

REGIONAL DIFFERENCES IN TRADITIONAL FOOD HARVESTING

**Exploring Regional Differences in Traditional Food Harvesting in
Three Northern Indigenous Communities in Canada**

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Abstract

Across what is now called Canada, Indigenous communities have been navigating a complex and challenging relationship with food security and food sovereignty. This relationship has been shaped by several factors, including geographical location, depletion of food sources, forced settlement, and the shift toward a wage-based economy, among others. This paper investigates how traditional foods contribute to meeting the energy requirements of three northern Indigenous communities: Clyde River, Moose Cree First Nation, and Old Crow. It begins by exploring the concepts of food security and food sovereignty and their relevance to Indigenous communities. This study highlights the cultural significance of traditional food systems and the lasting impacts of colonization on these relationships. By calculating the Total Energy Expenditure (TEE) for each community and estimating how many of the most hunted and consumed animals would be needed to meet a 17% contribution rate, the research illustrates the scale of harvesting required to sustain these communities. While reaching such targets may not be feasible for all, the findings emphasize the absolute necessity of supporting culturally appropriate, community-led, and ecologically sustainable traditional harvesting practices.

Acknowledgements

My journey began after my undergraduate degree was slightly postponed due to the birth of my son in 2018. Following this amazing life-changing addition to the family, I had the opportunity to work with my supervisor, Dr. Michael Robidoux, who guided me through my research project, propelling me to complete my undergraduate degree. I chose to continue my education and was encouraged by Michael to complete my Master's degree, snowballing off my undergraduate research. He has supported me in every way that I have asked for and beyond, providing vital advice and guidance, as this thesis would not be possible without him. I also want to thank my committee members, Dr. Eileen O'Connor for the support, Dr. Keira Loukes for your kindness, and Dr. Alex Dumas for stepping in when asked.

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Student's Contribution to Research

The research and ideas created and discussed in this paper are solely my own, with the intent and purpose of contributing to the discussion regarding the significance of increasing access to traditional food and harvesting in northern Indigenous communities. The paper was created and written as a sole researcher, with contributions from my supervisor throughout the editing process to improve the readability, organization, and ensure the paper would be understood by any reader. The physiological measurements, calculations, and figures were created in collaboration with fellow Master's student Cole Goode.

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Chapter I: Introduction

The terms food security and food sovereignty are commonly used when discussing traditional foodways in Indigenous communities around the globe. Traditional foods contribute to Indigenous well-being in many ways, including improved cultural continuity, mental health, physical health, and emotional health.¹ However, in what is now known as Canada, the imposition of colonial forces severed many Indigenous communities' relationships with traditional food. Efforts to strengthen local food systems and increase food sovereignty are challenging for Indigenous communities with the barriers that were imposed upon them that they continue to oppose today. To support Indigenous communities' traditional food initiatives the federal government of Canada has implemented several grants and subsidies to provide financial contributions fueling many projects in the north. For example, the Harvesting Support Grant and community food programs increase access to traditional foods through supporting traditional hunting, harvesting, and food sharing in communities that meet the qualifying credentials (Government of Canada, 2023). This is a step in the right direction but for these programs to effectively increase local food harvesting efforts and traditional food availability, they must be informed by the realities people face in northern communities and the enduring impacts of colonization.

As understood, colonization impacted Indigenous peoples unevenly across the country in different ways. For example, Baffin Island Inuit people experienced first contact as early as the tenth century (Bonesteel & Anderson, 2008; Brower, 2009), severely impacting their ability to survive and hunt whales as the populations rapidly declined. Europeans slowly encroached upon

¹ When discussing Indigenous food systems, traditional food can be a complicated term as it has different meanings to different people because of the sociocultural and economic shifts in society. Due to the complexity of the term, when referring to traditional food in this section, I am referring to food that is accepted in a particular culture and is harvested using local resources such as hunting, fishing, and plant harvesting (Thompson et al., 2018).

the James Bay region where animal populations once again rapidly declined due to overhunting from the high demand for fur, which created a heavy reliance on European imported goods (Bishop, 1970). Due to the different timelines in terms of contact with settler nations, Indigenous communities across Canada experienced the impacts of colonization in vastly different ways. For this reason, three communities from distinct nations and geographical regions were identified for this study: Clyde River, a coastal community on Baffin Island, Nunavut; Moose Cree First Nation, located on the southern coast of James Bay, Ontario; and Old Crow, located on Porcupine River in Northwest Yukon. The purpose of the study is to draw upon existing literature focusing on these distinct regions and to analyse how improved and supported access to traditional food and traditional harvesting can positively impact food security and food sovereignty in First Nations and Inuit communities in northern Canada.

Chapter II: Literature Review

Food Security & Sovereignty

“Food security” and “food sovereignty” are commonly explored terms when discussing Indigenous communities and their relationships with food. Although the concepts are similar, the reality of achieving either one in a capitalist, colonially controlled state, is vastly different. Food sovereignty can be defined as a people's right to produce food through ecologically sound and sustainable methods (Nyéléni Declaration, 2007). More specifically, Indigenous food sovereignty “moves beyond just food access to incorporate complex relations between Indigenous peoples, the land, and sacred food knowledge” (Maudrie et al., 2021, p.1). However, due to several barriers such as depletion of food sources, loss of traditional knowledge, climate change, resource extraction, forced settlement, and the introduction of the wage economy, complete food sovereignty is implausible in the current political and socioeconomic climate. Narrowing the focus to gaining more control over local food systems would provide a more realistic short-term goal toward ultimately achieving food sovereignty. This would include supporting traditional food harvesting to combat the prevalence of food insecurity in Indigenous households in Canada.

Food security was defined in the Encyclopedia of Food Security and Sustainability as when “all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (Peng & Berry, 2019, p.1). Using this definition, food insecurity can be described as a chronic epidemic amongst Indigenous populations in Canada who experience food insecurity at a rate of 2-6 times that of their non-Indigenous counterparts (Dietitians of Canada, 2016; Willows et al., 2009). Food security is appropriately described by Robin et al. (2021) as “not only a symptom of settler colonialism, but part of its very architecture” (p.1). Food insecurity is further explored in

an Indigenous context by Elaine Power (2008), who has nuanced the term to include culturally meaningful food, incorporating preferred foods into the definition rather than simply food availability. In conciliation efforts, several different programs implemented by governmental organizations (Nutrition North, Emergency Food Security Fund), local Indigenous organizations (Qajuqturvik Community Food Centre, Saugeen First Nation Food Bank), and non-governmental organizations (Canadian Feed the Children, Indigenous Food Systems Network) have been working to combat the shortages of accessible traditional and healthy foods for Indigenous people on and off-reserve. None of these programs have had the resources to fully supplement the exorbitant prices of market foods for remote and rural communities at their local markets keeping food insecurity rates extremely high. Study after study continues to report high food insecurity rates for Indigenous people throughout all of Canada (Batal, Chan, Fediuk, Ing, Berti, Mercille, et al., 2021; Chan et al., 2011; Chan et al., 2012; Chan et al., 2021; Poirier & Tait-Neufeld, 2023; Willows et al., 2009; Willows et al., 2011), and even higher rates in more isolated communities in northern Canada (Furgal et al., 2021; Harder & Wenzel, 2012). Traditional Indigenous knowledge, specifically knowledge of traditional foodways, plays a major role in Indigenous identity and further understanding of how these concepts intersect and interact is going to be explored to help lead towards a more food-secure future.

Significance of Traditional Foods

There are several important positive aspects that traditional food brings to Indigenous identity beyond the physical benefits that traditional Western science has historically emphasized (McEachern et al., 2022). Traditional food access and consumption can contribute to deeply meaningful aspects of Indigeneity such as cultural continuity, connection to land, and creating a more connected community. Indigenous informed research in this field identifies four

overarching health themes to be addressed to improve the overall wellness of Indigenous people, including spiritual/cultural, mental, physical, and emotional health (Battiste, 2000; Cochran et al., 2008; Edge & McCallum, 2006; Elliott et al., 2012; Getty, 2010). Traditional food harvesting (including harvesting/hunting, processing, cooking, and eating) encompasses all four of these wellness themes. Partaking in the hunting portion of harvesting is viewed as a form of medicine through which positive impacts are experienced by breathing fresh air, being physically demanding, and experiencing positive mental health results (Ahmed et al., 2022). Hunting, fishing, and edible plant harvesting are all important parts of Indigenous culture as they integrate traditional teachings and knowledge into the practice ensuring oral traditions remain alive (Ahmed et al., 2022; Gendron, 2016; Randazzo & Robidoux, 2018; Turner, 2020).

Spiritual/Cultural

As supported by Priadka et al. (2022), the entire wildlife harvesting experience is explained as an important cultural event where traditional ceremonies are practiced, and the concept of reciprocity is employed by sharing food and information among family and community members. Robidoux et al. (2012) further supported this point when they discussed how the food preparation process plays a major role in learning about culture while providing a positive, inclusive environment to community members who are looking to reconnect with their culture. A study with the Gitxaala Nation discussed their foods as an “experience that encompasses language, story, history, relationships” (Gendron, 2016, p.14). It is a form of cultural resurgence as individuals directly impacted by assimilative tactics employed by the Canadian government, such as residential schools, are provided the opportunity to connect to their culture in a safe, supportive environment, surrounded by individuals with similar goals and past experiences. Through enhanced cultural connectedness individuals experience an increase in

well-being and a sense of belonging (Blanchet et al., 2021). An important part of cultural resurgence is the connection to land, which is experienced by those who participate in hunting and gathering programs or activities. A strong connection to culture and the land can also contribute to improved mental health outcomes as exemplified in Leske et al.'s (2016) review of culturally adapted programming for Indigenous adults.

Mental Health

For many Indigenous communities and individuals, the act of hunting and harvesting is beneficial because being out on the land “in the fresh air and as a free soul” (Pufall et al., 2011, p.245) brings an unexplainable satisfaction. It has been documented that land-based programs connecting individuals to the land and traditional knowledge gained from communication with community Elders have been beneficial for mental health outcomes (Graham et al., 2021; Leske et al., 2016). There is a deep understanding between traditional foodways and the connection to the land through a reciprocal relationship (Milburn, 2004), which can contribute to the success of these land-based programs.

There can also be success in mental health outcomes in culturally based programs as represented by the study conducted by Gendron et al. (2017). They found that learning more about traditional foods significantly increased interest in continuing education and participation in traditional food knowledge. In further support, Murdock-Flowers et al. (2019) studied five different culturally based interventions and found how they positively impacted mental health, bringing participants a sense of pride, fulfillment, and identity. Within the five interventions, there was also great success in learning through physical activity.

Physical Health

The physical and mindfulness interventions in the same Murdock-Flowers et al., (2019) study, resulted in positive outcomes including improved physical benefits and improved ability to calm the mind. In congruency with these findings, further physical benefits are experienced by individuals who spend time participating in traditional activities such as hunting and fishing. Many youth participants described traditional activities as “strengthening and preparing their bodies for the bush” (Akbar et al., 2020, p. 10). They further discussed how participating in traditional activities is associated with improving physical fitness and healthy eating. A major contributor to the level of physical activity on hunting days is whether the hunt is successful. As observed by Paul (2020), there is a significant increase in intensified physical activity when the hunters are required to perform routine food preparation upon a successful hunt. This may require skinning the animal, dragging/lifting the animal, and cleaning the animal, all of which require considerable physical exertion and are standard procedures when harvesting large game. The hunting and harvesting of animals bring several positive emotions impacting the individual and community in a fourth dimension, emotional health.

Emotional Health

As mentioned by an interviewee in a Borish and colleagues’ study (2021), “Caribou meant everything...it brought happiness to everything. It made you feel special” (p.4). Hunting is discussed as producing an indescribable feeling that impacts everyone in a community, having an immense influence on the pride and integrity that Inuit people, in this case, feel about themselves (Borish et al., 2021). Programs offered by Indigenous communities and organizations attempt to provoke these positive emotional experiences through active participation in land-based activities (Ahmed et al., 2022; Fast et al., 2021; Roué, 2006; Toombs et al., 2022; Walsh et al., 2020; Wesche et al., 2016). For example, Healing Through Hunting was created and run by James Bay

Cree Elders where they use the land to teach the participants about the consequences of their actions. Elders describe the consequences as natural, for example, participants go thirsty if they do not collect water and go cold if they fail to collect firewood (Roué, 2006). Through this program, the youth can deepen their emotional connection with elders, peers, and the land. Furthermore, lessons of sharing harvests between hunters, family, friends, and community members assist in developing a deeper connection. This practice is significant as lessons around sharing and caring for others are core teachings in traditional hunting practices (Place & Hanlon, 2011). As exemplified through these land-based programs, there continues to be a revitalization of culture through programming to encourage Indigenous peoples to (re)connect with their culture. The reason why cultural ties were severed is due to colonization and land dislocation, which is why exploring and discussing the history of colonization in Canada is vital to comprehensively understand the necessity for a resurgence and revitalization of food sovereignty and security in Indigenous communities.

Colonization and Its Impact on Indigenous Foodways

First Nations and Inuit communities experienced the impact of colonization during different periods. This was due to differences in periods of first contact with settlers, which varied based on the communities' geographical location. First contact and geographical location influenced traditional food access and consumption habits of communities in several different ways. The Baffin Island Inuit for example, are documented to have had interactions with the Norse from southwestern Greenland from the late 10th to 15th centuries, followed by the Europeans in the late 15th century (Bonesteel & Anderson, 2008; Brower, 2009). Subsequently, Europeans flooded the eastern Arctic with ships during ice-free seasons, continuously decimating whale populations, including the killing of over 28,000 bowhead whales between 1792 and 1911

(Stern, 2013), a species very significant to the Baffin Island Inuit population. They experienced further cultural setbacks because of the loss of the bowhead whale hunt as they were banned from whaling until 1990, with the current harvest limit of six bowhead whales per year, 5 in Nunavut, and 1 in Nunavik (Higdon et al., 2023). The Inuit were further devastated as they struggled with the transition to a wage economy and an increased dependence on market goods (Bonesteel & Anderson, 2008). This was caused by the collapse of commercial whaling, which impacted both Inuit and First Nations populations, resulting in an expansion of the fur trade in many regions (Condon, 1994).

Due to the demand for fur, both James Bay First Nations and Arctic Inuit populations were forced to overhunt wildlife in their regions resulting in decimated animal populations (Bishop, 1970). The lack of wild food availability created an immediate food security issue in rural and remote northern communities in Ontario (Popkin et al., 2012; Spiegelhaar & Tsuji, 2013). Due to the primary food source of Indigenous peoples becoming less accessible, there was an increased reliance on easily accessible energy-dense foods, initially introduced by European settlers (Blanchet et al., 2021). This process of a shift in diet from traditional foods to mass-produced market-based foods was described by Samson and Pretty (2006) as the nutrition transition, a common term in the discussion surrounding Indigenous food sovereignty today. The nutrition transition was also fueled by the forced settlement of Indigenous peoples, many of whom were originally part of smaller semi-nomadic groups who followed the migration patterns of animal food sources (Bird, 2020; Dickason et al., 2022; Taylor 1972).

Forced settlement and land dispossession were tactics used by European settlers to control Indigenous peoples and to gain access and control over resource-rich lands (Lightbody, 2015). These tactics were employed forcefully and structurally by creating and signing the

Indian Act (1876). The *Indian Act* was implemented to assimilate Indigenous people into mainstream society through cultural genocide (Allan & Smylie, 2015; TRC, 2015) in the form of restricted mobility, restructured governance systems, and the implementation of residential and day schools. Both First Nations and Inuit children were forced to attend these “schools” where they were subjected to physical, sexual, and psychological abuse (TRC, 2015). Examples of the abuse include the cutting of children’s hair, forbidden communication in traditional languages, and the separation of siblings from one another to name a few. Cultural continuity was further fragmented as the survivors who were lucky enough to return home from “school” were disconnected from their parents and elders due to cultural and language barriers.

First Nations communities located closer to the west coast of Canada experienced colonial impositions much later than northern and eastern Indigenous communities. The first contact documented on the West Coast was in 1774 (the 18th century) (Fisher, 1992; Muckle, 2014), compared to the 10th century for Inuit communities on the southeastern coast of Baffin Island. Due to this significant difference in contact periods, the loss of traditional knowledge and practices was much more abrupt for Western communities. They were afforded longer access to their language, traditional teachings, and cultural celebrations before colonial disruptions; however, the devastation was unimaginable as an approximate population decline of over ninety percent occurred in less than one hundred years between 1835 and 1929 (Muckle, 2014). Indigenous existence is based on the interconnectedness of the world from the language to the culture to the land. The divergence of any of these aspects creates a ripple effect on every other aspect, which is why the loss of traditional knowledge plays a major role in traditional foodways. Adapting to this very aspect of Indigeneity, academics have altered the focus of their research to properly reflect the issue of a lack of traditional food in present-day Indigenous diets.

Barriers to Traditional Food Access

Indigenous people have long known the health benefits of traditional food, and westernized methods have recently caught up with this fact through qualitative and quantitative research methodologies (Batal et al., 2018; Kuhnlein, 2015; Kuhnlein & Receveur, 1996). The question remaining is why are traditional foods being consumed at such a low rate when food security poses an imminent threat to Indigenous communities, especially in more northern regions (Batal, 2022; Chan et al., 2006; Egeland, 2010; Health Canada, 2010; Pullman, 2023; Rosol et al., 2011)? Evidence points to barriers including resource access issues, loss of cultural and hunting knowledge, climate change, and colonization (Bussidor & Bilgen-Reinart, 1999; Coté, 2016; Daigle, 2019; Robin et al., 2021). Many of these barriers are structurally impeding Indigenous sovereignty by forcing them into positions of dependency, allowing the government and private organizations to appropriate their land and resources (Harris, 2001; Lutz, 2008; Turner et al., 2013). These barriers are exemplified in the industrial clear-cutting of forests (Clayoquot Scientific Panel, 1995), mining (Allard & Curran, 2023), and projects that pollute lakes and rivers decimating both plant and animal life (Batal, Chan, Fediuk, Ing, Berti, Sadik et al., 2021; Jonasson et al., 2019). The increased risk of contamination of these lands contributes to concerns leading to avoidance of specific areas (Batal, Chan, Fediuk, Ing, Berti, Mercille et al., 2021; Coté, 2016; Laberge Gaudin et al., 2015). Furthermore, several laws and policies restrict Indigenous intervention even though they are the traditional and original stewards of the land (Batal, Chan, Fediuk, Ing, Berti, Sadik et al., 2021). To acknowledge and support the resurgence of traditional food practices, the federal government has implemented programs to improve the ability to access healthy foods through affordability practices and increased access to traditional harvesting programs.

Funding Programs Supporting Traditional Food Harvesting

Taking steps towards achieving equity and reconciliation, the government of Canada has implemented some strategies to combat the costs required to purchase market foods and to access traditional foods in these isolated regions. For example, Nutrition North is a program that assists in making healthy foods more affordable and accessible through different forms of grants, subsidies, and initiatives (Government of Canada, 2022). The main program within Nutrition North that supports traditional harvesting is the Harvesters Support Grant, which provides funding to organizations and Indigenous governments in isolated communities. These organizations distribute the funds to support a range of activities and initiatives including purchasing harvesting equipment, maintenance and storage of equipment, training and education, local food programs, clothing, and much more (Government of Canada, 2023). These programs and funds assist with food access, however, there is a limited number of communities and organizations that qualify for the program. There are 124 communities qualifying for the Nutrition North Canada Subsidy, and only 112 of those communities are eligible for the Harvesters Support Grant, as the community must meet six requirements to qualify (Government of Canada, 2024).

The Nutrition North Canada program was reviewed to understand and evaluate its overall success in combatting food insecurity in Nunavut by St-Germain and colleagues (2019). The review revealed that food insecurity in the ten most populous communities in Nunavut increased from 33.1% of households in 2010 (one year before Nutrition North Canada's implementation) to 46.6% in 2014 (one year after full implementation). With amendments made to the program in 2016 and 2019, there continue to be issues with the program, as consumers only see between 57 to 78 cents out of every dollar provided to the suppliers from this subsidy (Galloway & Li,

2023). Understandably, the program looks to encourage healthy food options, but as the prices of non-perishable food items continue to rise, it might be beneficial to shift the focus to support subsidies for all grocery items rather than just healthy, fresh foods. This could be due to the monopoly and duopoly in many of these communities, as the Northwest Company, a direct descendant of the Hudson's Bay Company, owns and operates the retail locations in the communities (Galloway & Li, 2024). This program reflects the legacy of the government and colonialism in Canada by using a band-aid solution to attempt to solve a problem they created. Understanding the history and legacy of colonization is extremely important in understanding the necessity for this work, which is why a postcolonial theoretical approach is used for this project.

Chapter III: Theoretical Framework

This research will be informed from a postcolonial and decolonial theoretical lens to further understand and contextualize why Indigenous groups in Canada experience unique barriers to traditional food access. I will explore the post and colonial sections of this framework separately and together to comprehensively understand the historical and present-day impact of colonization. Colonialism is defined by Loomba (2015) as the “conquest and control of other people’s land and goods” (p.20). Colonialism is something that persists in Canada in different forms. This is exemplified by the exploitation of land through non-consensual projects (pipelines, oil drilling, logging), inadequate compensation for land dispossession, and the ongoing epidemic of Missing and Murdered Indigenous Women, Girls, and Two-Spirit individuals. Understanding and acknowledging that colonialism exists in the present tense is significant to this work as it addresses the enduring impacts of coloniality on Indigenous ways of life. Knowing the history of colonization helps contextualize the legacy that remains, as many descendants of colonized groups currently rely on these established countries' support either culturally or economically while concurrently seeking sovereignty from these very institutions (Loomba, 2015; Loukes, 2024; Quijano, 2000). The ongoing pursuit of sovereignty aligns with the views of Indigenous peoples in Canada and postcolonial theorists because they both contest colonization by challenging its legacy and domination (Loukes, 2024; Mignolo, 2007). These views are in line with a more specific variation within the postcolonial framework, which is decolonization.

Decolonial theory can be utilized to acknowledge the history and remaining legacy of colonization whilst centring Indigenous healing through unlearning and deconstruction of colonial impositions (Battiste, 2017; Gaudet, 2018). Furthermore, it can be used to emphasize

and focus on the value of Indigenous voices, experiences, and ways of seeing the world (Dankertsen, 2020; Murdoch & McGuire, 2022; Smith, 2021) as it can be utilized as a mode of resistance and anti-colonial radicality (Grey & Patel, 2015). The contributions of Indigenous experiences provide value in shaping and fighting systemic forms of oppression where Indigenous ways of knowing have been historically devalued (Wilson, 2008). In Canada, the formation of Eurocentric social and political systems laid the groundwork for anti-Indigenous laws and policies to be created, upholding the values of these colonial forces. Using decolonial theory, it is possible to further focus on dismantling these systems and discourses of colonialism through social transformation (Mignolo, 2007; Quijano, 2000). Social transformation can allow for the development of new ideas, thoughts, and opinions of those occupying the land that was once exclusively occupied by Indigenous nations.

With shifting thoughts and opinions of citizens as an action item, the history of colonization must guide how we progress in society to avoid repeating that history. As exemplified in the previous sections of this paper, the imposition and legacy of colonialism in Canada have disrupted thousands of years of complex and intricate social, personal, and community relationships and systems of Indigenous nations. The theoretical framework is important in this work to ensure that the reader understands how colonialism informs the questions being asked, the analysis, and the methods.

This research will be performed by analyzing primary research conducted in each of the three communities and their surrounding regions. Understanding the history of colonization and past interactions that each community has experienced with settlers will provide insight into the current barriers faced, contributing to improving access to traditional foods. More specifically, the step-by-step process used to complete this research includes understanding the history and

barriers to traditional food access, analyzing existing food security research in each community, finding traditional food consumption habits, and establishing a pathway to provide more clarity on lowering barriers to traditional food access. This study aims to understand current consumption patterns of traditional foods to increase awareness for policy reform to better facilitate communities and their access to harvesting on their lands.

Chapter IV: Methods

As previously noted, access to and consumption of traditional foods provide value to Indigenous communities far beyond nutrition. Indigenous communities have received advice from researchers for several years, encouraging increased consumption of traditional foods due to their health benefits (Kuhnlein, 1995; Kuhnlein et al., 2001; Milburn, 2004; Sheehy et al., 2015). However, Indigenous people have known and understood these benefits for many years, but due to a plethora of barriers, access to traditional foods has been significantly challenging. Researchers have come to understand that while the health benefits of traditional food are well known, increasing access to these foods needs to be prioritized (Borish et al., 2021; Elliott et al., 2012; Lambden et al., 2007; Robidoux et al., 2012). To further understand traditional food intake, focusing on the published literature by Robidoux et al. (2021) will be done using the Schofield (1985) and Mifflin et al. (1991) predictive equations to calculate Total Energy Expenditure (TEE) for each community. This will provide clarification on the amount that traditional foods contribute to overall caloric requirements in the communities.

To gain a deeper appreciation of the complexities of local food systems and local food access, this proposed research will involve the analysis of secondary literature documenting local foodways in three distinct arctic and subarctic regions in Canada to comparatively analyze different Indigenous communities' experiences with traditional foods based on differences in climate, ecosystems, and food sources available in each region. For example, Clyde River, a coastal Inuit community on eastern Baffin Island, is significantly impacted by climate change due to the constant shift of ice formations. The summer season is consistently being extended with average temperature increases estimated at over 2° Celsius from 2010 to 2050 (Suter et al., 2019). In contrast, Old Crow, the only remaining fly-in community in Northwest Yukon, is

currently impacted by resource extraction proposals such as the Willow project passed by the Biden administration, which will affect the main source of traditional food intake for many northern Indigenous communities, the Porcupine Caribou herd. There are several contrasts between the issues that each group or nation experiences, which is why studying several communities from distinct geographical locations allows us to understand the vast differences in the barriers faced by each community.

These barriers contribute to the communities' difficulties in supplementing their daily protein, vitamin, and mineral intake with traditional foods. A critical question to be explored in this thesis is whether an increase in daily intake of traditional foods could be a viable strategy to decrease food insecurity in First Nations and Inuit communities, considering the rapid changes experienced post-contact. This work builds off several previous papers that outline the lack of food security in Indigenous communities in Canada, creating concern about why this issue persists (Robidoux & Mason, 2017; Pal et al., 2013; Harder & Wenzel, 2012; Guyot et al., 2006; St-Germain et al., 2019).

Using the proposed methods, I build on the work of Robidoux et al., (2021) that assessed the feasibility of traditional food consumption impacting and contributing to lower food insecurity rates in Wapekeka First Nation, a subarctic First Nation in northwestern Ontario. Building from this research design, I followed a similar approach to contribute to existing research regarding the ability of increased harvesting of and access to traditional foods to impact food security rates in two First Nations and one Inuit community. This secondary research approach involves identifying the different traditional food sources in each region by reviewing primary data previously collected in the identified regions. The sources include academic research, government research, and community elders and current hunter knowledge to estimate

harvest species and numbers in each region. This is followed by further research identifying the populations, including any neighbouring communities, to understand how much traditional food would be required to provide sustenance to each community. The populations in each community vary, which means that to predict the contribution of traditional food to the overall diet, the average energy expenditure of the community will need to be calculated.

To calculate energy requirements, I utilize the methods used by Robidoux et al. (2021) to estimate the daily individual total energy expenditure of each community based on the demographic information provided by the 2021 Canadian Census (Statistics Canada, 2024). The census provides population information for sex and age groups from 0-19, 20-64, and 65+. I separated the groups, estimating the Total Energy Expenditure (TEE) for individuals under the age of 19 using the Schofield (1985) predictive equation. The average age, height, and weight for each age group were calculated to find the mean TEE for the age group. The same process was taken for adults, with the only difference being that the Mifflin et al. (1990) predictive equation was used. The yearly energy requirements were then calculated by adding the TEE for each group together and then multiplying by 365 days.

For this study, although there are various wild edible plants (e.g., berries, roots) that are locally available and popular in each region, I focused on animal consumption as it provides an overwhelming majority of the caloric intake of traditional foods (Robidoux et al., 2021). There is a significant difference in nutrient breakdown when comparing animals consumed as a moose is predominantly protein, contrasted with a whale that contains mostly fat and blubber, each with different vitamin and mineral contents. Due to this contrast, I focused on the caloric content portion of animal consumption opposed to only protein content. Data collected through the First Nations Food, Nutrition, and Environment Study (2008-2018) and the Inuit Health Survey of

2007-2008 will be utilized to provide estimates of the traditional food sources that are harvested or have previously been harvested for consumption in each community. As noted in the regions, food sources can be categorized into large mammals (moose, caribou, and whale), small mammals (beaver and rabbit), birds (waterfowl and partridge) and fish (salmon, whitefish, and walleye). Using previous data from each community that specify the most frequently consumed foods and the most consumed foods in terms of caloric intake will be required to estimate the type and number of species needed for harvest to reach approximately 17% of total caloric intake being traditional food. This percentage was considered from studies done in the Arctic (Batal et al., 2004; Kenny et al., 2018; Kuhnlein, 1995; Wein, 1995), which found that traditional foods' contribution to total energy intake ranged from an average of 6.4% to 32%, depending on the region. Using this data, I calculated the percentage that each animal contributes to total energy intake, including each animal's caloric contribution to the overall diet. The research from this study will hopefully inform policymakers, researchers and Indigenous communities/organizations working to understand how traditional food harvesting might contribute to local food security based on local food resource availability and current population dynamics.

Chapter V: ARTICLE

Introduction

Traditional food² access is an important factor impacting food security and sovereignty for Indigenous communities in northern regions in what is currently known as Canada (Ayach & Korda, 2010; Batal et al., 2019; Batal et al., 2005; Haman et al., 2010; Power, 2008; Willows, 2005). Food Security was defined by the *Encyclopedia of Food Security and Sustainability* as when “all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (Peng & Berry, 2019, p.1). Indigenous communities have been proven over and over again to face the highest rates of food insecurity in Canada when compared to non-Indigenous populations (Batal et al., 2021; Chan et al., 2011; Chan et al., 2012; Chan et al., 2021; Dietitians of Canada, 2016; Health Canada, 2010; Poirier & Tait-Neufeld, 2023; Tarasuk et al., 2016; Willows et al., 2011), especially those residing in isolated arctic and subarctic regions (Furgal et al., 2021; Harder & Wenzel, 2012; Pullman, 2023). Indigenous people in Canada were reported to have food insecurity rates of up to 70% for those living in more remote or northern communities compared to the general population, who experience food insecurity at 12.6% (Dietitians of Canada, 2016).

As a result of colonization, Indigenous people have endured historical and political discrimination, being forcibly displaced from their traditional territories, impacting the accessibility, availability, and use of traditional foods (Berkes & Farkas, 1978; Skinner et al., 2013; Taylor, 1972; Neufeld et al., 2017; Richmond & Ross, 2009). Compounding factors, such as overhunting (Bishop, 1970), climate change (Kuhnlein & Receveur, 1996; Elliott et al., 2012),

² Traditional food can be complicated when discussing Indigenous food systems due to socio-cultural and economic societal shifts. Due to the term’s complexity, traditional food in this article refers to animal and plant food sources that are available and accepted in a particular culture from the proximate environment, harvested using local resources including hunting, fishing, and plant harvesting (Elliott et al., 2012; National Collaborating Centre for Aboriginal Health, 2013; Thompson et al., 2018)

and habitat degradation (Kenny & Chan, 2017), gradually led to a decrease in local land and sea-based food consumption. This shift from traditional food consumption to a more Westernized diet is commonly referred to as the “nutrition transition” (Chan et al., 2011; Kuhnlein & Chan, 2000; Receveur et al., 1997; Samson & Pretty, 2006). The nutrition transition created a heavy reliance on lower-quality market-based food items that were highly processed, energy-dense, and nutrient-deficient (Batal et al., 2005; Sumner et al., 2019; Timler et al., 2019). The increased reliance on Western market food, however, did not lead to the eradication of traditional food consumption. Today, most northern Indigenous people’s diets are made up of a combination of traditional and market-based foods, which vary depending on geographic location, remoteness, land access, wild food resource availability, and a host of other factors. The well-known importance of traditional foods, from both nutritional and cultural perspectives, along with the critical food insecurity crises northern Indigenous peoples are facing, has prompted advocacy efforts for government support to increase local food harvesting capacity in the north.

The health benefits of traditional foods have been well-documented and understood by Indigenous communities for millennia and are just recently being acknowledged and encouraged for consumption by researchers and other non-Indigenous individuals and organizations (Kuhnlein, 1995; Kuhnlein et al., 2001; Milburn, 2004; Sheehy et al., 2015). Due to the knowledge of these health benefits, there has also been a major prioritization of research regarding increasing access to these foods (Borish et al., 2021; Elliott et al., 2012; Robidoux et al., 2012). To increase access to these foods, it is important to understand current consumption rates and the specific challenges each community/region faces in sourcing them. Drawing from the work by Robidoux et al. (2021), who estimated the potential impact of traditional foods on reducing food insecurity in the Wapekeka First Nation, this paper will address their

recommendation to document and analyze how regional differences impact the potential impact of traditional food to address northern food insecurity. To do so, this paper estimates potential harvest numbers required for two First Nations and one Inuit community from different geographical regions, as exemplified in Figure 1. The communities of Old Crow, Yukon, Clyde River, Nunavut, and the Moose Cree First Nation on Moose Factory Island, Ontario, are the three communities considered in this study.

Figure 1

Location of Old Crow, Clyde River, and Moose Factory, in northern Canada



Methods

Two main methods were utilized to carry out this research. The first involved a comprehensive analysis of secondary literature documenting local foodways in the three regions, which included estimated consumption rates of traditional food sources. The second involved an energy analysis of traditional foods in each region, based on Robidoux et al.'s work in 2021. A secondary literature approach was utilized because there is already extensive primary research describing traditional food intake in remote northern Indigenous communities, especially in the three regions selected for this study (Batal et al., 2005; Batal et al., 2021; Berkes et al., 1995; Berman et al., 2004; Elliott et al., 2012; Gearheard et al., 2006; Kenny & Chan, 2017; Kenny et al., 2018; Kuhnlein et al., 2008; MacPherson & Netro, 1989; Qaqqasiq, 2006; Schuster, 2010; Wein, 1995; Wenzel et al., 2016). To build on the existing literature, this paper analyzes secondary research that documents traditional foodways in these three distinct arctic and subarctic regions to further explore the potential impact local food harvesting might have on improving household food security. These academic and non-academic sources were obtained from searches using the University of Ottawa's OMNI database, Google Scholar, community websites, historical websites, Government of Canada publications, and provincial and territorial government documents. The most used keywords in online searches included traditional food, country food, food systems, harvesting, diet, consumption, preferences, access, and food (in)security. All publications, documents and online sources that mentioned food systems and harvesting of traditional or country foods were reviewed.

The 17% threshold used in this study is based on average traditional food consumption rates in the Canadian arctic and sub-arctic communities as documented by Batal et al., 2021, Kuhnlein et al., 2001, and Wein, 1995. There is quite a range in consumption rates based on a

variety of factors, with southern communities in the James Bay region reporting approximately 50 grams (5-7%) per day and more northern First Nations and Inuit communities reporting 150+ grams (14-35%) per day (Batal et al., 2021; Kuhnlein, 2001; Kuhnlein et al., 2006; Wein, 1995). It is important to recognize that the consumption rates and harvest numbers are estimates and not absolute values. It must also be noted that all communities in this study consume a combination of traditional foods and market foods. This study focuses specifically on animal consumption due to the overwhelming majority of caloric intake being derived from animal-based food sources rather than wild edible plants (Robidoux et al., 2021).

To conduct the energy analysis, total energy expenditure (TEE in kcal/day) was estimated from Schofield's predictive equation, validated by Rodriguez et al (2002), which considers sex, age, height, and weight, as described by Robidoux et al. (2021). Community demographics were gathered from the 2021 Canadian Census and differentiated into age groups of 0-4, 5-9, 10-19, and 20+ years of age (Statistics Canada, 2021, 2022a, 2022b). Schofield's validated predictive equation of basal metabolic rate (BMR) was used to estimate the daily metabolic rate for individuals aged under 20 years. Meanwhile, male and female adult BMR were estimated using Mifflin's predictive equation (1990). Adult average age, height and weight were derived from previous anthropometric measurements conducted in two First Nations in a sub-Artic region in Ontario (Imbeault et al., 2011). Yearly TEE was determined by multiplying the daily BMR by 365 for each of the three communities, then dividing by 17% to obtain the caloric equivalency goals derived from harvested wild game. Caloric contributions from each wild game species were tabulated to determine the total amount of wild game required to attain 17% of yearly TEE (rationale for 17% threshold described below).

The predictive analysis of each species contribution to caloric intake was performed using RStudio, version (2024.04.2+764). Caloric equivalencies of 1kg of muscle and ringed seal blubber (Clyde River) were multiplied by the edible weight of the said species to determine the total caloric contribution from the edible weight. An algorithm was used to determine how many animals of each species would be required to attain the goal target caloric contribution of 17% of total TEE for each community, by taking the caloric contribution from the edible weight of each species to estimate the amount of wild game required to attain the target caloric contribution.

Existing literature from Clyde River (Kenny & Chan, 2017; Priest & Usher, 2004; Wenzel et al., 2016), Old Crow (Berman et al., 2004; MacPherson & Netro, 1989; Schuster, 2009; Schuster et al., 2011; Wein, 1995), and Moose Factory (Berkes et al., 1994; Berkes et al., 1995; Prevett et al., 1983) was utilized to determine the most harvested and consumed foods in each region based on total harvest numbers and personal consumption preferences. The food yields and estimated energy contribution from each animal are based on secondary literature and obtained from various sources (Alaska Department of Fish and Game, n.d.; Berkes et al., 1994; Health Canada, 2015; Pattimore et al., 1985; Warkentin, 2010). Depending on the community, the total daily caloric consumption of the top three or four harvested animals can be nearly 95% of their diet, which is why this study focuses on only three or four food sources when discussing maximal harvesting scenarios (Wein & Freeman, 1995; Wenzel et al., 2016). Based on the difference in land-based food access and barriers faced in the regions, this paper offers insight into the local food sources and how they contribute to the energy requirements for each region.

Historical Profiles

As stated from the outset, the decision to focus on these three communities was based on their distinct regional differences, which differ by climate, food resources, food access, and barriers to land-based food practices. For example, Clyde River has been impacted by global temperature changes extending summer seasons each year (Suter et al., 2019), and Old Crow has experienced major concerns regarding both climate change (Guyot et al., 2006) and cost of harvesting (Douglas et al., 2014), which negatively impacts traditional food consumption. The barriers to harvesting contribute to the increased consumption of market-based food items that are typically energy-dense, nutritionally deficient, and exorbitantly priced (Samson & Pretty, 2006; Skinner et al., 2013; Sumner et al., 2019). Considering the myriad barriers to accessing and harvesting foods from the land, the question becomes, can increasing traditional food harvesting be a legitimate strategy for combatting food insecurity for northern Indigenous communities? Food insecurity is an important determinant of health that increases the risk of developing dietary diseases (Batal et al., 2005; Tarasuk et al., 2016), and as aforementioned, Indigenous communities in Canada experience food insecurity at the highest rates in Canada (Batal et al., 2021; Chan et al., 2012; Chan et al., 2021). This paper's objective is to contribute to the existing literature that outlines food insecurity in Indigenous communities and consider how traditional food harvesting can ameliorate household food security (Guyot et al., 2006; Harder & Wenzel, 2012; Pal et al., 2013; Robidoux & Mason, 2017; St-Germain et al., 2019).

Clyde River

Clyde River is an isolated Inuit community located at the head of Patricia Bay in the northeastern part of Baffin Island, near the entrance to a 100-km-long fjord known as Clyde Inlet. The community of Clyde River was established by seven extended Inuit families who were

originally living off the land and received pressure from local government administrators, RCMP, nurses, and teachers to relocate to Patricia Bay, the location of the Hudson's Bay Company's already established trading post (Wenzel, 1995). The movement of these extended families began in the early 1950s, with the last large group arriving in 1977, and continual population growth has continued to the present day. This is reflected in the population dynamics as in 1961, Clyde River had a registered population of 32. This increased to 210 in 1969, 934 in 2011, and the most recent number listed as 1,055 in 2021 (Statistics Canada, 2022a).

Inuit lifestyles in this region were traditionally semi-nomadic as they developed complex societal systems and trade routes across the Arctic, some of which are still in use today (Aporta, 2009). They travelled in kin groups of five to thirty people, utilizing seasonal and permanent bases for subsistence activities (Lightbody, 2015; QIA, 2010). These traditional harvesting practices were based on kinship, where the older male, who was the most accomplished hunter with the largest extended family, would assume the role of leader. They would be responsible for decision-making regarding hunting excursions and resource decisions, including food distribution (Harder & Wenzel, 2012). The resources were shared from subordinate family members to other family members, and each person's role was immensely impactful in the harvesting practices. The older, more experienced hunters required the labour and agility of the younger hunters, and the women had an important role in food preparation, making clothing, and ensuring shelter was provided (Harder & Wenzel, 2012).

These traditional migratory lifestyles and subsistence practices were maintained by Inuit groups into the twentieth century based on the availability of natural resources. Although exposed to European and Norse travellers between the tenth and fifteenth centuries, many harvesting practices were not altered until the mid-late 1800s due to the introduction of European

goods and technologies by Dutch, American, French, and Scottish whalers (Bonesteel & Anderson, 2008; Brower, 2009). These goods and technologies included items such as “metal knives and needles, rifles, tobacco, cloth and food” (Bonesteel & Anderson, 2008, p.2). Also, during the late 1800s, American, English, and Scottish commercial whalers overharvested bowhead whales, leading to the subsequent decimation of whale populations, forever changing how Inuit harvested and provided food for their families in this region. The lack of availability of a historically abundant whale population shifted the focus to other skin and fur-bearing mammals to trade for income as the Inuit shifted away from traditional subsistence practices. This was followed by the implementation of the wage economy as Inuit families were taking employment on ships to pay for food and other goods. This included the expansion of Hudson’s Bay Company (HBC) trading posts, which were followed by the Northwest Mounted Police and missionaries who flooded the area and focused on the development and construction of hospitals, schools, and churches. The HBC posts and other new developments impacted Inuit cultural norms, which were traditionally structured by kinship, but now required the inclusion of money, equipment, and market foods (Harder & Wenzel, 2012). Money became an essential resource for purchasing and maintaining equipment as the onset of a sedentary lifestyle began through forced settlement (Harder & Wenzel, 2012).

The mass relocation of the Baffin Island Inuit to thirteen permanent settlements that boasted educational, medical, and penal institutions allowed for the exploitation of resource-rich areas (Bonesteel, 2009; Lightbody, 2015; Tester & Kulchyski, 1994). A catalyst for developing sedentary Inuit communities was the potential for resource exploitation, resulting in great revenue for Canadian companies (Bonesteel & Anderson, 2008). The exploitation came in many forms, initiated by overhunting local game populations to justify the relocation to permanent

settlements, contributing to the portrayal of the Inuit as helpless and lacking social structures (Lightbody, 2015; Tester & Kulchyski, 1994). This formula was successful as arctic mining and fossil fuel industries expanded, while Inuit socio-cultural and economic structures began to corrode (Lightbody, 2015).

The lack of consultation in establishing the location of these settlements proved detrimental, as the vast distance between the permanent settlements increased the difficulty of trade between Indigenous groups. This further increased the reliance on government provisions to supplement their diet. Some settlements were positioned close to hunting grounds, decreasing the impact on obtaining traditional food. However, the location of the settlements was mainly chosen because they were easily accessible by boat or aerial routes, as the federal government in the 1950s had planned for thirteen permanent settlements that encompassed 100 different Inuit communities and groups (Lightbody, 2015).

The older generations who transitioned from nomadic lifestyles to permanent settlements have often felt disengaged and disconnected from younger generations (Lightbody, 2015). This disconnect has affected both older generations and youth on several levels. Some Elders among these older generations feel less certain in their ability to predict the weather, making them uncomfortable advising hunters about safe and accessible areas throughout the year (Qaqqasiq, 2006). This advisory role is of critical importance to communities as hunters have relied on this knowledge for generations, but also for many community Elders whose shifting roles are impacting their emotional health (Fox, 2002). Furthermore, fewer young Inuit people are acquiring essential traditional hunting and harvesting knowledge and skills (Gearheard et al., 2006). While subsistence activities remain important for younger generations, proportionately fewer are showing the same level of commitment to harvesting as previous generations.

Old Crow

Old Crow is known as the Vuntut Gwitchin First Nation, or people of the lakes, and is the northernmost community in the Yukon territories, 128 km north of the Arctic Circle. There has been archaeological evidence that places Old Crow as one of the earliest human settlements in North America, dating as far back as 15,000 years (Yukon Bureau of Statistics, 2024). They have one of the richest sources of ice age fossils in Canada, where remnants of mammoths and giant camels have been commonly discovered in the area (Government of Yukon, 2013). As a people, they were known to be nomadic as they followed the Porcupine Caribou Herd's migration route for sustenance. The permanent settlement of Old Crow was established in the 1950s (Schuster et al., 2011) and has grown to host a population of 240 (Canada, 2022d) but people had been living there since the early 1900s when a community leader, John Tizya, built a camp at the mouth of Crow River because of the location's well-known productivity as a fishing camp. The fishing camp, construction of a mission building, and trade restrictions between the Canada-U.S. border (Alaska) made Old Crow a more attractive place to settle, resulting in several families' decisions to settle permanently (Government of Yukon & Vuntut Gwichin Government Heritage Branch, 2018).

Before the introduction of permanent settlements, semi-permanent dwellings were used as shelters where people lived in moss houses from autumn to mid-winter, each structure housing up to two families. Their winter housing consisted of Nivaze, or semi-spherical tents made from bull caribou skins tanned with fur on them and could be easily carried on sleds (Balikci, 1963). Summer housing was a version of the Nivaze known as the Ditrije, which was untanned, waterproof skins along with other forms of dwellings. The housing was easily transported using

birch bark canoes, sleds, dog packs, and snowshoes in the winter to follow food sources (Balicki, 1963).

As mentioned, being able to follow the caribou herd migration was of utmost importance for survival because caribou is the main source of caloric consumption for the Vuntut Gwitchin people, historically estimated as being 90% of the community's country food intake (Macpherson & Netro, 1989). To hunt caribou, hunters would drive herds into previously constructed enclosures lined with snares using a wolf's cry. They used several locations for the enclosures to increase the hunt's success (Balicki, 1963). During the colder seasons, there were surrounds of snares placed in habitually travelled forest locations where the caribou were herded in the hope that the snares would be successful due to the difficulty in traversing the deep snow during those seasons.

These land-based harvesting practices have been increasingly compromised due to changes in human and animal populations, extractive policies, climate change, commercial hunting, and access to hunting territory. For example, the Porcupine Caribou herd has fluctuated in population from 100,000 in the late 1970s to over 200,000 in 2020 (Porcupine Caribou Management Board, 2024). Despite the herds' rise in numbers, their alteration in migration path is taking them further away from Old Crow's hunting territories, resulting in lower harvest numbers. The change in migration path has been due to the highest-ever recorded levels of tundra fires, increased spring rains, and thinning sea ice. The boreal regions of northern Canada are host to the most rapid increase in fire activity (Brown & Johnstone, 2011; Walker et al., 2019). With the combination of wildfires destroying lichen that caribou feed on and increased rain, caribou have been avoiding Old Crow altogether, resulting in a substantial reduction in harvesting numbers (Jamal, 2019).

The decline in caribou harvesting has led to an attempted reliance on other, more precarious food sources. Salmon has historically been one of the secondary food sources relied upon by Old Crow community members (Berman et al., 2004; MacPherson & Netro, 1989; Schuster et al., 2011; Wein, 1995). Historically, summer months provided easier access to food sources like fish, with popular methods that included ‘fish traps’ being used. These traps consisted of a V-shaped weir of stakes and willow poles with an opening point into a sluice where the fish entered a dipnet or a basket (Osgood, 1936). This technique took significant planning and organization between the men, and the catch was distributed equitably amongst all families who contributed. This technique was extremely proficient, with catches of up to 2000 fish in a single night. Despite reports of salmon populations in the Yukon River watershed declining (Connors et al., 2016), consumption of salmon in Old Crow has increased (Douglas et al., 2014; Schuster et al., 2011). Salmon consumption was the only statistically significant increase in the top foods consumed, but there was also a small increase in the mean moose consumption from 1992 to 2008 (Schuster, Wein et al., 2011).

Moose hunting was viewed by the Vuntut Gwitchin as secondary due to the abundance and preference for caribou meat, as well as unique environmental conditions that made moose more difficult to harvest (Balicki, 1963). Unlike group harvesting methods used to hunt caribou, hunting moose required more individualistic methods, such as lying in ambush and placing snares around lakes that moose frequented, as the most common tactics used (Balicki, 1963). Moose meat is the second most common mammal consumed by Old Crow households, which increases the importance of moose harvesting, considering caribou harvesting declines (Schuster 2009; Schuster, Wein et al., 2011).

Moose Factory Island (Moose Cree First Nation)

The Moose Cree First Nation is on Moose Factory Island, an island on the southwestern portion of James Bay, and is home to 1,390 residents (Statistics Canada, 2022b). It is home to the Mushkegowuk people, who speak three different Cree languages (Gaudet, 2016) and is the site of the second oldest HBC trading posts (Parks Canada, 2017). The major fur-trading post is a contributing factor to the location of Moose Factory, as it was a centralized location that increased in popularity as a permanent settlement in the 1900s and was fully established with the construction of the hospital in 1951 (Ohmagari & Berkes, 1997). The smaller outposts also transitioned into smaller permanent settlements due to governmental developments (Flannery, 1995).

Before contact, hunting differed based on food availability and season with summer months seeing 30-40 families gathered in fishing camps, slowly dispersing as colder weather approached with a maximum of 10 families at hunting camps in the autumn, and finally reaching their family hunting grounds in the boreal forest interior during winter months with groups of 1-4 families (Flannery, 1995; Long et al., 2017). The families dispersed in the winter to maximize their chances of finding food where intense physical requirements ensured a healthy and active lifestyle (Dickason & Newbigging, 2019).

Due to the location of Moose Factory Island, it was one of the first regions in Canada that was contacted by Europeans, being at the mouth of Moose River, connecting to the southeastern portion of James Bay. Early explorations led to the building of trading posts as part of the HBC. They traded with local Indigenous people who were hoping to acquire new goods, including tools, food, and clothing (Rich, 1949). The HBC employees and postmen were forced to trade for food and other essentials because they had not developed skills that would allow them to provide

necessities, which is why Indigenous life skills such as hunting, fishing, and harvesting were deemed essential (Carlos & Lewis, 1999; Long et al., 2017).

The larger trading posts quickly transitioned into colonial settlements, with Moose Factory reaching a population of 575 by 1901, consisting of 129 HBC employees and 446 Indigenous people (Reimer & Chartrand, 2005). With the signing of Treaty 9 in 1905 and the adhesion in 1929, a Reserve settlement was established on the east side of the island of Moose Factory (Gaudet, 2018; Long, 2010; Loukes et al., 2021). Treaty 9 was understood to have no impediment to the hunting and fishing freedoms of the Indigenous groups who signed, although they had to accept they would be restricted in terms of living in permanent settlements (Long, 2006). The written version of the treaty was significantly different than the orally agreed upon terms, which have impacted harvesting and traditional food consumption for several communities and nations across the country. These agreements and their impact on traditional foods and harvesting add to the plethora of barriers experienced by Indigenous people across the country, as traditional foods contribute value far beyond nutrition to these communities.

Due to the shift in reliance on Western goods and food supplies, animal food sources were also harvested for the furs to be traded and sold, which decimated the animal populations in the region (Bishop, 1970; Honigmann, 1981; Rogers, 1963). Concurrently, there was an expansion of trade in the boreal interior, which increased trade stability but ultimately caused a greater reliance of Indigenous people on traded items, impacting consumption habits and lifestyles (Black-Rogers, 1986; Krech, 2014). Reliance on traded items included the introduction of new technologies, which contributed to the degradation of traditional knowledge and teaching methods that were utilized pre-colonization.

As discussed by Preston (1975), formal education on bush skills was not formally taught but was experienced through the popular teaching method of “learning by doing”. Younger people would contribute to the bush camps by imitating adults performing tasks, with most children assisting in small chores around the camps as soon as they could walk. Failure was viewed as a positive attribute because mastery was achieved through trial and error, with patience and support being enforced to encourage learning (Blythe et al., 1985; Preston, 1979). This form of education was greatly impacted because missionaries encouraged Indigenous adults to leave their children in formal educational institutions instead of bringing them along to the hunting camps (Johnston, 1988). Eventually, children were forced to attend educational institutions, learning skills that did not necessarily translate to living on the land. The values and skills they learned were not in line with Cree culture, which contributed to the weakening social system in several communities (Barman et al., 1987), as children were not afforded adequate access to the traditional knowledge that their parents and grandparents experienced. The lack of access to traditional teaching methods, such as learning by doing, led to a lack of skills and knowledge that would have allowed them to be successful in living on the land (Ohmagari & Berkes, 1997). They were being prepared for a capitalist society that revolved around wage work instead of traditional knowledge and hunting skills.

The loss of traditional skills, practices, and knowledge can have long-term implications for the health and well-being of individuals and communities, with the lack of access to traditional foods being one of the ramifications. Absolon (2022) discussed how traditional foods are deeply connected to cultural knowledge, practices, and the transmission of knowledge. Climate change is also having an imminent impact on harvesting and access to traditional foods. Early and erratic conditions, including melting snow and ice, are contributing to a more

dangerous environment to explore, as there is an elevated risk for fatal accidents to occur in recent years (Nancarrow & Chan, 2010). Poor conditions are restricting access to traditional means of hunting and fishing, which has further implications on the mental, spiritual, physical, and cultural health of Indigenous peoples.

Local Harvesting and Energy Requirements

Considering the known health and cultural benefits of Indigenous food systems, and the barriers Indigenous communities face accessing them, it is important to understand the quantity of traditional food harvesting needed to meet daily energy requirements for communities based on current population demographics in different regions in Canada. To understand the energy necessary to sustain each community, we calculated the total caloric requirements for the three communities identified for this study and estimated the maximal food harvesting scenarios based on current consumption patterns. A maximal food harvesting scenario would assume that harvesting was without limitations and would meet consumption habits based on the most consumed foods in each community, while meeting the most basic resting energy requirements.

Clyde River

Table 1. Population of Clyde River, Nunavut, 2021 and TEE (kcal/day).

Age Group ^a	♂	♀	TEE
0-4	65	60	119,185
5-9	70	70	168,630
10-19	105	105	3,873,745
20+	290	290	1,160,580
Total TEE/year (kcal)			670,045,100

^a : 2021 Canadian Census, Clyde River, Nunavut

According to Wenzel and colleagues (2016), the top three consumed land/sea-based foods in Clyde River are ringed seal, caribou, and arctic char. Ashley (2002) provided estimates for total energy derived from each animal by comparing several studies. They explained that weight estimates will vary as approximations are used in most studies, due to how labour-intensive and expensive it is to get exact weight measurements of each animal. As referenced in Figure 2, based on the daily TEE, the community of Clyde River would require 670,045,100 calories yearly (1,835,740 calories daily) to fulfill their energy requirements. The existing literature

regarding traditional food intake in the three regions in this study estimates that approximately 10-36% of overall diets are traditional foods, with the higher percentages being from Inuit communities (Batal, Chan, Fediuk, Ing, Berti, Sadik et al., 2021; Kuhnlein et al., 2001; Wein, 1995). If average daily consumption of traditional foods reached 17% of daily energy requirement (as estimated by Batal, Chan, Fediuk, Ing, Berti, Sadik et al., 2021; Kuhnlein et al., 2001; Wein, 1995), the total daily calories required from traditional foods in Clyde River would be 312,076 kcal. In a maximal harvesting scenario to meet this 17%, Clyde River residents would consume 55% of their traditional food caloric intake from ringed seal (379 seals), 32% from caribou (906 caribou), and 13% from arctic char (6,385 char), as exemplified in Figure 3.

Table 2. Maximal Harvesting Scenario, Clyde River and Caloric contribution per animal from wild game harvested.

Animal	Edible Weight (kg)	kcal/kg ^d	Total kcal	Animals Harvested
Ringed Seal ^a	59	3,144	185,529	379
Caribou ^b	37	1,220	45,140	906
Artic Char ^c	2	1,330	2,660	6,385

^a: Canadian Nutrient File, Health Canada (2015)

^b: Edible portion assumed from Pattimore (1985) (unpublished) from Ashley (2002). 27% of the seal carcass is blubber (Wolkers et al., 2008), the remainder was assumed to be skeletal muscle and organ tissue. Total caloric contribution was partitioned into blubber (27%) and skeletal muscle (63%). Each portion was multiplied by its respective value and the results were summed to estimate total caloric content of the whole carcass.

^c: Pattimore et al., 1985

^d: Pattimore et al., 1985

Old Crow

Table 3. Population of Old Crow, Yukon, 2021 and TEE (kcal/day)

Age Group ^a	♂	♀	TEE
0-4	5	5	9,520
5-9	10	5	18,395
10-19	20	10	56,970
20+	95	90	371,370
Total TEE/year (kcal)			166,533,075

^a: Canadian Census, Old Crow, Nunavut

Although Old Crow has experienced many changes such as migration patterns, late freezes, and uncertain ice conditions, they continue to hunt and consume caribou, moose,

salmon, and duck as the most common traditional foods (Berman et al., 2004; MacPherson & Netro, 1989; Schuster, Wein et al., 2011; Wein, 1995). Caribou is their most consumed traditional food, at nearly 85-90% of the traditional diet, and the remaining 10-15% of calories are split between other traditional foods. To fulfill 17% of Old Crow's yearly TEE (listed as 166,533,075 kcal in Figure 4), they must consume 28,310,623 kcal from traditional foods. As demonstrated in Figure 5, there would need to be 411 caribou (85% of diet), 66 chinook salmon (5%), 6 moose (5%), and 8,701 ducks (5%) harvested in one calendar year to meet a 17% contribution to total

Table 4. Maximal Harvesting Scenario, Old Crow and Caloric contribution per animal from wild game harvested.

Animal	Edible Weight (kg)	kcal/kg ^e	Total kcal	Animals Harvested
Caribou	37 ^a	1,220	45140	596
Chinook Salmon	12 ^b	1,790	21480	58
Moose	199 ^c	1,240	246760	6
Duck	0.77 ^d	211	162	0

^a Pattimore et al., 1985

^b Alaska Department of Fish and Game, n.d.

^c Berkes et al., 1994

^d Berger (1977)

^e Canadian Nutrient File, Health Canada (2015)

caloric requirements for the community of Old Crow. To determine these numbers, the edible weight and calories that each animal provides were sourced from the Alaska Fish and Game Department (n.d.), Berger (1977), Berkes et al. (1994), and Pattimore et al. (1985). How closely these estimations align with contemporary harvesting practices can only be confirmed by local harvesters in each region based on the feasibility of each animal to be harvested at that rate from a sustainability standpoint, based on local ecology and animal populations. The number of animals harvested can be adjusted to fit the community's needs while fulfilling their traditional food consumption and sustaining the animal populations. If these numbers are not manageable, increased consumption of moose and chinook salmon, for example, could fulfill traditional food requirements while preserving the caribou and duck populations.

Moose Factory Island (Moose Cree First Nation)

Table 5. Population Moose Factory Island, Ontario, 2021 and TEE (kcal/day).

Age Group ^a	♂	♀	TEE
0-4	50	60	104,350
5-9	75	55	157,895
10-19	115	105	407,425
20+	475	455	1,865,670
Total TEE/year (kcal)			925,399,100

^a: 2021 Canadian Census, Factory Island 1, Ontario

Moose Cree First Nation, being the largest of the three populations, has greater caloric needs than the other two communities. As exemplified in Figure 6, MCFN requires 925,399,100 kcal total to fulfill annual caloric requirements, and 157,317,847 kcal from traditional foods to reach a 17% contribution rate towards yearly caloric requirements. As recorded by Berkes et al. (1994, 1995) and Prevett et al. (1983), the most consumed foods in Moose Factory are moose, geese (Canada and snow), and fish (whitefish, walleye, pike). As demonstrated in Figure 7, each animal's edible weight and their kcal per kilogram were sourced from Berkes et al. (1994) and Table 6. Maximal Harvesting Scenario, Moose Factory and Caloric contribution per animal from wild game.

Animal	Edible Weight (kg) ^a	kcal/kg ^b	Total kcal	Animals Harvested
Moose	199	1,240	246,760	213
Goose	2.1	1,350	2,835	11,988
Walleye	0.62	9,30	577	21,785
Pike	1.1	880	968	21,785
Whitefish	0.76	1,140	866	21,785

^a Berkes et al., 1994^b Canadian Nutrient File, Health Canada (2015)

the Canadian Nutrient File (2024). In a maximal harvesting scenario, based on previously recorded harvests, 213 moose would be consumed at a rate of 34% of the total traditional food intake, 65,355 fish at 34% (split between whitefish, walleye, and pike), and 11,988 geese at 22%.

Moose Factory is a unique case as it is in a more densely populated region compared to the previous two communities. In addition to the island population, the proximity to the town of Moosonee (pop 1,505) (Statistics Canada, 2022c) creates an increased strain on the local food resources. With caloric needs being so high and increased strain on local food resources, an 8% contribution rate for traditional foods could be a more feasible option from a sustainability perspective. Halving the traditional food requirements would result in 107 moose, 5,994 geese, and 32,678 fish being harvested, creating less strain on the local food resources, lowering the costs associated with traditional food harvesting, and providing more realistic harvesting scenarios for local hunters.

Community Responses, Challenges, and Barriers

The energy analysis in this paper offers important insight into the number of animals required for communities to meet relative energy requirements based on unique population and environmental dynamics. The transition from nomadic or semi-nomadic lifestyles, travelling in small family hunting groups, to living in permanent settlements with much greater populations was a result of treaties and government legislation and was experienced by all three communities in this study. These population and lifestyle changes drastically altered the number of animals required to sustain the local population and maintain a diet consisting of traditional foods. A large community like the Moose Cree First Nation hosts a population of 1,385, which would require 213 moose, nearly 12,000 geese, and over 64,000 fish to be harvested in one year to reach just 17% of the total caloric intake for the community. The sheer volume of animals required for harvest in this region is considerable, making one question how realistic it is to reach 17% of caloric intake from traditional food. Conversely, a slightly smaller population like Clyde River (1,055), which has year-round access to its most consumed traditional food (ringed seal) that requires less travel distance to harvest, creates a more realistic expectation to reach, and possibly exceed, a 17% contribution to overall traditional food consumption. In addition, approximately 55% of Clyde River's estimated traditional diet is ringed seal, and the lipids (blubber) in seal make up 27% of its edible portion. The high lipid levels mean that per edible kilogram, seals provide more than double the calories of the next highest calorie animal in this study, making the 17% consumption rate more attainable.

Comparatively, MCFN and Old Crow, being inland communities, rely on land-based mammals as their most harvested foods (moose and caribou, respectively). Their most abundant harvests are limited to seasonal periods due to animal migration and mating seasons, creating

limited harvest time and requiring a longer distance to travel for harvest (Duhaime, 2001; Hamilton et al., 2016; Robidoux et al., 2021). These two inland communities also have direct access to rivers, providing access to a secondary food source, fish. Old Crow's smaller population and remote location prove to require fewer calories to sustain the community, with no neighbouring communities putting extra pressure on local food sources. If Old Crow faces a harvesting season that is not optimal (the Porcupine caribou herds' migration path avoids Old Crow for a season), they can pivot and focus on increasing their moose and salmon harvests to compensate for a lower-than-anticipated caribou harvest season. These differences between the three communities prove that geographical location, population size, permanent settlements, and policy restrictions influence traditional harvesting and would impact whether reaching or exceeding a 17% consumption rate would be a realistic goal.

These results have further implications for policymakers looking to meaningfully change Indigenous communities' access to traditional foods, which requires a significant financial investment. Individuals in these communities can teach, learn, and understand traditional harvesting methods, but if they are not afforded access to the land and safe, functioning equipment, they will not be able to apply their skills and knowledge to provide food for their family/community. The cost required to access the land/sea, which includes purchasing harvesting tools, maintaining and purchasing equipment and vehicles, and taking leave from work, all create barriers to access. The substantial costs of traditional food harvesting are creating greater reliance on store-bought foods, which are exorbitantly priced, but are still often a cheaper alternative and are more easily accessible than food from the land/sea. The economic investment results in greater pressures to participate in the wage economy to pay for equipment, clothing, and hunting supplies, posing a paradox as participation in the wage economy limits

one's time to get on the land (Chabot, 2003). The cost of necessary equipment for modern-day harvesting has increased significantly, with the substantial cash investment going towards items such as GPS, VHF radios, and more powerful boat motors that are required to fulfill safety concerns (Condon et al., 1995; Chabot, 2003). The market for seal skins and animal furs has declined, resulting in many full-time harvesters seeking income through different sources (Wenzel, 1991).

Harvesters have increased their reliance on full-time and part-time employment to supplement their income and to assist in funding their subsistence activities. They must book time off weeks and sometimes months in advance, increasing the probability of risky behaviour due to the limited harvest time (Ford et al., 2006). Furthermore, there are significantly fewer employment opportunities in northern Indigenous communities, resulting in high unemployment rates (Nuttall, 2000). Considering the unemployment rates and the essentiality of traditional harvesting, government organizations have implemented strategies to combat the costs related to subsistence activities and to lower the costs of market food items in isolated northern regions. The Harvesters Support Program is one example that provides lump-sum payments to a limited number of hunters to help them cover equipment costs associated with harvesting. Clyde River and Old Crow are eligible for the grant. To qualify for the program, harvesters must meet certain criteria, with the program covering just 75% of the total equipment cost and a maximum amount of \$1,000 per equipment request (Qikiqtani Inuit Association, 2021). Another program that all three communities in this study are eligible for is the Nutrition North Canada subsidy. This subsidy is applied to a specific list of nutritious eligible foods, as well as non-food items sold by retailers, suppliers or local food growers, with the subsidy paid to the retailer (Government of Canada, 2022).

The Nutrition North Canada program was reviewed to understand and evaluate its overall success in combating food insecurity in Nunavut by St-Germain and colleagues (2019). The review revealed that food insecurity in the ten most populous communities in Nunavut increased from 33.1% of households in 2010 (one year before Nutrition North Canada's implementation) to 46.6% in 2014 (one year after full implementation). With amendments made to the program in 2016 and 2019, there continue to be issues (Galloway & Li, 2023). In a scoping review of the program by Pagaduan et al. (2024), the second most mentioned recommendation for future directions was support for traditional food harvesting, hunting, and community food initiatives. This supports the stance that Nutrition North should expand its subsidy to focus more on traditional food access than simply groceries. It is important to note that relying solely on traditional foods is not a feasible short-term solution, which is why programs that include modern Indigenous lifestyles and culture to produce recipes incorporating non-traditional foods are suggested to improve healthy eating measures (Douglas et al., 2014).

Chapter VI: Conclusion

This study illustrates the energy demands of three Indigenous communities in northern Canada and the important and complex role that traditional food plays in meeting those demands. By estimating the TEE of each community and comparing those needs with the maximal harvesting scenarios, based on current consumption patterns, a clearer picture of the barriers to increasing traditional food consumption is revealed. These findings suggest that isolated coastal communities such as Clyde River have an ecological and geographical advantage that creates a more realistic expectation for supporting higher rates of traditional food intake. Their population size, proximity to their most consumed traditional food, and year-round harvesting abilities provide a more optimal scenario for traditional food consumption, which is not the case for all.

The two inland communities in this study, MCFN and Old Crow, face multiple barriers, including their limited seasonal access to main food sources, ecological pressures of sustaining animal populations, and migratory patterns of their traditional foods. Due to colonial policies that resulted in forced settlement, the large, concentrated population of MCFN requires the greatest caloric needs of all three communities in this study. It is the only community with a neighbouring town in proximity, which creates a logistical and ecological challenge in reaching a 17% contribution rate from traditional foods. Old Crow, although the smallest in population, must face the challenges of unpredictable wildlife migration routes and a limited diversity of traditional food sources due to their reliance on caribou. These challenges highlight how geography, population, climate variability, and colonial legacies have influenced contemporary harvesting and traditional food consumption in these communities. These challenges do require economic investment, such as the Harvesters Support Grant to support traditional food harvesting, but as this study demonstrates, the challenges far exceed cost. As mentioned by Robidoux et al. (2021),

funding models that support broader food capacity building is required, along with developing more affordable market food distribution beyond the basic subsidies Nutrition North is currently providing.

The data presented in this study supports the argument that Indigenous leaders, communities, and scholars have been making for years, that a key to combatting food insecurity in these communities lies in centralizing traditional food systems and supporting individual community needs. This means committing to land-based education, sustainable funding models, access to the land, and ecologically sustainable harvesting methods. Increasing access to traditional foods is complicated and stretches beyond simply reaching caloric targets or suggesting that spending time on the land is sufficient. While it may not be feasible for every community to meet a certain target percentage of consumption, aiming to increase access to traditional harvesting in culturally appropriate, community-led, and sustainable ways is critical and an absolutely necessary investment.

Chapter VII: Final Thoughts

Traditional foods play an important and complicated role in connecting Indigenous communities to their culture, communities, and ways of knowing. With my unique position as a white settler with German and Welsh ancestry, who has an Indigenous partner and an Indigenous son, I know that the role non-Indigenous researchers and allies play is vital in the reclamation of sovereignty as individual communities and nations. Traditional foods impact so many facets of this sovereignty, and the process involved in harvesting, which includes hunting/gathering, preparing, and cooking the food, intertwining endless numbers of lessons and teachings within one act of Indigeneity. The benefits of increasing access to traditional harvesting, as discussed in the article, are proven to positively impact cultural, mental, physical, and emotional health. My research intends to contribute to the conversation in this field of work regarding the importance of traditional food harvesting and how its significance can impact daily life, far beyond simply meeting nutritional requirements.

For all individuals to understand the necessity of traditional food harvesting, we must acknowledge the impact and legacy of colonization that continues to impact communities in the present. Based on all the changes that Indigenous communities have experienced, including land dispossession, the signing of treaties, forced settlement, decimation of animal populations, etc., getting on the land and increasing traditional food access and harvesting is easier said than done. Given today's population levels and the size of permanent settlements, traditional harvesting will differ significantly from pre-contact times. As a result, substantial and ongoing annual economic investment is necessary to adequately support these harvesting activities. Questions need to be considered, such as: What specifically do communities need? What is possible in the present day? And how should the government be supporting these efforts? These questions are for

Indigenous communities to answer, and supporting their assessment on these matters is of utmost importance as settlers on the land we currently call Canada.

Limitations

This study faced key limitations that should be acknowledged. Firstly, it was not possible to speak directly with local hunters and community members, restricting the ability to gather current local perspectives on wildlife populations as well as environmental pressures impacting hunting. Additionally, due to the time constraints of this project, primary field research in the three remote locations could not be carried out. This limited the scope of data collection to secondary sources, as previously explained and may not contain the most up-to-date environmental information, wildlife numbers, and number of animals hunted in the regions. Despite these limitations, this study aims to contribute to discussions and important policy decisions regarding Indigenous food security and to provide impetus for future studies.

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