if you have or have not heard* this
message: Country foods can provide a significant
variety and amount of nutrients.

Yes

No

Don't Know



Please indicate *if you have or have not heard*
this message: Eating country foods can lower
the risk of getting diabetes.

Yes

No

Don't Know



Please indicate *if you have or have not heard*
this message: Eating country foods can lower
the risk of getting heart disease.

Yes

No

Don't Know



Part C: Risk Perceptions and Personal Efficacy

We would like to know about your concerns around foods and contaminants.

Continue



We would like to know about your concerns around foods and contaminants. Please indicate the extent to which you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
Most First Nations and Métis adults in the Northwest Territories do not need to be concerned about contaminant-related effects from country food consumption	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most First Nations and Métis adults who live in this community do not need to be concerned about contaminant-related effects from country food consumption	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have concerns about the quality or safety of the country foods I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have concerns about the quality or safety of the store-bought foods I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think that I know enough about contaminants (like lead and mercury) in country food to protect me and my family's health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



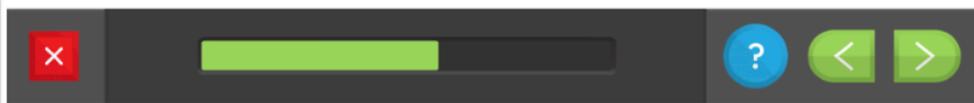
More specifically, do you have any concerns about the following contaminants or issues?
Please choose all that apply.

Mercury	Lead	Uranium
Radon	PCBs	Pesticides
Heavy metals	Antibiotics in meat	Indoor air quality
Chlorine in drinking water	Asbestos	None of these
Other		



Do you think **cigarette smoke** (through smoking cigarettes and second-hand smoke) may impact the amount of contaminants you are exposed to?

Yes
No
Don't Know



Do you think **eating store bought foods** may impact the amount of contaminants you are exposed to?

Yes

No

Don't Know



Do you think **eating fish** may impact the amount of contaminants you are exposed to?

Yes

No

Don't Know

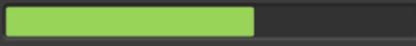


Do you think **eating moose meat** may impact the amount of contaminants you are exposed to?

Yes

No

Don't Know

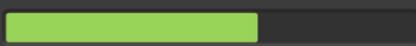


Do you think **eating moose organs**, like liver or kidneys, may impact the amount of contaminants you are exposed to?

Yes

No

Don't Know



Do you think **eating other country foods** may impact the amount of contaminants you are exposed to?

Yes

No

Don't Know



Are there **other** items which you think may impact the amount of contaminants you are exposed to?

Yes

No

Don't Know



Which **other** items do you think may impact the amount of contaminants you are exposed to?



Part D: Communication Preferences

In the last part of this survey we would like to know about some of your communication preferences and how you normally get information.

Continue



Do you have access to the following in your home? Please choose all that apply.

<input type="checkbox"/> The internet	<input type="checkbox"/> Facebook account
<input type="checkbox"/> Twitter account	<input type="checkbox"/> Instagram
<input type="checkbox"/> Email address	<input type="checkbox"/> Cell phone
<input type="checkbox"/> Landline phone	



We would like to know how often you access different sources of information. Please tell us how often you use the following sources of

news.

	Never	A few times a year	Monthly	Weekly	Daily
Local Newspapers	<input type="radio"/>				
National Newspapers	<input type="radio"/>				
Local Radio	<input type="radio"/>				
National Radio	<input type="radio"/>				



We would like to know how often you access different sources of information. Please tell us how often you use the following sources of

news.

	Never	A few times a year	Monthly	Weekly	Daily
Local TV	<input type="radio"/>				
National TV	<input type="radio"/>				
Social Media	<input type="radio"/>				
Websites	<input type="radio"/>				

Navigation bar with a red 'X' button, a green progress bar, a blue question mark button, and green left and right arrow buttons.

To better provide information, we would like to know about where you normally get your information. Please identify all of the sources you normally get health information from.

Elders	University Researchers	Community Chief	Doctors
Local TV	National TV	Local Newspaper	National Newspaper
Local Radio	National Radio	Friends or Relatives	Local Government
NWT Government	Federal Government	Non-profit organization	Teachers or Schools
Websites	Social Media	Other health workers (nurses, etc)	

Navigation bar with a red 'X' button, a green progress bar, a blue question mark button, and green left and right arrow buttons.

We would like to know *who you would trust* if you wanted to get information about contaminants in the environment and country foods. **Please note your answers will remain confidential.**

	Don't trust at all	Trust a little bit	Neither trust nor not trust	Trust some	Trust a lot
Elders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
University Researchers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Chief	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doctors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other Health Workers (nurses, etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local TV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



We would like to know *who you would trust* if you wanted to get information about contaminants in the environment and country foods. **Please note your answers will remain confidential.**

	Don't trust at all	Trust a little bit	Neither trust nor not trust	Trust some	Trust a lot
National TV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Newspapers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National Newspapers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Radio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National Radio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Friends or Relatives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



We would like to know *who you would trust* if you wanted to get information about contaminants in the environment and country foods. **Please note your answers will remain confidential.**

	Don't trust at all	Trust a little bit	Neither trust nor not trust	Trust some	Trust a lot
Local Government	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NWT Government	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Federal Government	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-Profit Organization	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

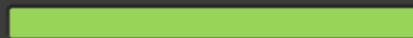


We would like to know *who you would trust* if you wanted to get information about contaminants in the environment and country foods. **Please note your answers will remain confidential.**

	Don't trust at all	Trust a little bit	Neither trust nor not trust	Trust some	Trust a lot
Teachers or Schools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Websites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social Media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Do you have any other comments about contaminants and country foods, or about the way you would like to hear about the results of this project?



The survey is now complete.
We **thank you** for your time!

Start New Survey



Appendix I: Example of Information Letter and Consent Letters for Participants 18+

Title of Project: First Nations Contaminants Biomonitoring in the Northwest Territories: Investigating the Links Between Contaminants Exposure, Nutritional Status, and Country Food Use.

Principal Investigator: Brian Laird, PhD, School of Public Health and Health Systems, University of Waterloo

INFORMATION LETTER FOR ADULT PARTICIPANT

Dear First Nation or Metis Member,

Would you like to take part in a contaminant study involving blood, urine and hair sampling? The study is happening in your community. University of Waterloo researchers will analyze the collected data over the next 12 months. The Northern Contaminants Program, which is jointly funded by Health Canada and Indigenous and Northern Affairs Canada, has supported this study.

Is this study beneficial to participating communities?

Yes, this study benefits participating communities by helping to answer important questions about:

- The current levels of contaminant exposure in the Northwest Territories.
- The role of food in contaminant exposure to people in the Northwest Territories.
- The balance between risks and benefits from country foods.

What is the purpose of this study?

- To evaluate country food usage patterns, levels of contaminant exposure, and nutrient biomarkers in participating communities in the Northwest Territories.
- To create a public health screening tool that can be used to characterize those most at risk of facing elevated contaminant exposures in the Northwest Territories.
- To develop public health communication strategies that promote country foods in ways that can improve nutrition while limiting people's exposure to contaminants.

What will be involved if you agree to participate in this study?

There are six components to the study. Although participants are encouraged to participate in all six parts, each participant is free to take part in only the components that they want to complete. Taking part in the study will take no more than 2 hours in total. Participants will have their height and weight measured for the study.

- Component 1: Completing a 24 hour recall survey (25 minutes)
Participants will be asked to detail what they had eaten over the prior 24 hours using a web-based survey (WEB-Q, <https://www.peaceworks.ca/content/web-q-waterloo-eating-behaviour-questionnaire-24-hour-dietary-recall-food-behaviour>).
- Component 2: Answering a Food Frequency Questionnaire (25 minutes)
A local research coordinator will help participants answer a survey

on an electronic tablet (e.g. iPad™). This survey will ask participants what country foods they ate over the past year.

- Component 3: Hair Sampling (20 minutes)
A research team member will collect a five millimeter width sample of full length hair using sterilized scissors from the back of the head.
- Component 4: Urine Sampling (20 minutes)
A research team member will ask you to collect your urine in a 120 ml container. You don't have to fully fill the container.
- Component 5: Blood Draw (20 minutes)
A registered nurse will collect blood samples (3 x 6 mL vials) from a vein on the inside surface of the elbow.
- Component 6: Risk Perception and communication survey (10 minutes)
Participants will be asked to complete a questionnaire on their knowledge of contaminants and on how they prefer to receive the results.

Are there any risks or cons for participants?

- There are no anticipated risks from the dietary surveys.
- There are minimal anticipated risks (e.g. laceration) from hair sampling.
- There are no anticipated risks from the urine collection.
- There are low anticipated risks from the blood draw. Registered medical staff will collect the blood sample from a vein in the forearm. There is a potential to experience bruising or discomfort from the site of insertion, and therefore, participants are encouraged to keep pressure on the point immediately after the blood draw for roughly ten minutes. The blood withdrawal might cause low blood pressure, dizziness or fainting.

Additional instructions?

Participants are encouraged to wear a loose shirt or a short sleeve shirt as the most commonly used vein for blood collection is located on the inside surface of the elbow.

Also, those instructions below are not requirements to participate to the study but are suggested to facilitate interpretation of the results:

- Please do not eat or drink anything other than water during the 2 hours prior to the appointment
- Please do not smoke or use other tobacco and nicotine products during the 2 hours prior to the appointment
- Please do not drink any alcoholic beverages on the day of your clinic appointment
- Please do not donate blood 2 days prior to the appointment
- Please bring your medications, herbal remedies or supplements on the day of the appointment. If you need to take medication, you can still do so.

Will participants receive any benefits?

No benefit is expected from this research for the participant. However, for your time, you will receive a \$25 gift card for the Northmart Store right after you are done participation. Additionally, you can enter your name into a draw for a \$250 Northmart gift card. Your odds of winning are based on the number of individuals who participate in the study.

We expect that approximately 40 individuals in each community will take part in the study. Information collected to draw for the prizes will not be linked to the study data in any way, and

this identifying information will be stored separately, then destroyed after the prizes have been provided. All gift card amounts received are taxable. It is your responsibility to report this amount for income tax purposes.

Do participants receive any feedback from their samples?

Yes, within twelve months, each study participant that provided a hair, urine and/or blood sample will receive by mail a confidential, plain-language letter detailing his/her contaminant exposure levels. These letters will compare their contaminant exposure results to levels seen in other Canadian populations and relevant screening guidelines. If contaminant levels are above the relevant guideline, the letter will provide advice on what the results mean and what people can do to lower their exposure.

Can I change my mind after I agree to let my sample(s) or questionnaire results be used?

Yes, every component of this study is voluntary; you do not have to take part. For example, one individual may choose to provide dietary information and hair but not provide blood whereas another may choose to provide hair and blood but not complete the dietary surveys.

You may decline to answer any question and/or stop participation at any time during the course of this study without loss of remuneration. If you decide to withdraw from the study, please contact Brian Laird or Mylène Ratelle by phone or by email (contact information is below). You may also decline having your samples be stored in a biobank for up to 10 years. If this option is chosen, your samples will be analyzed and then discarded after your personal results are given. However, biobanks are useful because they preserve the samples so that, in the future, they can be tested for additional contaminants that scientists are not yet able to measure. Hair and blood samples are currently being tested for mercury levels in hair, and metals and fatty acids in blood.

How will confidentiality of data be maintained?

Data collection will be done in the community center and therefore participation will not be confidential. Responses and samples will be kept confidential by the researchers. You will be given a participant identification number so your name will not be associated with your results. All survey data and participant identification information from this study will be kept at the University of Waterloo on a password-protected computer in a locked room. Hair, urine and blood samples will be brought to the University of Montreal, and the University of Waterloo for analyses. Any samples (hair, urine, blood) obtained for the purposes of this study will become the property of the researchers and once you have provided the samples you will not have access to them. They will be kept at the University of Waterloo in a locked, secure laboratory for up to ten (10) years. During this time, each participant has the right to withdraw from the study without loss of remuneration. The samples will be discarded through the University of Waterloo's Environmental Safety Facility. There is a prohibition for financial gain of the researchers for samples, therefore, they cannot be sold. Individuals with exposure levels that exceed contaminant guidelines will receive follow-up from the local Health and Service Authority so they can learn how to reduce their levels. No genetic testing will be done on the samples.

Where will this information be reported?

The samples will be used for research. No research performed under this Agreement, no research products, and no tradition or indigenous knowledge will be used for commercial purposes.

Researchers have the moral duty to contact the participant to be informed of results, however, it is up to the participant whether they would like to be informed or not at that time. Results will be returned to the participating communities in the form of a plain-language report in the following 12 months after the sampling. After results have been returned to communities, students may present de-identified results in theses, papers, and presentations at national and international meetings.

Biobanking

If you agree, your urine, hair and blood samples not required for the current project analyses will be kept at the University of Waterloo for up to 10 years. Your samples will be anonymous. They will be stored with some expectation that they may also be used in future research, although the precise research project may not be design at the time. The only analyses that could be done on your samples would be on contaminants/chemicals exposure. No genetic testing will be done to the samples in the biobank.

Concerns about your participation?

This study has been reviewed and received ethical clearance through a University of Waterloo Research Ethics Committee (ORE#20950). However, the final decision about participation is mine. If I have any questions or ethics concerns, I may contact the Chief Ethics Officer, at the Office of Research Ethics, at 519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

Contact Information:

Feel free to contact Mylène Ratelle or Brian Laird for more information at any time during the course of the study.

Yours sincerely,

Mylène Ratelle, PhD
Research Coordinator
School of Public Health and Health Systems
University of Waterloo
Ph: 519-888-4567 ext. 30365
mratelle@uwaterloo.ca

Brian Laird, PhD
Principal Investigator
School of Public Health and Health Systems
University of Waterloo
Ph: 519-888-4567 ext. 3272
brian.laird@uwaterloo.ca

Co-investigators:

Shannon Majowicz, PhD (University of Waterloo)

Michael Power, PhD (University of Waterloo)

Rhona Hanning, PhD (University of Waterloo)

George Low (Dehcho First Nations)

Ken Stark, PhD (University of Waterloo)

Heidi Swanson, PhD (University of Waterloo)

Kelly Skinner, PhD (University of Waterloo)

Chris Furgal, PhD (Trent University)

Amanda Boyd, PhD (University of Washington)

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Appendix J: Example of Consent Form for Adult Participants

Title of Project: First Nations Contaminants Biomonitoring in the Northwest Territories: Investigating the Links Between Contaminants Exposure, Nutritional Status, and Country Food Use.

CONSENT FORM FOR ADULT

By signing this form, I agree to take part in this study being conducted by Brian Laird, PhD, of the School of Public Health and Health Systems at the University of Waterloo. I have decided to participate based on the provided information letter and have had the chance to ask any questions and have received acceptable answers. If I have any questions later about the study, I can contact Brian Laird or Mylène Ratelle (mratelle@uwaterloo.ca, 519-888-4567 ext. 30365) as indicated previously on the information letter.

By signing this form (circle your answer):

- I understand my involvement in the research study.....Yes No
- I have read and received a copy of the attached information sheet.....Yes No
- I had an opportunity to ask questions and discuss this study.....Yes No
- The issue of confidentiality has been explained to me, and I understand who will have access to my data and samples.....Yes No
- I agree to have my height and weight measured for the study.....Yes No
- I agree to complete the 24-hour recall survey.....Yes No
- I agree to complete the Food Frequency Questionnaire.....Yes No
- I agree to give a hair sample and have it tested.....Yes No
- I agree to give a urine sample and have it tested.....Yes No
- I agree to give a blood sample and have it tested.....Yes No
- I am aware of the anticipated risks associated with blood sampling.....Yes No
- I agree to complete the risk perception and communication survey.....Yes No
- I agree to let my hair, urine and blood samples be stored in a biobank for up to 10 years for the testing of other contaminants and nutrition markers....Yes No
- I am aware I have the right to omit to answer any question.....Yes No
- I am aware I have the right to withdraw at any time during the study without loss of remuneration. If I decide to withdraw, I will contact Brian Laird with the previously provided contact information.....Yes No
- I want to receive my personal results after the completion of the project.....Yes No

Participants will receive one \$25 gift card for the Northmart Store for completing some or all commitments of this study. Additionally, participants would also be entered into a raffle for a

\$250 Northmart gift card. I have been informed that all gift card amounts should be reported on my Income Tax Return.

This study has been reviewed and received ethical clearance through a University of Waterloo Research Ethics Committee (ORE#20950). However, the final decision about participation is mine. If I have any questions or ethics concerns, I may contact the Chief Ethics Officer, at the Office of Research Ethics, at 519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

By signing this consent form, you are not waiving your legal rights or releasing the investigators or involved institutions from their legal and professional responsibilities.

Participant's Name (Please Print): _____

Participant's Signature: _____

Date: _____

Witness Name: _____

Witness Signature: _____

Appendix K: Example of Information Letter for Minor Participants

Title of Project: First Nations Contaminants Biomonitoring in the Northwest Territories: Investigating the Links Between Contaminants Exposure, Nutritional Status, and Country Food Use.

Principal Investigator: Brian Laird, PhD, School of Public Health and Health Systems, University of Waterloo.

INFORMATION LETTER FOR A MINOR PARTICIPANT (<18 years old)

Dear First Nation or Metis Member,

You are the guardian or the parent of a child who would like to take part in a contaminant study involving blood, urine and hair sampling? The study is happening in your community. University of Waterloo researchers will do the analysis of the collected data in the next 12 months. The Northern Contaminants Program, which is jointly funded by Health Canada and Aboriginal Affairs and Northern Development Canada, has supported this study.

Is this study beneficial to the community?

Yes, this study benefits the participants and the communities by helping to answer important questions about:

- The current levels of contaminant exposure in the Northwest Territories.
- The role of food in contaminant exposure to people in the Northwest Territories.
- The balance between risks and benefits from country foods.

What is the purpose of this study?

- To evaluate country food usage patterns as well as the levels of contaminant exposure, and nutritional biomarkers in participating communities in the Northwest Territories.
- To create a public health screening tool that can be used to characterize those most at risk of facing elevated contaminant exposures in the Northwest Territories.
- To develop public health communication strategies that promote country foods in ways that can improve nutrition while limiting contaminant exposure in the Northwest Territories.

What will be involved if I agree to let my child participate in this study?

There are six components to the study. Although participants are encouraged to participate in all six parts, each participant is free to take part in only the components that they want to complete. Taking part in the study will take no more than 2 hours in total. Participants will have their height and weight measured for the study.

- Component 1: Completing a 24 hour recall survey (25 minutes)
Participants will be asked to detail what they had eaten over the prior 24 hours using a web-based survey (WEB-Q, <https://www.peaceworks.ca/content/web-q-waterloo-eating-behaviour-questionnaire-24-hour-dietary-recall-food-behaviour>).
- Component 2: Answering a Food Frequency Questionnaire (25 minutes)
A local research coordinator will help the child answers a survey on an electronic tablet (e.g. iPad™). This survey will ask participants what country foods they ate over the past year.
- Component 3: Hair Sampling (20 minutes)
A research team member will collect a five millimeter width sample of full length hair using sterilized scissors from the back of the head.
- Component 4: Urine Sampling (20 minutes)

A research team member will ask the child to collect his urine in a 120 ml container. He/she doesn't have to fully fill the container .

- Component 5: Blood Draw (20 minutes)
A registered nurse will collect blood samples (3 tubes of 6 ml) from a vein on the inside surface of the elbow.
- Component 6: Risk Perception and communication survey (10 minutes)
Participants will be asked to complete a questionnaire on their knowledge on contaminants and on how they prefer to receive the results.

Are there any risks for participants?

- There are no anticipated risks associated from the dietary surveys.
- There are minimal anticipated risks (e.g. laceration) from hair sampling.
- There are no anticipated risks associated from the urine collection.
- There are low anticipated risks from blood draw. Registered medical staff will collect the blood sample from a vein in the forearm. There is a potential to experience bruising or discomfort from the site of insertion, and therefore, participants are encouraged to keep pressure on the point immediately after the blood draw for roughly ten minutes. The blood withdrawal might cause low blood pressure, dizziness or fainting.

Additional instructions?

The child is encouraged to wear a loose shirt or a short sleeve shirt as the most commonly used vein for blood collection is located on the inside surface of the elbow.

Also, those instructions below are not requirements to participate to the study but are suggested to facilitate interpretation of the results:

- The child should not eat or drink anything other than water during the 2 hours prior to the appointment
- The child should do not smoke or use other tobacco and nicotine products during the 2 hours prior to the appointment
- The child should not drink any alcoholic beverages on the day of your clinic appointment
- The child should not donate blood 2 days prior to the appointment
- The child should bring his/her medications, herbal remedies or supplements on the day of the appointment. If medication needed, the child can still take it.

Will participants receive any benefits?

No benefit is expected from this research for the participant. However, for the child's time, he/she will receive a \$25 gift card for the Northmart Store. Additionally, your child can enter his/her name into a draw for a \$250 Northmart gift card. Their odds of winning are based on the number of individuals who participate in the study. We expect that approximately 40 individuals in each community will take part in the study. Information collected to draw for the prizes will not be linked to the study data in any way, and this identifying information will be stored separately, then destroyed after the prizes have been provided. All gift card amounts received are taxable. It is your responsibility to report this amount in the child's income tax.

Do participants receive any feedback from their samples?

Yes, within twelve months, each study participant that provided a hair, urine and/or blood sample will receive by mail a confidential, plain-language letter detailing his/her contaminant

exposure levels. These letters will compare their contaminant exposure results to levels seen in other Canadian populations and relevant screening guidelines. If contaminant levels are above the relevant guideline, the letter will provide advice on what the results mean and what people can do to lower their exposure.

Can I or my child change minds after agree to let my child's sample or questionnaire results be used?

Yes, every component of this study is voluntary; the child does not have to take part. For example, one individual may choose to provide dietary information and hair but not provide blood whereas another may choose to provide hair and blood but not complete the dietary surveys.

The child may decline to answer any question and/or stop participation at any time during the course of this study without loss of remuneration. If you or the child decides to withdraw from the study, please contact Brian Laird or Mylène Ratelle by phone or by email (contact information is below). You and/or the child may also decline having the child's sample(s) be stored in a biobank for up to ten (10) years. If this option is chosen your child's samples will be analyzed and then discarded after their personal results are given. However, biobanks are useful because they preserve the samples so that, in the future, they can be tested for additional contaminants that scientists are not yet able to measure. Hair, urine and blood samples are currently being tested for mercury levels in hair, and metals and fatty acids in blood.

How will confidentiality of data be maintained?

Data collection will be done in the community center and that therefore participation will not be confidential. The child's responses and samples will be kept confidential by the researchers. Your child will be given a participant identification number, so his/her name will not be associated with their results. All survey data and participant identification information from this study will be kept at the University of Waterloo on a password-protected computer in a locked room. Hair, urine and blood samples data will be brought to the University of Montreal, and the University of Waterloo for analyses. Any samples (hair, urine, blood) obtained for the purposes of this study will become the property of the researchers and once you have provided the samples you will not have access to them. They will be kept at the University of Waterloo in a locked, secure laboratory for up to ten (10) years. During this time, each participant has the right to withdraw from the study without loss of remuneration. The samples will be discarded through the University of Waterloo's Environmental Safety Facility. There is a prohibition for financial gain of the researchers for samples and therefore, cannot be sold. Individuals with exposure levels that exceed contaminant guidelines will receive follow-up from the local Health and Service Authority so they can learn how to reduce their levels. No genetic testing will be done on the samples.

Where will this information be reported?

The samples will be used for research. No research performed under this Agreement, no research products, and no tradition or Indigenous knowledge will be used for commercial purposes. Researchers have the moral duty to contact the participant of the samples to be informed of results, however, it is up to the participant whether they would like to be informed or not at that time. Results will be returned to the participating communities in the form of a plain-language report in the following 12 months after the sampling. After results have been returned to

communities, students may present de-identified results in theses, papers, and presentations at national and international meetings.

Biobanking

If you and the child agree, his/her urine, hair and blood samples not required for the current project analyses will be kept at the University of Waterloo for up to 10 years. Samples will be anonymous. They will be stored with some expectation that they may also be used in future research, although the precise research project may not be design at the time. The only analyses that could be done on those samples would be on contaminants/chemicals exposure. No genetic testing will be done to the samples in the biobank.

Concerns about your participation?

This study has been reviewed and received ethical clearance through a University of Waterloo Research Ethics Committee (ORE#20950). However, the final decision about participation is mine. If I have any questions or ethics concerns, I may contact the Chief Ethics Officer, at the Office of Research Ethics, at 519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

Contact Information:

Feel free to contact Mylène Ratelle or Brian Laird for more information.

Yours sincerely,

Mylène Ratelle, PhD
Research Coordinator
School of Public Health and Health Systems
University of Waterloo
Ph: 519-888-4567 ext. 30365
mratelle@uwaterloo.ca
Brian Laird, PhD
Principal Investigator
School of Public Health and Health Systems
University of Waterloo
Ph: 519-888-4567 ext. 32720
brian.laird@uwaterloo.ca

Co-investigators:

Shannon Majowicz, PhD (University of Waterloo)
Michael Power, PhD (University of Waterloo)
Rhona Hanning, PhD (University of Waterloo)
George Low (Dehcho First Nations)
Ken Stark, PhD (University of Waterloo)
Heidi Swanson, PhD (University of Waterloo)
Michele Bouchard, PhD (University of Montreal)
Deborah Simmons, PhD (Sahtú Renewable Resources Board)
Kelly Skinner, PhD (University of Waterloo)
Chris Furgal, PhD (Trent University)
Amanda Boyd, PhD (University of Washington)

Appendix L: Example of Consent Form for Minor Participants

Title of Project: First Nations Contaminants Biomonitoring in the Northwest Territories: Investigating the Links Between Contaminants Exposure, Nutritional Status, and Country Food Use.

CONSENT FORM FOR A MINOR PARTICIPANT

By signing this form, I agree to let my child take part in this study being conducted by Brian Laird, PhD, of the School of Public Health and Health Systems at the University of Waterloo. I have decided to let my child participate based on the provided information letter, and have had the chance to ask any questions and have received acceptable answers. If my child or I have any questions later about the study, I can contact Brian Laird or Mylène Ratelle (mratelle@uwaterloo.ca, 519-888-4567 #30365) as indicated previously on the information letter.

By signing this form (circle your answer):

- I understand my child’s involvement in the research study.....Yes No
- I have read and received a copy of the attached information sheet.....Yes No
- Both my child and I had an opportunity to ask questions and discuss this study
.....Yes No
- The issue of confidentiality has been explained to me, and I understand who will have access to my child’s data and samples.....Yes No
- I agree to have my child’s height and weight measured for the study.....Yes No
- I agree to my child completing the 24-hour recall survey.....Yes No
- I agree to my child completing the Food Frequency Questionnaire.....Yes No
- I agree to my child giving a hair sample and having it tested.....Yes No
- I agree to my child giving a blood sample and having it tested.....Yes No
- I agree to my child giving a urine sample and having it tested.....Yes No
- I am aware of the anticipated risks associated with blood sampling.....Yes No
- I agree to my child completing the risk perception and communication survey.....Yes No
- I agree to let my child’s hair, urine and blood samples be stored in a biobank for up to ten (10) years for the testing of other contaminants and nutrition markers...Yes No
- I am aware my child has the right to omit to answer any question.....Yes No
- I am aware my child has the right to withdraw at any time during the study without loss of remuneration. If my child decides to withdraw, I will contact Brian Laird with the previously provided contact information.....Yes No
- I want to receive my child’s results after the completion of the project.....Yes No

Participants will receive one \$25 gift card for the Northmart Store for completing some or all commitments of this study. Additionally, participants would also be entered into a raffle for a \$250 Northmart gift card. I have been informed that all gift card amounts should be reported on my child's Income Tax Return.

This study has been reviewed and received ethical clearance through a University of Waterloo Research Ethics Committee (ORE#20950). However, the final decision about participation is

mine. If I have any questions or ethics concerns, I may contact the Chief Ethics Officer, at the Office of Research Ethics, at 519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

By signing this consent form, you are not waiving your legal rights or releasing the investigators or involved institutions from their legal and professional responsibilities.

Guardian's Name (Please Print): _____

Guardian's Signature: _____

Relationship to Participant: _____

Date: _____

Witness Name: _____

Witness Signature: _____

Title of Project: First Nations Contaminants Biomonitoring in the Northwest Territories: Investigating the Links Between Contaminants Exposure, Nutritional Status, and Country Food Use.

CONSENT FORM FOR ADULT

By signing this form, I agree to take part in this study being conducted by Brian Laird, PhD, of the School of Public Health and Health Systems at the University of Waterloo. I have decided to participate based on the provided information letter and have had the chance to ask any questions and have received acceptable answers. If I have any questions later about the study, I can contact Brian Laird or Mylène Ratelle (mratelle@uwaterloo.ca, 519-888-4567 ext. 30365) as indicated previously on the information letter.

By signing this form (circle your answer):

- I understand my involvement in the research study.....Yes No
- I have read and received a copy of the attached information sheet.....Yes No
- I had an opportunity to ask questions and discuss this study.....Yes No
- The issue of confidentiality has been explained to me, and I understand who will have access to my data and samples.....Yes No
- I agree to have my height and weight measured for the study.....Yes No
- I agree to complete the 24-hour recall survey.....Yes No
- I agree to complete the Food Frequency Questionnaire.....Yes No
- I agree to give a hair sample and have it tested.....Yes No
- I agree to give a urine sample and have it tested.....Yes No
- I agree to give a blood sample and have it tested.....Yes No
- I am aware of the anticipated risks associated with blood sampling.....Yes No
- I agree to complete the risk perception and communication survey.....Yes No
- I agree to let my hair, urine and blood samples be stored in a biobank for up to 10 years for the testing of other contaminants and nutrition markers....Yes No
- I am aware I have the right to omit to answer any question.....Yes No
- I am aware I have the right to withdraw at any time during the study without loss of remuneration. If I decide to withdraw, I will contact Brian Laird with the previously provided contact information.....Yes No
- I want to receive my personal results after the completion of the project.....Yes No

Participants will receive one \$25 gift card for the Northmart Store for completing some or all commitments of this study. Additionally, participants would also be entered into a raffle for a \$250 Northmart gift card. I have been informed that all gift card amounts should be reported on my Income Tax Return.

This study has been reviewed and received ethical clearance through a University of Waterloo Research Ethics Committee (ORE#20950). However, the final decision about participation is mine. If I have any questions or ethics concerns, I may contact the Chief Ethics Officer, at the Office of Research Ethics, at 519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

By signing this consent form, you are not waiving your legal rights or releasing the investigators or involved institutions from their legal and professional responsibilities.

Participant's Name (Please Print): _____

Participant's Signature: _____

Date: _____

Witness Name: _____

Witness Signature: _____

Appendix M: Example of Result Letter



Waterloo, August 25th, 2017.

To: NAME

Subject: Results from the Northwest Territories Biomonitoring Project

In the last year, you took part in a research project, funded by the Northern Contaminants Program, studying the levels of contaminants participants are exposed to by consuming foods harvested in the Northwest Territories. Some foods are shown to have higher levels of contaminants, but are also important sources of beneficial nutrients. So, to understand the balance between benefits and risks, it is important to study contaminants and nutrients. To help with this research, you provided hair, urine, and/or blood samples to a research team led by Dr. Brian Laird to measure contaminants and nutrients.

In this letter you will find the results from the samples you provided and additional information to understand what your results mean. To interpret your results, we used several indicators of exposure and risk. For example, the health guidelines available from Health Canada recommend limit levels of mercury in blood (20 ug/L or 8 ug/L for children or woman of 45 years old and below), lead in blood (100 ug/L or 50 ug/L for children or woman of 45 years old and below) and cadmium in blood (5 ug/L) and urine (7 ug/L). If you want to receive more information on how to interpret your levels, contact us and we will send you the values we used to interpret your results and further information on the significance of your results.

Here is a preview of your results for the 3 most harmful contaminants: mercury, cadmium, and lead.

You provided: Hair

Blood

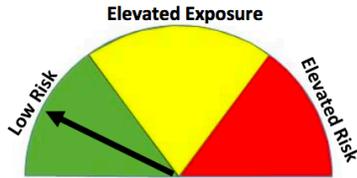
Urine

IN HAIR	IN BLOOD	IN URINE
 Your value: _____ μg/g	 Your value: _____ μg/L	 Your value: _____ μg/L

These results mean that your levels of mercury, lead, and cadmium were in the normal range. **These levels are well below those known to cause health problems.**

Even though these contaminants are sometimes found in country foods, **the benefits of eating country foods most often outweigh the risks posed by these low exposures.**

If you provide blood or urine, the rest of your results can be found on a separate page enclosed in this letter.



We are in town to discuss the results of the project to-date, answer your questions, and listen to your concerns. We hope to see you then! As the project continues, Dr. Laird's research team will be able to provide more information on the exposure levels of people living in the Northwest Territories. When you participated, you might have agreed that the research team could keep your sample(s) so that more contaminants or nutrients could be measured in the future. If we receive any additional information about your samples, we will provide another letter with those results too. Information discovered through this research will first be shared with the participating communities before being mentioned anywhere else (media, science presentations).

This letter does not replace regular visits to your doctor or health care professional. These results only cover your exposure levels when samples were collected and may not represent your values over the whole year. If you have any health concerns, you should discuss these with a health professional. You may wish to provide your health care provider with a copy of these results for your health records. In the future, these results may be useful to you, so we recommend keeping this letter in a safe place for long-term storage in case you need it.

If you have any questions or comments, we will be pleased to talk with you.

Thank you very much for your participation in this project.

To follow the project:

Facebook: [BiomonitoringNT](#)

Twitter: [NTBiomonitoring](#)

Brian Laird
Principal Investigator

School of Public Health and Health Systems,
University of Waterloo,
200 University Avenue West,
Waterloo, ON, Canada N2L 3G1

Email: brian.laird@uwaterloo.ca
Phone: (519) 888-4567, ext. 32720

Mylène Ratelle
Project Manager

School of Public Health and Health Systems,
University of Waterloo,
200 University Avenue West,
Waterloo, ON, Canada N2L 3G1

Email: mratelle@uwaterloo.ca
Phone: (519) 888-4567, ext. 30365

Colour indicators

On the next pages, each of your results has been given a colour code to help you understand what these levels mean.

	What do my results mean?	What can I do?
	<p>Your result was less than all available health guidelines for this contaminant. There are no known health risks at this exposure level.</p> <p>Your result was less than the upper indicator from other Canadian groups. This means that your result was in the normal range observed in Canada.</p>	<p>We do not recommend that you do anything differently.</p>
	<p>There is no available health guideline for this contaminant.</p> <p>But, your result was above the upper indicator from other Canadian groups. This means that your result was higher than the normal range observed in Canada.</p>	<p>We do not recommend that you do anything differently.</p>
	<p>Your result was less than all available health guidelines for this contaminant. There are no known health risks at this exposure level.</p> <p>But, your result was higher than the upper indicator from other Canadian groups. This means that your result was higher than the normal range observed in Canada.</p>	<p>You may want to lower your exposure.</p> <p>We have included some advice on how you could lower your exposure.</p>
	<p>Your result is above the health guideline for this contaminant.</p> <p>If your exposure level stays this high, it could put your health at risk.</p>	<p>We recommend that you lower your exposure. We have included some advice on how you could lower your levels.</p> <p>We would like to meet with you to answer any of your questions and talk with you more about your result. We recommend that you bring a copy of this letter to your health center.</p>
	<p>Very little is known about this contaminant.</p>	<p>We do not recommend that you do anything differently.</p>

How to lower your levels

Some of your contaminant/nutrient levels may have been higher than we usually see in the general population of Canada. ***This does not mean that your health is at risk.*** But, you may want to lower your exposure. We have included some information describing what you could do to try to lower your levels:

Recommendations:

- Eating a healthy diet rich in zinc, iron, and calcium can help reduce many contaminants levels over time (cadmium, lead).
- Reducing your exposure to tobacco smoke (from smoking and second hand smoke) will reduce some contaminants, such as cadmium.
- Some organs (liver/kidney) of moose from the southern Mackenzie Mountains might also contain high cadmium levels, but moose meat is always a safe and healthy alternative.
- Using lead-free ammunition can also help lower your lead exposure.
- Choosing small fish over big fish. Recommendations on fish consumption can be found on the Government of Northwest Territories' website: <http://www.hss.gov.nt.ca/>
- Choosing not predatory fish (Whitefish, cisco, grayling, suckers, and inconnu) over predatory fish (such as jackfish, lake trout, and walleye). Public health advisories on fish can be found on the Government of Northwest Territories' website: <http://www.hss.gov.nt.ca/>
- Bring water with you on the land. Choose the treated water over the untreated water on the land. Municipal drinking water is tested regularly for several chemicals, including uranium, and is safe to drink.
- If you are taking a multi-vitamin and your level of some nutrients were higher than usual, you may want to talk to your doctor about your choice of multi-vitamin.
- You can get additional information about contaminants on the Factsheets (ToxFAQs) from the Agency of Toxic Substances and Disease Registry, a branch of the U.S. Centers of Disease Control. Each of these short factsheets summarize answers to the most commonly asked questions about contaminants. <https://www.atsdr.cdc.gov/toxfaqs/Index.asp>

DENE HÉ DÁGÓT'E?

How Are We Doing?

The Déljñę ʔehdzo Got'jñę is sponsoring research with Dr. Brian Laird and Dr. Mylene Ratelle (University of Waterloo) to address community questions about Dene béré (country food), asjǰ beta ʔajá (contaminants) and health. You're welcome to participate if you're six years old or older.

Monday-Thursday
February 13-16
9 am-6 pm
Dene Náoweré Kó
(Cultural Centre)

Gift cards!
Prizes!

Funded by
the Northern Contaminants Program

Canada

Máhsı to our partners!

For more information, contact Ed Reeves or Michael Neyelle at the Déljñę ʔehdzo Got'jñę office, 589-8100, ext. 1013, or Ruby Baton-Beyonnie and Dora Blondin at Dene Náoweré Kó, 588-4013.



UNIVERSITY OF
WATERLOO



Appendix O: Example of Recruitment Poster (English)

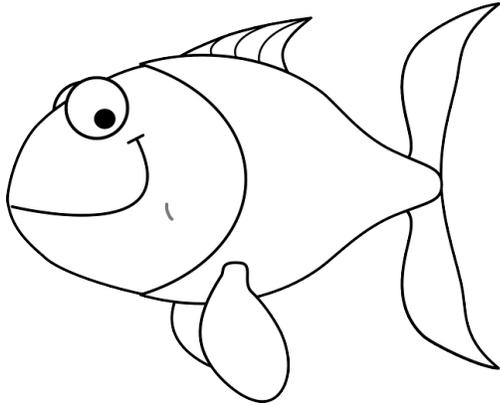
Would you like to take part in a study on Contaminants and Human Health in your community?

Dr Brian Laird and Dr Mylène Ratelle, from University of Waterloo, will be in your community to offer you the chance to participate.

Why?

This study will help to answer important questions about:

- The current levels of **contaminant** exposure in the body.
- The **sources** of contaminant exposure to people in the Northwest Territories.
- The balance between risks and benefits from **country food**.



Who?

Everyone from 6 years and older are welcome!

How?

Each participant is **free** to take part in only the components they want to complete (2 hours in total):

- Completing a 24 hour food recall survey
- Completing a Food Frequency Questionnaire
- Collect a five millimeter width sample of full length hair
- Collect urine sample
- A nurse will collect blood samples

Results will be returned to each participant 6 to 12 months after sampling.

You will receive a **\$25 gift card** for the Northmart Store right after you are done participation. Additionally, you can enter your name into a draw for a \$250 Northmart gift card.

You want to know more? Come to meet us!

When: _____

Where: _____

Contact us by email at: mratelle@uwaterloo.ca

Appendix P: Interview Consent Form

CONSENT FORM

By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about a study being conducted by Dr. Kelly Skinner and Danielle Brandow of the School of Public Health and Health Systems at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses.

I am also aware that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#20950). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions contact Dr. Kelly Skinner, 519-888-4567, ext. 38164 or Danielle Brandow, dbrandow@uwaterloo.ca

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

YES NO

I agree to have my interview audio recorded.

YES NO

I agree to the use of anonymous quotations in any thesis or publication that comes of this research.

YES NO

Participant Name: _____ (Please print)

Participant Signature: _____

Witness Name: _____ (Please print)

Witness Signature: _____

Date: _____

Country Foods are Healthy to Eat

Cadmium in Moose Kidneys vs. Inhaling Cigarettes

At the request of Dehcho First Nations, ENR collected moose organs and meat to determine levels of cadmium and other contaminants present. Mackenzie Valley harvesters provided samples from 43 moose. Samples from 18 moose from the Mackenzie Mountains were also collected.

Cadmium naturally occurs in the environment. Moose accumulate cadmium in their organs as they get older. Cadmium levels in organs from moose in the Valley were similar to those found in Scandinavia and other regions in North America. Moose meat from both the Valley and Mountains contains very low levels of cadmium and **REMAINS A VERY HEALTHY FOOD CHOICE.**

Amount of cadmium absorbed from eating a whole **Valley moose kidney** is much **LESS** than the amount of cadmium absorbed from smoking **one pack of cigarettes.**

Amount of cadmium absorbed from eating a whole **Mountain moose kidney** is **SIMILAR** to the amount of cadmium absorbed from smoking **five and a half packs of cigarettes.**



Smoking 1 pack of cigarettes = 2 µg of cadmium absorbed by the lungs.

Tolerable daily intake of cadmium according to the World Health Organization is 60 µg/day for adult women and 70 µg/day for adult men.

Public Health Advisory

VALLEY MOOSE RECOMMENDED MAXIMUM:

**one serving of kidney every two months
and one serving of liver a week.**

MOUNTAIN MOOSE RECOMMENDED MAXIMUM:

**one serving of liver every three months
and advise not to consume kidney as a precaution.**





Fish Consumption Notice

March 2016 | www.hss.gov.nt.ca

Kelly Lake - Lake Trout

Based on the latest monitoring results, Lake Trout from Kelly Lake (Sahtu) contain levels of mercury above the Health Canada recommendations for average consumption.

The Chief Public Health Office is therefore recommending that:

- Occasional consumption of Lake Trout is not harmful.

If you regularly consume Lake Trout on a weekly basis, the following restrictions apply:

Pregnant / Breastfeeding Women	Children 5 - 11 years old	Children 1 - 4 years old	General Population
2 servings per month	1 and $\frac{2}{3}$ servings per month	1 serving per month	2 servings per week

1 serving = 75 grams = 1 pack of cards



You can eat unlimited amounts of Whitefish from Kelly Lake (Sahtu).

Fish is good for you. It is high in protein, vitamin B and omega-3 fatty acids. Omega-3 fatty acids are food for your heart, your brain, and your eyesight. Fish are also an excellent source of vitamin D, which helps your body use calcium, a mineral required for the development of strong teeth and bones.

Best | Best | Better
health | care | future

If you would like this information in another official language, contact us at 1-855-846-9601.
Si vous voulez ces renseignements dans une autre langue officielle, communiquez avec nous au 1-855-846-9601.

Government of
Northwest Territories

Appendix S: GNWT Health and Social Services: Public Health Advisory webpage



Health and Social Services

Home Topics Resources Jobs About Us **Newsroom** HSS Professionals (Staff Only)

Home / Newsroom 

Newsroom

- News Releases
- Boil Water Advisories
- **Public Health Advisories**

Public Health Advisories

August 1, 2017

[Arsenic in Lake Water Around Yellowknife](#)

November 25, 2016

[Suspected opioid overdoses prompts health alert in Yellowknife](#)

February 16, 2015

[Street Drug "Greenies" prompts health alert in Yellowknife](#)

October 3, 2012

[MRSA on the Rise in the NWT](#)

[Phone Directory](#) [Terms of Use](#) [Accessibility](#) [Using the LISTEN Feature](#)