Inuit Food Security: Vulnerability of the traditional food system to climatic extremes during winter 2010/2011 in Iqaluit, Nunavut

By

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ABSTRACT

Arctic climate change is an influential food security determinant because varying environmental conditions affect the ability of Inuit to harvest traditional food, thus impacting food security. This case study assesses how climatic extremes during winter 2010/2011 affected the vulnerability of the traditional food system in Iqaluit, Nunavut. This winter was statistically anomalous in terms of environmental conditions throughout the Canadian Arctic, which manifested locally via warmer temperatures and poorer sea ice conditions. The aim of this thesis is to determine whether these conditions impacted the procurement of traditional food and whether this caused food insecurity amongst vulnerable residents at the community level. The main objective is to identify and characterize locally relevant extreme climatic conditions during winter 2010/2011 (*exposure*), their subsequent effects on Iqaluit's traditional food system with a focus on public housing residents (*sensitivity*) and coping strategies used for dealing with food-related stresses (*adaptive capacity*). This mixed-methods approach involves analysis of instrumental records, interviews with local hunters and key informants, as well as surveys with public housing residents. Results show increased environmental stresses to the traditional food system compared to previous years, which negatively impacted hunters' harvests and residents' food supplies. Coping strategies alleviated some stresses, but resilience was particularly impeded for financially insecure households reliant on income support. Overall, the traditional food system was not as vulnerable to climatic extremes as anticipated, as broader social determinants had a greater influence on Inuit food security. However, when poor socioeconomic conditions, such as those associated with public housing, are coupled with poor environmental conditions, such as those experienced during winter 2010/2011, the vulnerability of the traditional food system is even further exacerbated.

RESUMÉ

Le changement climatique dans l'Arctique est un facteur déterminant de la sécurité alimentaire des Inuits. En effet, il affecte leur capacité à se procurer les nourritures traditionnelles, fragilisant ainsi leur sécurité alimentaire. Cette étude de cas évalue dans quelle mesure les conditions climatiques changeantes durant l'hiver 2010/2011 ont affecté la vulnérabilité du système alimentaire traditionnel à Iqaluit, Nunavut. Selon les statistiques, les conditions environnementales de cet hiver ont été anormales à travers l'ensemble de l'Arctique Canadien, ce qui, à l'échelle locale, s'est traduit par des températures plus chaudes et de mauvaises conditions des glaces. Le but de cette thèse est de déterminer si ces conditions climatiques ont affectés la récolte de nourritures traditionnelles, à l'échelle de la communauté, et si cela a causé de l'insécurité alimentaire chez les résidents les plus vulnérables. L'objectif principal est d'identifier et de caractériser les conditions climatiques extrêmes à l'échelle locale durant l'hiver 2010/2011 (*exposition*), leurs conséquences sur le système alimentaire traditionnel d'Iqaluit avec une attention particulière aux résidents de logements publics (*sensibilité*) et aux stratégies d'adaptation utilisées pour faire face aux contraintes alimentaires (*capacité d'adaptation*). Cette méthodologie mixte de recherche implique l'analyse des données climatiques, des entrevues avec des chasseurs locaux et des informateurs clés, de même que des sondages avec des résidents des logements publics. Comparativement aux années précédentes, les résultats montrent un accroissement des pressions sur le système alimentaire traditionnel, ce qui affecte négativement la récolte des chasseurs et l'approvisionnement des résidents. Bien que les stratégies d'adaptation atténuent certaines de ces contraintes, la capacité de résilience des ménages financièrement précaires, qui dépendent d'un soutien au revenu, a été particulièrement affectée. De manière générale, le système alimentaire traditionnel n'a pas été aussi vulnérable aux conditions climatiques extrêmes qu'anticipées, cela en raison de conditions socio-économiques plus larges qui ont eu une plus grande influence sur la sécurité alimentaire des Inuits. Toutefois, lorsque des conditions économiques précaires, notamment celles associées au logement public, sont jumelées avec de mauvaises conditions climatiques, comme celles vécues durant l'hiver 2010/2011, la vulnérabilité du système alimentaire traditionnel est exacerbée.

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1. INTRODUCTION

1.1 INTRODUCTION

The Arctic Climate Impact Assessment (ACIA) highlights that future climate change will be experienced earlier and more acutely in polar regions than the rest of the world (2005), and there is already strong evidence that human induced climate change is underway in the Canadian Arctic (IPCC 2007a). At the local level, weather is more variable and less predictable, and there is an increased frequency of extreme weather events (Berkes 2007, Laidler et al. 2009, Weatherhead, Gearheard and Barry 2010). Community workshops throughout Nunavut have noted that temperatures are warmer and fluctuate more often, sea ice is thinner, and sea ice break-up occurs both faster and earlier (Nickels et al. 2006). These observations have implications for Canadian Inuit, many of whom depend on hunting and fishing for their livelihoods (ACIA 2005, Furgal 2008, Furgal and Prowse 2008, IPCC 2007a). Changing environmental conditions challenge traditional Inuit knowledge, thus reducing the confidence with which people can use the sea ice and impacting Arctic residents (ACIA 2005, Ford et al. 2009, Gearheard et al. 2006, Huntington et al. 2007, Keskitalo 2008, Laidler et al. 2010).

Climate change may affect food systems in several ways ranging from direct effects on food growth and production to indirect changes in markets, food prices, and supply chain infrastructure (Gregory, Ingram and Brklacich 2005). With regards to the biophysical sciences, the links between climate change and food security have, to date, largely been explored in relation to impacts on crop productivity and hence food production (Gregory et al. 2005). The social sciences, on the other hand, have assessed broader socioeconomic and political conditions that influence the ability to manage stresses to the food system (Chambers 1989, Eakin and Luers 2006, Ford and Berrang-Ford 2009, Sen 1981, Watts 1983, Yaro 2004). These two sciences offer different yet complementary approaches to analyzing the impacts of climate change on food systems.

The relationship between climate change and food security has been widely addressed in the context of large-scale *agriculture*-based food systems (Brown and Funk

2008, Gregory et al. 2005, Lobell et al. 2008, Scmidhuber and Tubiello 2007), but there have been few studies regarding how small-scale *subsistence*-based food systems are affected by climate change (Chan et al. 2006, Ford 2009, Furgal and Seguin 2006, Power 2008). Food security research within Inuit communities typically focuses on specific issues such as the role of kinship and food sharing mechanisms (Chabot 2004, Collings, Wenzel and Condon 1998, Collings 1997, Duhaime et al. 2004, Duhaime 2002, Kishigami 2004, Wenzel 1995, Wenzel 1991), the impact of contaminants on quality of traditional foods (Bjerregaard et al. 2001, Boucher et al. 2009, Dewailly et al. 2001b, Dewailly et al. 2001a, Fontaine et al. 2008, Jardine et al. 2004, Sandau et al. 2000, Van Oostdam et al. 2005), changes in dietary preference from nutrient-rich traditional foods to nutrient-poor store foods (Egeland et al. 2011, Egeland et al. 2010, Egeland et al. 2009, Kuhnlein et al. 2008, Kuhnlein and Receveur 1996, Lambden, Receveur and Kuhnein 2007, Lambden et al. 2006, Sharma et al. 2010a, Sharma et al. 2010b, Sharma, Couturier and Cote 2009), and quantifying the prevalence of food insecurity using questionnaires (Egeland et al. 2010, Ford 2009, Ford and Berrang-Ford 2009, Lawn and Harvey 2003, Ledrou and Gervais 2005). None of these food security topics directly considers environmental influences. However, there is an emerging body of literature that examines the implications of climate change for Inuit food systems, and assesses how environmental, political, and socioeconomic stresses that emanate at multiple scales affect food security (Beaumier and Ford 2010, Chan et al. 2006, Ford and Beaumier 2010, Ford 2009, Guyot et al. 2006).

Food insecurity occurs when food systems are stressed so that food is not accessible, available, and/or of sufficient quality (FAO 2002). While food insecurity affects populations worldwide, it is a particularly urgent public health issue for indigenous populations due to their high rates of poverty, the effects of climate change on traditional food systems, and high incidence of diet-related diseases (Power 2008). Studies have shown that indigenous populations experience a greater prevalence of food insecurity than their non-indigenous counterparts (Browne, Laurence and Thorpe 2009, Willows et al. 2009). Indeed, food insecurity is particularly problematic for Arctic indigenous populations in Canada. Ledrou and Gervais (2005) report that approximately 56% of households in Nunavut “often” or “sometimes” did not have enough food to eat

in the previous year, which is much more prevalent compared to 7% for Canada as a whole. Community-based studies indicate food insecurity rates ranging from 50-80% (Egeland et al. 2011, Egeland et al. 2010, Ford and Berrang-Ford 2009, Lawn and Harvey 2003). High baseline food insecurity may make Inuit particularly susceptible to the impacts of climate change on food systems, with potentially significant health implications (Ford 2009, Power 2008). As such, research that focuses on assessing determinants of food insecurity amongst this population has high importance as it can be used to guide appropriate interventions.

Amongst Inuit food security research, studies have focused on vulnerable sub-populations such as women (Beaumier and Ford 2010, Ford and Beaumier 2009, Healey and Meadows 2007), children (Egeland et al. 2010, Johnson-Down and Egeland 2010), and the elderly (Smith, Easton and Saylor 2009). However, to the author's knowledge, no studies have focused explicitly on Inuit who are financially marginalized – despite the fact that those with low household incomes, limited access to resources, and economic problems have been identified as particularly vulnerable to food insecurity (Bohle, Downing and Watts 1994, Erber et al. 2010, Sarlio-Lähteenkorva and Lahelma 2001). To address this research gap, this study focuses on those with limited financial resources who therefore may be at greater risk for climate-related food insecurity.

There has been a rapidly expanding scholarship in the past decade reporting on case studies that assess vulnerability to climate change in the Canadian Arctic. These case studies predominantly involve smaller traditional communities, such as Sachs Harbour (Berkes and Jolly 2002, Nichols et al. 2004), Ulukhaktok (Pearce 2009), Arviat (Beaumier and Ford 2010, Blakeney and Suluk 2006), Cape Dorset (Laidler and Elee 2008, Laidler and Elee 2006), Arctic Bay (Ford et al. 2008b, Ford, Smit and Wandel 2006b), Igloolik (Ford and Beaumier 2010, Ford and Berrang-Ford 2009, Ford 2009, Ford et al. 2008b, Ford et al. 2006c, Laidler et al. 2009), and Pangnirtung (Laidler, Dialla and Joamie 2008). However, the experience and determinants of food insecurity in larger regional Inuit centers (RICs), such as Iqaluit, have been largely unexamined (Ford and al. in press, Ford, Lardeau and Vanderbilt in review-a). This presents a gap in the literature as RICs greatly differ from smaller communities in that they have quickly developing

economies, improved transportation infrastructure, rapid in-migration, as well as increasing waged employment while attempting to retain waning subsistence-based lifestyles (Lardeau, Healey and Ford 2011, Searles 2010, Searles 2008). The dual nature of Iqaluit's food system and economy provides an important context for the future of northern communities that may follow a similar development trajectory. Iqaluit is considered to be a large urban city when compared to other communities throughout the Canadian Arctic. While these traditional communities may not yet exhibit the same characteristics as Iqaluit, they are growing rapidly (Statistics Canada 2007). As such, the factors influencing vulnerability and adaptation in Iqaluit may become more prevalent in smaller communities in the future.

With regards to climate change vulnerability, most research assessing Inuit food security has created baseline data for general food security statuses during any given year. However, to the author's knowledge, no studies have focused on how anomalous environmental conditions occurring over a distinct time period have propagated through the traditional food system to impact food security. Early in 2010, it was anticipated that climatic conditions throughout the year would be anomalous with regards to long term averages (The Canadian Press 2010). Indeed, these predictions came to fruition in that temperatures were exceptionally warm and sea ice conditions were extraordinarily poor. While there is value in assessing food security during any given year, these extreme climatic conditions provided an opportunity for assessing societal responses to these conditions. Societies tend to prepare for future events based on their responses to a previous extreme climatic event that affected them (Berrang-Ford, Ford and Patterson 2011, Glantz 1996, Glantz 1992, Glantz 1991, Glantz 1990, Glantz 1988). Therefore, given the similarity of conditions during winter 2010/2011 with general trends projected for the Iqaluit region by global climate models (Dumas, Flato and Brown 2006), it is worthwhile to identify and characterize some of the actual processes and conditions shaping vulnerability and adaptability. By assessing winter 2010/2011, an understanding can be gained with regards to how these conditions influence the traditional food system. As such, this research will help develop a baseline assessing for future impacts of climate change on food security in the Canadian Arctic.

This thesis uses a case study of the territorial capital of Iqaluit, Nunavut to identify and examine the key processes and conditions shaping vulnerability (and adaptability) of the traditional food system to extreme climatic conditions during winter 2010/2011. Specifically, this vulnerability-based temporal analogue approach uses this timeframe as a lens for understanding determinants of vulnerability and pathways for adaptation. This thesis characterizes the climatic conditions during winter 2010/2011 and their departure from long-term norms. It then explores how the community was affected by the extreme conditions by identifying sensitivities and adaptive responses. Finally, the thesis explores broader processes and conditions that shape vulnerability of the traditional food system, and examines the potential implications of future climate change.

1.2 Aim and Objectives

The aim of this thesis is to identify and characterize the vulnerability of Iqaluit's traditional food system to extreme climatic conditions during winter 2010/2011 in the context of broader socioeconomic stresses. This will facilitate an assessment of changing climatic conditions as a potential determinant of food insecurity, focusing on Iqaluit's public housing residents. Specific research objectives include:

1. Develop a vulnerability-based approach integrating mixed-methods and temporal analogues for assessing human implications of climatic extremes in the Canadian Arctic,

2. Identify and characterize locally relevant extreme climatic conditions during winter 2010/2011 (*exposure*), their subsequent effects on Iqaluit's traditional food system with a focus on public housing residents (*sensitivity*) and coping strategies used for dealing with food-related stresses (*adaptive capacity*).

3. Examine how the vulnerability of the traditional food system influences food security among public housing residents in Iqaluit.

4. Identify and characterize how the vulnerability or resilience of the traditional food system is influenced by environmental and socioeconomic processes operating at various spatial and temporal scales.

5. Identify what lessons can be learned from winter 2010/2011 in terms of the future implications of climate change.

1.3 THESIS FORMAT

This thesis is comprised of seven chapters. Following the Introduction, Chapter 2 presents a literature review of relevant concepts such as food systems, food security, and climate change, thus providing context for the thesis. Chapter 3 describes the study design, including both the conceptual framework (vulnerability approach) and analytical framework (temporal analogue approach). Chapter 4 explains the variety of quantitative and qualitative methods used during the research process. Chapter 5 presents the results of this vulnerability assessment in the context of exposure, sensitivity, and adaptive capacity, as well as barriers to adaptation. Chapter 6 discusses the environmental and socioeconomic determinants of vulnerability with regards to current vulnerability and extrapolates the implications of these for future vulnerability. Chapter 7 presents key conclusions from the research.

2. LITERATURE REVIEW

This chapter defines relevant concepts to this thesis, such as food systems and food security, and describes the health implications of food insecurity. It outlines the various determinants of Inuit food insecurity that have been identified in the literature, particularly focusing on the influence of climate change.

2.1 INUIT FOOD SYSTEMS IN THE CANADIAN ARCTIC

A *food system* comprises "dynamic interactions between and within biophysical and human environments which result in the production, processing, distribution, preparation and consumption of food" (Gregory et al. 2005, Ericksen 2008), and both operates within and is influenced by socioeconomic, political, and environmental contexts. More specifically, a *traditional food system* includes all processes involved in feeding a population from local natural resources that are culturally accepted (Kuhnlein and Receveur 1996), and includes all aspects of hunting, harvesting, preparing, sharing, and consuming food. Food systems, therefore, involve much broader considerations than productivity and production alone - they underpin food security (Gregory et al. 2005).

The Canadian Arctic is characterized by a distinctive dual food system that incorporates both traditional food (hereafter "country food") and store-bought food (hereafter "store food") (Figure 1). Country food includes items that indigenous peoples can access locally from the natural environment through the use of traditional knowledge (Kuhnlein, Erasmus and Spigelski 2009). Country food is commonly obtained from terrestrial or (often frozen) aquatic environments (herein collectively termed "the land") via hunting, fishing, and harvesting. It may include a variety of locally obtained non-domesticated wildlife species such as caribou, seal, fish, and berries (NWMB 2004). Store foods, on the other hand, are those that enter communities often through global commercially organized retail outlets and which must be purchased (Kuhnlein et al. 2009). Typical store foods include canned goods, cereals, as well as fruits and vegetables. These contemporary foods have played an increasingly important role in the diet of

Canadian Inuit over the past 50 years at the expense of traditional foods (Ford 2009, Kuhnlein and Receveur 1996), yet both country food and store food are important components of the contemporary Inuit food system (Ford 2009). For this thesis, the main focus is the effects of climatic extremes on the traditional food system. As such, the country food aspect of the dual food system will be more prevalent. However, it is recognized that the dual-nature of the Inuit food system will inevitably involve discussion of both components.

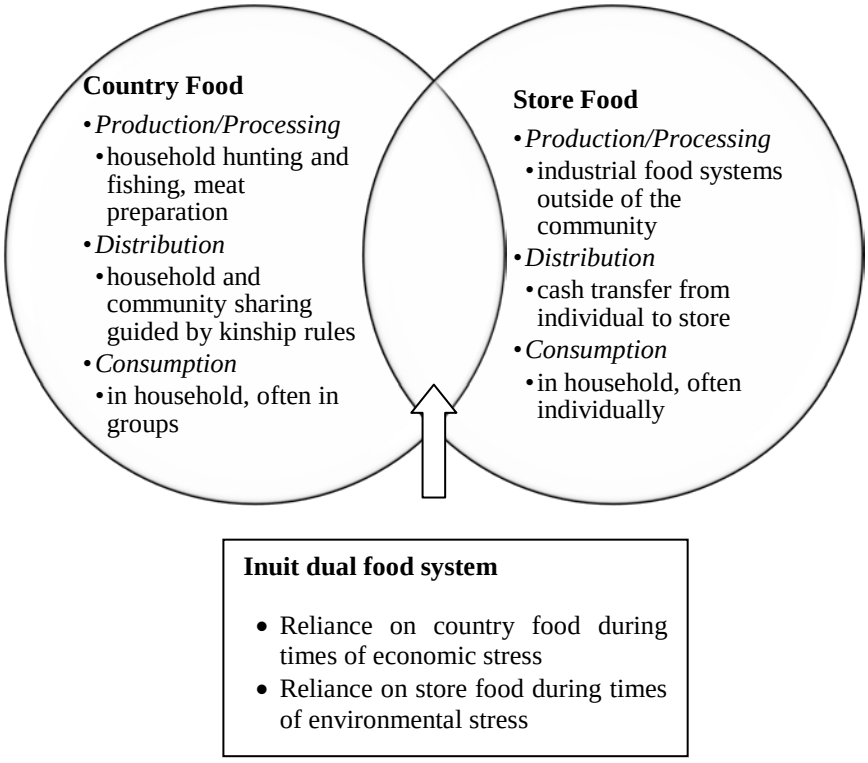

FIGURE 1. The country food and store food components of the Inuit dual food system (Ford 2009).

2.2 THE NUTRITION TRANSITION

Inuit have long subsided on a traditional diet of country food that offers a rich source of antioxidants, omega-3 fatty acids, monounsaturated fatty acids, protein, and micronutrients (Egeland et al. 2009). Kuhnlein and Receveur (2007) found that for

children and adults, even a single portion of country food resulted in significantly increased levels of energy, protein, vitamin D, vitamin E, riboflavin, vitamin B-6, iron, zinc, copper, magnesium, manganese, phosphorus, and potassium. Traditional foods are therefore extremely important to ensure high dietary quality of both children and adults (Kuhnlein and Receveur 2007). However, Inuit food consumption patterns have undergone rapid changes within the past few decades due to a number of socioeconomic and cultural factors (Myers, Powell and Duhaime 2004). The Inuit diet in Nunavut has for decades consisted of a combination of traditional and imported food, but the balance between these components is changing, with more commercially produced, imported store food being used (Myers et al. 2004). This phenomenon, termed the "nutrition transition," has been documented throughout the Canadian Arctic whereby nutrient-rich country foods are replaced with nutrient-poor store foods (Hopping et al. 2010, Kuhnlein 1996, Sharma et al. 2010b, Sharma et al. 2010a). According to several dietary studies, imported store food has become an important source of food for Inuit (Erber et al. 2010, Hopping et al. 2010, Kuhnlein and Chan 2000). Inuit health is threatened by this decline in traditional food consumption as this recent diet is heavier in saturated fats, sugars, salt and carbohydrates (Kuhnlein 1996). This dietary change has been linked to an increased likelihood of nutrient deficiencies and chronic disease in this already high-risk population (Bjerregaard et al. 2004, Chan et al. 2006, Kuhnlein et al. 2004). In addition, this transition has led to a higher prevalence of lung, breast and colon cancers, diabetes, cardiovascular disease, dental caries and other afflictions that were historically rare in northern communities (Bjerregaard et al. 2004, Friborg and Melbye 2008). Overweight and obesity are also becoming more rampant amongst Canadian Inuit (Kuhnlein et al. 2004). In developing countries, the nutrition transition has been associated with both under- and over-nutrition being cited within the same communities and even the same households (Popkin 2002). Likewise, both overweight and obesity and sub-optimal nutrient intakes co-occur in Inuit communities and households (Kuhnlein et al. 2004). Despite these dietary changes, country food still constitutes an considerable portion of the Inuit diet (Duhaime et al. 2004, Duhaime 2002, Poppel et al. 2007), albeit in a decreasingly prominent way.

2.3 Food Security in the Canadian Arctic

The World Food Summit of 1996 defined food security as existing "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." Food insecurity therefore exists when these conditions fail to be met. With regards to indigenous peoples, Paci et al. (2004) define northern traditional food security as "the continued and predictable availability and access to food, derived from northern environments through indigenous cultural practices." This definition stresses the importance of the food system from a social perspective, and acknowledges the importance of all aspects of harvesting, preparing, and consuming traditional foods (Wesche and Chan 2010). For many indigenous peoples, the traditional diet is not only a vital source of nourishment, but is also an integral part of their emotional, spiritual, and cultural well-being.

There are numerous criteria used to identify food security. For the purpose of this study, three main components of food security are recognized in order to understand the social and environmental factors relevant to traditional indigenous food systems: *availability* (sufficient quantities available consistently), *accessibility* (sufficient resources to obtain food), and *quality* (food of adequate nutritional and cultural value) (Ford 2009, Ford and Berrang-Ford 2009, Gregory et al. 2005). It is suggested that for food security to exist, these various dimensions must be fulfilled. In terms of the traditional food system, availability may refer to the presence or absence of wildlife, accessibility may refer to the distribution of and ability to harvest wildlife, while quality may refer to the general health or nutritional value of wildlife.

2.4 Health Implications of Food Insecurity

Food security and health are closely linked, with those who are food insecure being more likely to suffer from compromised health status (UNFWP 2007). Therefore, it is important to identify factors affecting food security to ensure that populations remain

healthy. Food inadequacy is often associated with nutrient deficiencies and diets that are inconsistent with healthy eating (Che and Chen 2005). As a result, there are negative psychological, social, and physical consequences. These may include mental health problems such as anxiety and depression in both children and adults as well as social exclusion (McIntyre and Tarasuk 2002). Those who experience food insecurity are more likely to feel unhealthy, be prone to infection, experience stress, and have chronic health problems (Hamelin, Habicht J. P. and Beaudry 2002, Hamelin, Habicht J. P and Beaudry 1999, Health Canada 2005, Lambden et al. 2006, McIntyre and Tarasuk 2002). Due to these negative health outcomes, it is important to identify the specific determinants of food insecurity so that appropriate policies may be created to improve health.

2.5 Determinants of Food Security in the Canadian Arctic

Many factors converge in the Canadian Arctic to undermine food security, leading to varying levels of food insecurity throughout the region (Table 1). These determinants operate at various spatial and temporal scales and often interact to exacerbate food insecurity. Some factors are derived within the region while other factors are exogenous.

TABLE 1. Determinants of food insecurity in a Canadian Arctic context as indicated by a systematic peer-reviewed literature review.

Human Factors	Environmental Factors
Demographic	**Climatic**
• Changes in age distribution	• Variable sea ice conditions
• Fewer hunters	• Increased temperatures
• Gender and age	• More intense and frequent storms
Economic	**Biotic**
• Unemployment	• Altered animal migration patterns
• Dual-based economy	• Decreased quality of country food
• Time constraints	• Loss of native species
• Financial constraints	• Addition of non-native species
• Cost of food	**Geomorphic**
• Cost of hunting/fishing equipment	• Landslides
Sociocultural	• Coastal erosion
• Strained sharing networks	
• Nutrient transition	
• Food preference	

- Gambling/violence/substance abuse
- Loss of traditional knowledge
- Language barriers

Political

- Insufficient policies
- Inadequate regulations
- Lack of cultural sensitivity

The high cost associated with obtaining food is a prevalent food security determinant in the Arctic (Beaumier and Ford 2010, Chan et al. 2006, Damman, Eide and Kuhnein 2008, Ford and Beaumier 2010, Ford 2009, Ford and Berrang-Ford 2009, Goldhar, Ford and Berrang-Ford 2010, Lambden et al. 2006, Loring and Gerlach 2009, Myers et al. 2004). With the increased mechanization of hunting and fishing, Inuit require increased capital in order to procure traditional food (Beaumier and Ford 2010, Chan et al. 2006, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Ford and Berrang-Ford 2009, Goldhar et al. 2010, Lambden et al. 2006, Loring and Gerlach 2009, Myers et al. 2004). Modern items such as snowmobiles, gasoline, and firearms are more costly than their traditional counterparts such as dogsleds, dogs, and harpoons. Yet, there are increasing expenses within the new era of modernity as well. For example, changes in seasonal freeze-thaw cycles cause increased hunting costs due to the extra fuel required to access hunting and fishing grounds (Loring and Gerlach 2009). For many Inuit, the price of store food is extremely high and is often unaffordable (Beaumier and Ford 2010, Chan et al. 2006, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Ford and Berrang-Ford 2009, Goldhar et al. 2010, Lambden et al. 2006, Loring and Gerlach 2009, Myers et al. 2004). Ford and Beaumier (2010) report that in 2008, the cost of a basket of food for a family of four in Igloolik, Nunavut was $551 – more than twice the price of the same basket in Montreal, Quebec. Compounding the issue of high food cost is lack of money management skills (Beaumier and Ford 2010, Chan et al. 2006, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Ford and Berrang-Ford 2009, Goldhar et al. 2010, Lambden et al. 2006, Loring and Gerlach 2009, Myers et al. 2004). This is attributed to the relatively recent arrival of monetary transactions in the Arctic, as well as limited experience of western concepts of budgeting in Inuit culture (Suluk and Blakney 2008).

Canadian Inuit food security is negatively impacted by a reduction in the number of active hunters procuring traditional food (Beaumier and Ford 2010, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009). This decline has been attributed to illness, injuries, and death (Beaumier and Ford 2010), as well as fewer younger hunters engaging in subsistence-based activities (Beaumier and Ford 2010, Damman et al. 2008, Ford 2009). The decreased rate of hunting amongst youth is attributed to a number of factors, such as increased wage employment that reduces opportunities for hunting, lack of access to funds for purchasing equipment, changing dietary preferences toward store-bought foods, inadequate experience due to requirements of western-style schooling, lack of interest in an increasingly "marginalized" activity, and increasing participation in organized sports (Chan et al. 2006). A decreasing number of hunters translates to decreasing availability of traditional food, which has implications for food security.

Another barrier to food security concerns demographics – more specifically, the age distribution of Canada's Arctic Inuit population. Research in Nunavut has noted many food security determinants that are related to a rapidly changing population distribution (Ford 2009). Nunavut is characterized by an expansive population pyramid similar to that of a developing nation, with a broad base that indicates a high proportion of children, a rapid rate of population growth, and a low proportion of adults. This has implications for food security because the decreasing number of hunters, as previously mentioned, means that remaining hunters face further demand to provide food for this increasing population. This rapidly growing younger population also leads to variations in the cultural acceptability of food through the influence of schooling and media (Damman et al. 2008, Myers 2005). Damman et al. (2008) suggest that intergenerational differences in food preference have caused reduced consumption of country food and increased consumption of unhealthy store foods that are promoted to youth by Western images and ideals.

The strength of food sharing networks has been identified as an important food security determinant (Beaumier and Ford 2010, Chan et al. 2006, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Goldhar et al. 2010). There is a long history of food system research in Arctic communities in anthropology (Ford and Beaumier 2010), with

studies focusing on the role of kinship and food sharing (Chabot 2004, Collings et al. 1998, Collings 1997, Duhaime et al. 2004, Duhaime 2002, Kishigami 2004, Wenzel 1995, Wenzel 1991). Country food has always been shared through principles of "solidarity-affection" to friends, guests, and others, as well as through "respect-obedience" within extended families (Wenzel 2000). Increased reliance on, yet weakening of, food sharing practices has led to food insecurity (Beaumier and Ford 2010). The cultural practice of sharing may have developed as an effective mechanism to maintain food security in the face of environmental constraints, yet the practice is currently under strain (Chan et al. 2006).

Another common factor affecting food security involves political barriers (Beaumier and Ford 2010, Chan et al. 2006, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Ford and Berrang-Ford 2009, Goldhar et al. 2010, Lambden et al. 2006, Loring and Gerlach 2009, Myers et al. 2004). These may include wildlife management policies, food subsidies, population settlement policies, or gun licence requirements. Inuit historically altered what, where, and when they hunted in accordance with fluctuations and variations in wildlife availability and accessibility, but they are now restricted. In Alaska, wildlife management policies such as hunting or fishing seasons, quotas, and area closures have impeded access to country food (Loring and Gerlach 2009). In Greenland, similar institutional barriers that regulate hunting and fishing impact access to traditional food (Goldhar et al. 2010). In the Canadian Arctic, settlement policies during the 1960s led to subsequent struggles for Inuit; by centralizing former semi-nomadic hunting groups into communities located far from their traditional hunting areas, increased capital needs such as snowmobiles and motor boats are required to obtain food (Damman et al. 2008, Wenzel 1991). Chan et al. (2006) noted that gun license delays, poor distribution of funding in the Harvester Support Program, and insufficient government-funded programs negatively influenced food security. Myers et al. (2004) also raised issue with the Federal Firearms Act, and stated that Inuit have made the case that their traditional harvesting rights must not be blocked by new legislation requiring gun licenses. However, it should be noted that beneficial policy measures have been implemented to make healthy food more affordable in the Canadian Arctic, including food banks, soup kitchens, and the (now outdated) Food Mail Program (Damman et al. 2008).

Other factors affecting food security are those related to social issues. These include substance abuse and addiction (Beaumier and Ford 2010, Chan et al. 2006, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Ford and Berrang-Ford 2009, Goldhar et al. 2010, Lambden et al. 2006, Loring and Gerlach 2009, Myers et al. 2004), gambling (Beaumier and Ford 2010, Chan et al. 2006, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Ford and Berrang-Ford 2009, Loring and Gerlach 2009, Goldhar et al. 2010, Lambden et al. 2006, Myers et al. 2004), occupation (Ford and Berrang-Ford 2009), challenges in the balance between time and money that has resulted from the presence of a dual economy (Damman et al. 2008, Ford 2009), and decreased use of country food (Ford and Berrang-Ford 2009, Healey and Meadows 2007). It has been found that there is a gender difference for food security status in the Canadian Arctic, with females reported to be more food insecure than males in some community studies (Beaumier and Ford 2010, Ford and Berrang-Ford 2009). Language has been identified as a barrier to healthy food choices, as English food labelling at the grocery stores are considered a hindrance to the identification of nutritious foods by unilingual Inuktitut adults (Bird et al. 2008).

A more recently identified determinant of Arctic food insecurity identified in the literature is climate change (Beaumier and Ford 2010, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Goldhar et al. 2010, Guyot et al. 2006, Lambden et al. 2007, Loring and Gerlach 2009, Myers et al. 2004, Nancarrow and Chan 2010, Wesche and Chan 2010). This phenomenon affects various aspects of availability, accessibility, and quality of food, but will be further explored in the next section.

2.6 Impacts of Climate Change on the Traditional Food System

According to the observations of Arctic indigenous communities, three interrelated phenomena characterize Arctic climate change at the local level: weather is more variable, weather is less predictable, and there is an increased frequency of extreme weather events (Berkes 2007). A report by the Government of Nunavut entitled "*Inuit Qaujimajatuqangit* of Climate Change in Nunavut" highlights Inuit experiences of recent

climate and environmental change in Iqaluit (Government of Nunavut 2005). Approximately half of the participants in Iqaluit agreed that there is an increase in weather variability and/or weather unpredictability. Participants highlighted two common sea ice observations: sea ice forming unusually later and sea ice melting earlier. Additionally, a smaller number of people interviewed noticed that sea ice is becoming thinner in recent years. Climate models predict sea ice change to continue into the foreseeable future (ACIA 2005, IPCC 2007b). All model runs in the Intergovernmental Panel on Climate Change Fourth Assessment Report, for example, project a shrinkage in future sea ice cover (IPCC 2007c), concluding that sea ice extent will continue to decrease this century with a high level of confidence.

Food availability, accessibility, and quality are sensitive to climatic conditions, and it is therefore believed that traditional food systems are susceptible to climate change (IPCC 2007c). Climate change is cited in literature as a common food insecurity determinant across the Arctic, including Alaska (Loring and Gerlach 2009), Greenland (Goldhar et al. 2010) and the Canadian Arctic (Beaumier and Ford 2010, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Guyot et al. 2006, Lambden et al. 2007, Myers et al. 2004, Nancarrow and Chan 2010, Wesche and Chan 2010). Food *availability* is compromised when animal migration routes are altered (Beaumier and Ford 2010, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Guyot et al. 2006, Lambden et al. 2007, Myers et al. 2004, Nancarrow and Chan 2010, Wesche and Chan 2010). This has been observed for migratory caribou herds, whereby direct and indirect consequences of climate change, such as alteration in habitat use, foraging behaviour, and demography, have affected migration patterns (Sharma et al. 2009). Temperate or seasonally migrant species also have the capability to extend their geographic range into Arctic marine habitats (Moore and Huntington 2008). For example, traditional Inuit knowledge has confirmed a recent influx of killer whales into eastern Arctic waters as the sea ice melts and enlarges their habitat (Ferguson, Higdon and Westdal 2012). However, some marine mammals species are vulnerable to the effects of climate change, including polar bear, bearded seal, and ringed seal whose life histories depend on the sea ice (Moore and Huntington 2008, Simmonds and Isaac 2007). Changes in plant and animal distribution may have both positive and negative influences on availability of food. While the loss of

historically abundant native species may harm food security, the replacement of these species with novel non-native species may instead protect food security (Beaumier and Ford 2010, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Guyot et al. 2006, Lambden et al. 2007, Myers et al. 2004, Nancarrow and Chan 2010, Wesche and Chan 2010). Food *accessibility* is also affected by climate change, as wildlife access is impeded by environmental changes such as thinner ice, later ice freeze-up, earlier ice break-up, more variable snowfall, unpredictable weather, warmer temperatures, and more frequent and intense storms (Wesche and Chan 2010, Beaumier and Ford 2010, Ford and Beaumier 2010, Nancarrow and Chan 2010, Ford 2009, Damman et al. 2008, Lambden et al. 2007, Guyot et al. 2006, Myers et al. 2004). *Quality* of traditional food can also be negatively impacted by changes in the environment. Lambden et al. (2007) explored observed changes country food and noted reduced animal size, physical deformities of animals, as well as variations in taste and other sensory changes. Others have noted a general decrease in wildlife health of some species (Beaumier and Ford 2010, Damman et al. 2008, Ford and Beaumier 2010, Ford 2009, Guyot et al. 2006, Lambden et al. 2007, Myers et al. 2004, Nancarrow and Chan 2010, Wesche and Chan 2010).

The literature shows that climate and hence climate change can significantly influence various aspects of the traditional food system, thus impacting food security. The impacts of climate change on store food are beyond the scope of this thesis. For a review of vulnerability of food systems in general to climate change, see Gregory et al. (2005).

3. STUDY DESIGN

This chapter describes the conceptual and methodological frameworks used to guide the study design. The benefits of these frameworks are highlighted with regards to their relevancies for assessing the vulnerability of the traditional food system to climatic extremes.

3.1 CONCEPTUAL FRAMEWORK: VULNERABILITY-BASED APPROACH

This thesis uses a vulnerability-based approach to assess the impacts of climatic extremes on the Inuit traditional food system. Vulnerability science is reflexive (Beck 1999), whereby we learn from experience and anticipate how future vulnerability will change. Vulnerability assessments are an integral component of human dimensions of climate change (HDCC) research, and have been conducted in communities throughout the Canadian Arctic (Ford et al. 2010). There have been many different interpretations of vulnerability appraisal within climate change discourse, but there are two main branches of vulnerability assessment (Table 2). These branches are often defined differently from author to author, leading to difficulty in terms of streamlining each of the two approaches.

TABLE 2. Summary of the two types of vulnerability assessment.

Author	First Type	Second Type
Kelly and Adger, 2000	End point approach	Starting point approach
Burton et al., 2002	Type 1 First generation Impacts-driven research	Type 2 Second generation
Brooks, 2003	Biophysical vulnerability	Social vulnerability
O'Brien et al., 2007	Outcome vulnerability	Contextual vulnerability
Ford et al., 2010	Impacts-driven vulnerability studies	Contextual vulnerability

The first type of vulnerability assessment focuses on modeling the impacts of climate change on biophysical and human systems using simulations generated by global

circulation models (GCMs). This type of study measures vulnerability as the result of varying greenhouse gas emissions scenarios combined with hypothetical adaptation interventions. Unless specified in the model, this approach assumes that no adaptation or mitigation is occurring or will occur, and also assumes that external social, economic, environmental, political, and institutional forces have limited influence. As such, results may not be completely representative of the situation being assessed. Despite these limitations, this branch of vulnerability assessment provides vital information with regards to potential implications of climate change, and has been widely used from local to national levels (Ford et al. 2010). The main critique of this approach is that *biophysical* systems remain the focus of analysis while the dynamic determinants that shape how *human* systems experience and respond to climate change are neglected (Ford and Smit 2004, O'Brien et al. 2007, Smit and Wandel 2006). Researchers have called for a more holistic and integrated approach for vulnerability assessment, thus resulting in the second approach to assessing vulnerability.

The second type of vulnerability assessment seeks to identify current and future vulnerabilities arising from climate change in the context of concurrent and interacting social, economic, environmental, political, and institutional conditions. Vulnerability is not conceptualized as a static outcome, but rather a dynamic state or condition that is constantly evolving and changing (Eakin, Winkels and Sendzimir 2009, O'Brien and Leichenko 2001). This conceptualization suggests that contextual conditions influence both exposure to climate change and the potential responses, and that these responses can in turn affect the contextual conditions. This approach addresses the shortcomings of the first type of vulnerability that are outlined by Ford et al. (2010): it does not rely heavily upon models, focus on future conditions and risks as opposed to current stresses, or assume which climate stimuli are relevant before beginning the assessment. As such, the second type of vulnerability assessment is used to guide this thesis.

Vulnerability is commonly described as the "capacity to be wounded," and is a measure of a system's susceptibility to harm in response to a stimulus or stimuli (O'Brien et al. 2007, Smit and Wandel 2006). The Intergovernmental Panel on Climate Change (2001) defines vulnerability as "the degree to which a system is susceptible to, or unable

to cope with, adverse effects of climate change, including climate variability and extremes." Smit and Wandel (2006) state that *vulnerability* of a system is a function of the *exposure* and *sensitivity* of the system to hazardous conditions, as well as the *adaptive capacity* of the system to cope with those conditions (Figure 2). Vulnerability and its components of exposure, sensitivity, and adaptive capacity are dynamic. They vary spatially and temporally in response to changes in social, economic, environmental, political, and institutional conditions (Smit and Wandel 2006).

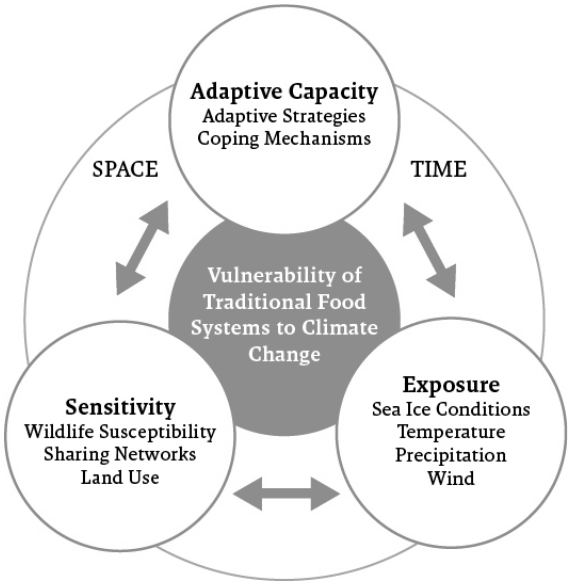

FIGURE 2. Conceptual framework for vulnerability assessment, where vulnerability of traditional food systems to climate change is a function of exposure, sensitivity, and adaptive capacity.

Exposure and *sensitivity* are interactive and almost inseparable properties of a system that are dependent on the interaction between the characteristics of the system and on the attributes of the climatic stimulus (Smit and Wandel 2006). The conceptual model of vulnerability developed by Ford et al. (2006b) combines these two terms to discuss the concept of *exposure-sensitivity* as a single entity. Exposure-sensitivity is indicative of the susceptibility of humans to conditions that represent risks, and is dependent upon both the characteristics of climatic conditions and the nature of the human system in question

(Ford et al. 2006b). The characteristics of climatic conditions include magnitude, frequency, spatial dispersion, duration, speed of onset, timing, and temporal spacing of climatic risks (Ford et al. 2006b, Ford and Smit 2004). In this thesis *exposure* refers to those climate-related risks that affect food systems. In the context of the traditional food system, exposure can denote environmental conditions such as sea ice conditions or extreme temperatures. *Sensitivity* refers to the nature of the food system that makes people particularly susceptible, and includes factors such as the degree to which a hunter relies on the environment or the degree to which a household depends on traditional foods.

Adaptive capacity refers to the ability of individuals, communities, or institutions to address, plan for, or adapt to exposure-sensitivity (Smit and Pilifosova 2003). Smit and Wandel (2006) view adaptations as "manifestations of adaptive capacity." Adaptation in the context of the human dimensions of climate change typically refers to a process, action, or outcome in a system (household, community, group, sector, region, country) that is completed in order to better cope with or adjust to some changing condition, stress, hazard, risk, or opportunity (Smit and Wandel 2006). Adaptive capacity relates to a system's resistance, resilience, flexibility, and robustness (Smithers and Smit 1997), and will ultimately determine the extent to which a community may become vulnerable. Local adaptive capacity is reflective of broader conditions, so the scales of adaptive capacity are not independent but interactive (Smit and Pilifosova 2003, Yohe and Tol 2002). For example, local adaptive responses could include altering traditional hunting routes if sea ice conditions impede travel while regional coping mechanisms might involve expanding sharing networks from between households to between communities if wildlife is unavailable or inaccessible.

3.2 Analytical Framework: Temporal analogue approach

Analogues are used as a methodology in vulnerability research. The increasing importance of analogues in human dimensions of climate change (HDCC) research is consistent with the development of contextual approaches to vulnerability assessment

(Ford et al. 2010). Analogy is defined as the inference that if two or more things agree with one another in some respects, they will probably agree in others. Analogue methodologies involve using knowledge about one subject (the base) to improve understanding of another subject (the target) where less is known (Ford et al. 2010). In the context of this thesis, the base is winter 2010/2011 and the target is some future date during which the extreme climatic conditions are increasingly common. Analogue methodologies have been widely used in climate research since the 1960s (Nicholls 1980), and can be spatial or temporal in nature. Spatial analogues are those in which insights are drawn from one region and applied to a comparable region over the same time period. Spatial analogues are beyond the scope of this thesis; for a review of the use of spatial analogues in HDCC research, refer to Ford et al. (2010). In contrast, temporal analogues are those in which insights are drawn from past conditions. They are used to develop understanding of current conditions, and are then applied to make inferences about the future. This thesis uses a temporal analogue based approach whereby insights for the future will be drawn from winter 2010/2011.

The use of temporal analogues in a climate change context was pioneered by Michael Glantz, who developed an approach called Forecasting by Analogy (FBA) in the 1980s as a basis for exploring potential future climate impacts (Glantz 1988). FBA is a method that is used to determine local responses to global climate change. It is based on the premise that past societal responses to extreme climate-related events provide a first approximation of how a society might respond to the effects of climate change in the future (Glantz 1996). Societies show the tendency to prepare for future extreme events based on their responses to a previous extreme climate event that affected them (Berrang-Ford et al. 2011, Glantz 1996, Glantz 1992, Glantz 1991, Glantz 1990, Glantz 1988). Therefore, analogies can help to identify societal strengths and weaknesses in responding to past extreme meteorological events so that the strengths can be reinforced and the weaknesses reduced (Glantz 1996). Since its development and initial application in 1987, FBA has been used to assess climate-related impacts of various economic sectors and ecosystems (Ford et al. 2010, Glantz 1996). The prevalence of this approach suggests that temporal analogue methodologies may be an integral component of climate change research, and warrant further use.

There have been many applications of temporal analogues in HDCC research. Some studies assess social outcomes, such as how climatic extremes have influenced human migration patterns (Gilbert and McLeman 2010, Meze-Hausken 2000, McLeman et al. 2008, McLeman and Smit 2006). Others focus on the influence of extreme events, such as floods in Puerto Rico (Lopez, Schmith and Kaas 2000, López-Marrero and Yarnal 2010), Norway (Naess et al. 2005), and the Netherlands (Zaalberg et al. 2009), or droughts in America (McLeman et al. 2008, McLeman and Smit 2006), Canada (Gilbert and McLeman 2010), and the United Kingdom (Mechler et al. 2010). Extreme ice conditions have also been assessed in the Canadian Arctic (Ford et al. 2009). Temporal analogues have been used to assess not only human responses to extreme climatic events, but also institutional and technological advancements in light of a changing climate (Chhetri and Easterling 2010, Jacobs 1996, Naess et al. 2005). It is noted that the applications identified here are not mutually exclusive. While one study may have a strong environmental component, there are invariably other social, economic, or political influences that are explored as well. Such is the case with this thesis.

Temporal analogues can involve a variety of time scales, and examples from the literature range from years (Ford et al. 2009, Ford et al. 2008b, Ford et al. 2006c, Pearce 2009), to decades (Belliveau, Smit and Bradshaw 2006, Gilbert and McLeman 2010, Lim et al. 2005, McLeman et al. 2008, McLeman and Smit 2006), centuries (Zhang et al. 2007), and even millennia (Brooks, Grist and Brown 2009, Brooks 2006, Cooper and Peros 2010, Woodhouse et al. 2010). The diversity of temporal scopes indicates the importance of establishing a timeframe that is appropriate to the study when using temporal analogues in vulnerability research. Defining a timeframe should take into account the extent to which past conditions that determine vulnerability are relevant today (Ford et al. 2010). This thesis argues that timeframes within the past few decades are more useful than those further in the past. This is because while the conditions of the future may not replicate those of the past, societal responses to extreme climatic events in the *near future* will most likely be similar to those of the *recent past* (Glantz 1996). Therefore, contemporary determinants of vulnerability and adaptation are more likely to be relevant than historical determinants. Also, adaptive strategies are more likely to be relevant given similar levels of technological and institutional advancement. As such,

anomalous climatic conditions experienced in Iqaluit during winter 2010/2011 provide an appropriate timeframe for examining how climatic extremes, which are likely to become more common with climate change, affect the traditional food system.

There are many merits of using temporal analogues as a means to assess vulnerability and adaptation in HDCC research. First, temporal analogues are useful in that they are holistic and consider both social and biophysical influences of vulnerability. Temporal analogues identify various contextual factors affecting HDCC, and these influences would not be explicated through traditional impacts-driven vulnerability assessments such as those that use GCMs. For instance, Lopez-Marrero (2010) discovered that community response to floods is affected by flood-risk perceptions, and these cognitive factors are important determinants of vulnerability. This was important because flood control projects have promoted a false sense of security among community members in Puerto Rico, reducing their risk perception and inhibiting their likelihood to adapt. This example, while brief, shows the importance of including social factors when assessing vulnerability and adaptation. Second, temporal analogues often involve case studies that are rich in detail and are conducted at a scale that allows for close collaboration with stakeholders and for linking research to policy. The findings do not merely state the presence or absence of vulnerability, but the drivers that influence it. Identifying determinants of vulnerability and adaptation is important as they provide entry points for appropriate interventions. Finally, one of the most essential values of temporal analogues is their ability to address not only *vulnerability* to climate change, but also *resilience* to climate change, thereby acknowledging the positive opportunities that extreme climatic events may provide. Although certain populations face significant challenges due to varying climatic conditions, their adaptive strategies allow them to persist in a changing environment (Ford et al. 2008b, Ford et al. 2006c, Pearce 2009). Studies have highlighted how climatic extremes can stimulate adaptive learning and enhance the likelihood of adaptation taking place (Berrang-Ford et al. 2011, Ford et al. 2009, Moser 2012). The ability to identify adaptive capacity is important as it counteracts the critique that vulnerability terminology portrays climate change pessimistically and neglects the prospects that climate change may offer. Given the negative connotation

often associated with climate change, acknowledging these positive opportunities is imperative (Ford et al., in press).

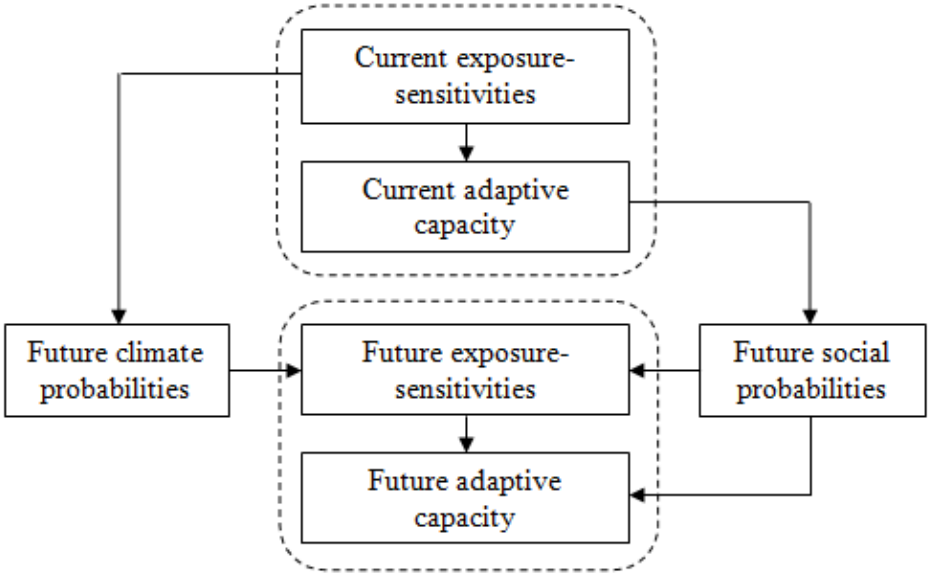

FIGURE 3. Analytical framework for vulnerability assessment (adapted from Ford et al., 2008: 46).

The temporal analogue analytical framework developed in this thesis is similar to that described by Ford and Smit (2004), and is consistent with other vulnerability studies (Belliveau et al. 2006, Ford 2009, Ford et al. 2009, Ford et al. 2008b, Ford et al. 2007, Ford et al. 2006b, Ford et al. 2006c, Johnston and Williamson 2007, Laidler et al. 2009, Pearce 2009) (Figure 3). The first stage assesses past and present vulnerability by considering current exposure-sensitivity and adaptive capacity in the context of broader socioeconomic factors. The second stage assesses future vulnerability by estimating changes in exposure-sensitivity and evaluating future adaptive capacity on the basis of past behaviour as well as future adaptation options, constraints, and opportunities (Ford et al. 2006b). In this thesis, this temporal analogue approach is used to hypothesize future vulnerability trends, but a comprehensive examination of the status of future vulnerability is beyond the scope of this work.

4. METHODS

This chapter outlines methods used for conducting the research. The chapter begins by describing the use of case studies in vulnerability research, followed by a profiling of the case study community of Iqaluit, Nunavut. The rationale is then explained with regards to the research design. Data collection and analysis techniques are finally summarized.

4.1 CASE STUDIES IN VULNERABILITY RESEARCH

Vulnerability assessments typically combine temporal analogues approaches within case study research (Ford et al. 2010). Case studies involve in-depth place-based research that focuses on a particular exposure unit (e.g. community, industry, etc.) to characterize vulnerability and its determinants (Ford et al. 2010). When employing analogue methodologies, case studies are commonly used because they are rich in detail and provide contextual insight. Therefore, conclusions can be drawn with regards to drivers that influence vulnerability or resilience. These conclusions can then be used to guide policy. It has been argued that case studies focus too greatly on the local scale and cannot shed light on human responses to changes in regional climate (Rudel 2008). However, while each case may be unique to a location or sector, meta-analyses can be used to draw generalizations (Ford et al. 2010) and provide invaluable insight in terms of the human dimensions of climate change.

4.2 CASE STUDY LOCATION: IQALUIT, NUNAVUT

This case study takes place in Iqaluit, Nunavut (Figure 4), and involves a community-based research approach that consists of close collaboration between university researchers, northern science bodies, community members, and local hunters throughout the research process. A preliminary consultation trip to Iqaluit was conducted in February 2011 to explore potential research questions and determine an appropriate

study design. A secondary trip was conducted in March 2011 to present the research proposal to the Amarok Hunters and Trappers Association to obtain feedback. Field work was conducted during May and June 2011 to collect insight from local hunters and community members. A follow-up trip in November 2011 provided further knowledge through interviews with key informants.

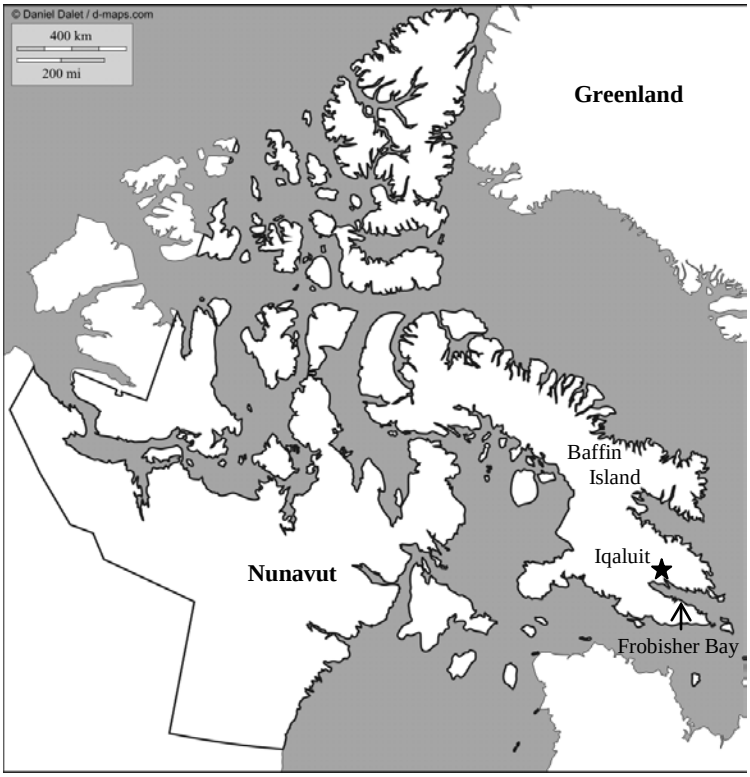

FIGURE 4. Map of Nunavut.

Iqaluit (63°45'N 68°31'W) is the largest community and territorial capital of the Canadian territory of Nunavut. Iqaluit is located on the southeast coast of Baffin Island. The city is situated at the mouth of the Sylvia Grinnell River, which empties into Koojesse Inlet before entering Frobisher Bay. In 1955, the settlement, then known as Frobisher Bay, became the center for American and Canadian Distant Early Warning (DEW) Line operations. This establishment drew semi-nomadic groups to the

community, resulting in further settlement. In 1987, Frobisher Bay officially reverted to its original name, Iqaluit, meaning “place of many fish” in the Inuit language of Inuktitut.

Iqaluit is surrounded by undulating topography and is influenced by a polar tundra climate. Due to its geographic location situated in a fjord-river valley, the community is predisposed to hazardous weather in all seasons (Hudson et al. 2001, Nawri and Stewart 2006). Variable conditions such as offshore and onshore winds, abrupt shifts in wind direction, blizzards, wind chill, extreme cold, tidal fog and reduced visibility are common in Iqaluit and make it difficult to traverse the landscape (Hudson et al. 2001). This is important as traditional activities such as hunting, fishing, recreational activities, and travel require use of the surrounding land and sea ice.

As of the 2006 Canadian census, the population of Iqaluit was 6,184. Although this displayed an increase of 18.1% from the 2001 census, Iqaluit has the lowest population of any capital city in Canada. However, Iqaluit’s population is rapidly expanding due to both high fertility rates and movement from smaller Arctic communities or larger southern cities. The proportion of Inuit in Iqaluit (58.2%) is much lower than the Nunavut average (84.8%), as its status as the territorial capital draws many southerners to the community for waged employment. However, Iqaluit’s Inuit population is still growing as it increased 17.6% between 2001 and 2006, compared to an increase of 9.2% in Nunavut as a whole. Iqaluit’s population is more transient than other Nunavut communities, with only 78% of people occupying the same dwelling in 2006 as previous years compared to 87% throughout Nunavut.

Iqaluit has expanded dramatically since its establishment, and the economy has shifted from being based entirely upon subsistence activities to a mixed economy where both the informal and formal economic sectors play an important role (Damas 2002). As such, Iqaluit has a “dual economy” consisting of subsistence-based and wage-based activities. Today, the formal economy is comprised predominantly of government, which has rapidly developed since Iqaluit became the capital of Nunavut in 1999. Although Iqaluit is a rapidly modernizing community, many residents still engage in informal land-based activities such as hunting, fishing, and trapping (Lardeau et al. 2011, Searles 2010). In the Survey of Living Condition in the Arctic (Poppel et al. 2007), 57% of those

surveyed in Iqaluit reported hunting and fishing in the last 12 months, and 33% reported obtaining more than half of their meat and fish from traditional sources. In contrast to smaller Inuit communities, there has been limited research on the human dimensions of climate change in the larger regional centers like Iqaluit (Bolton et al. 2011), which reflects trends in Inuit studies more generally (Searles 2010, Searles 2008).

4.3 Research Design Rationale

4.3.1 Winter 2010/2011

Winter 2010/2011 is used as the timeframe for this temporal analogue vulnerability assessment as this year experienced extreme climatic conditions throughout the Canadian Arctic, which are in many ways similar to climate projections for 2050. The National Snow and Ice Data Center (NSIDC) reported that Arctic sea ice reached its winter maximum extent in March 2011, which tied 2006 for the lowest winter sea ice extent in the satellite record (NSIDC 2011b). In addition, December 2010 and January 2011 had the lowest ice extent recorded since satellite records began in 1979 (NSIDC 2011e, NSIDC 2011c) while February 2011 matched the record low set in 2005 (NSIDC 2011d). These records are due, in part, to anomalously warm winter temperatures across much of the Arctic. In fact, Environment Canada declared 2010 to be the warmest year on record in Iqaluit (Environment Canada 2011). While these regional extremes are not specific to Iqaluit, they signify general anomalous trends that warrant further examination at a local scale.

4.3.2 Public Housing Residents

Those with low household incomes, limited access to resources, and economic problems have been identified as particularly vulnerable to food insecurity (Bohle et al. 1994, Erber et al. 2010, Sarlio-Lähteenkorva and Lahelma 2001). Therefore, this study focuses on assessing the food security of those with limited access to financial resources

who may be at greater risk for climate-related food stresses. Public housing data were used to identify such residents, as many of the households living under this jurisdiction are financially insecure and often rely upon government assistance to either supplement, or even provide, their income. For this thesis, public housing dwellings are defined as "subsidized rental dwellings managed by the Nunavut Housing Corporation available to Nunavummiut who meet certain eligibility requirements" (Government of Nunavut 2010).

The Nunavut Housing Corporation (NHC) has determined that the need for public housing has tripled over the past four years and estimates that that a total of 1,500 Nunavummiut are on wait lists for public housing units (CBC 2011). The Iqaluit Housing Authority (IHA) believes that at least 262 people from Iqaluit (hereafter Iqalummiut) are awaiting public housing in the territorial capital, displaying an increase from approximately 90 in 2007. Without affordable rental accommodations in the private market, many residents have no alternative to the government subsidized dwellings. As such, this particular demographic may become more prevalent in the future, thus highlighting the need for research. Characterization of the food security of public housing residents is therefore warranted, as it may guide policy prioritization and target appropriate interventions for this vulnerable population.

The Nunavut Housing Needs Survey, conducted from November 2009 to June 2010, is a survey of households throughout 25 communities in Nunavut. The main objective of the survey was to collect data on the housing needs of Nunavummiut. The survey has shown that public housing dwellings accounted for 19% of the housing stock in Iqaluit and 51% of the housing stock in Nunavut (Figure 5) (Government of Nunavut 2010). In order to be eligible for public housing in Iqaluit (not all communities have the same requirements), residents must live in Nunavut for two consecutive years with at least one consecutive year in Iqaluit and be at least 19 years old. Residents cannot owe any money to the NHC, the IHA, or the Power Corporation. Residents are not eligible if they reside in staff housing or are entitled to staff housing. Finally, residents do not qualify to apply for public housing if the household's gross annual income exceeds $90,500. The IHA, which manages public housing in Iqaluit on behalf of the NHC,

allocates housing on the basis of a point system that considers time spent on the waiting list, victims of violence, lower incomes, and poor health related to current accommodation.

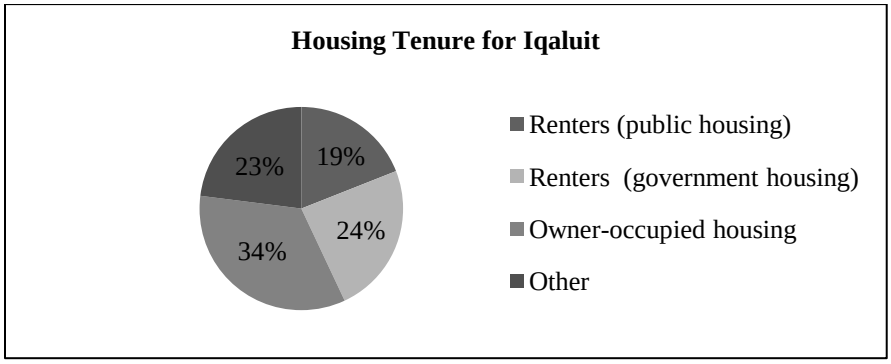

FIGURE 5. Housing tenure for Iqaluit, 2009/2010 (Government of Nunavut 2010).

4.4 LOGISTICS

Ethics approval was granted by McGill Research Ethics Board 1 (file number REB 195-0407) and a scientific research license was provided by Nunavut Research Institute (licence number 01 085 11N-M). Two students from the Nunavut Arctic College participating in the Environmental Technology Program, Daniel Kaludjak and David Nakashuk, were hired as research assistants. Both received training that included how to obtain informed consent, how to administer unbiased surveys, and how to ensure anonymity of respondents. Participants were given the option of completing their interview or survey in English or Inuktitut. Interpretations were provided by research assistants and translations were provided by Innirvik Support Services Ltd.

4.5 MIXED-METHODS APPROACH

A mixed-methods approach, or "multi-method approach" whereby data are accumulated by different methods but bearing on the same issue (Kohlbacher 2006), was

used to examine how Iqaluit's traditional food system is influenced by climatic extremes in the context of broader socioeconomic conditions. This approach is useful since "different methods have different strengths and weaknesses," so that "[i]f they converge (agree) then we can be reasonably confident that we are getting the true picture" (Gillham 2000). This mixed-methods approach involved the use of both quantitative and qualitative methods, thus allowing scientific knowledge and traditional knowledge to complement one another. Methods included collection and analysis of instrumental data, semi-structured interviews with local hunters, household surveys with public housing residents, and interviews with key informants, as well as participant observation. Findings were cross-checked with relevant literature. In recognition of the prevalent discourse on climate change introduced to Arctic communities, this research was not framed as a "climate change" project in order to avoid bias (Dowsley et al. 2010, Martello 2008). Instead, this project was framed in terms of interest in the interaction between anomalous environmental conditions and the traditional food system.

4.6 Data Collection

4.6.1 Instrumental Data

To characterize the nature of sea ice conditions during winter 2010/2011 and assess temporal trends, sea ice data were obtained from the Canadian Ice Service. Working closely with collaborators in the Department of Geography at the University of Toronto (Dr. William Gough and Rick Siewierski), ice charts were analyzed in order to determine break-up and freeze-up dates as well as length of ice stability for the Iqaluit region. Break-up and freeze-up dates are important because they control the length of time during which sea ice can be traversed, thus permitting or impeding hunting and fishing activities. Two sea ice cover thresholds were used to determine freeze-up: 5/10 sea ice coverage, which is commonly used to define freeze-up reflecting a ship-navigable water threshold (Gagnon and Gough 2005); and 9/10 sea ice coverage, which approximates sea ice that can be navigated by community members on snowmobile or on

foot (Laidler et al. 2009). For break-up, 5/10 ice coverage was used as the threshold, which is consistent with other work (Ford et al. 2009, Gagnon 2005, Gough 2004, Laidler et al. 2009). While sea ice data are available from the late 1960s, data from 1982 to 2011 were used, reflecting the higher level of confidence in the more recent data through improved technology (Ford et al. in review-b).

Temperature and wind records were also obtained for this 1982-2011 time period from Environment Canada's National Climate Data and Information Archive. Weather data are important because they influence the type of exposure to which the food system is subjected. Environmental data were analyzed in order to characterize temperature and wind conditions for the Iqaluit region. Data from 1950 to 2007 were made available from the Iqaluit Airport, after which the Automated Weather Observation Station took over from 2008 to present.

4.6.2 Interviews with Hunters

Interviews with local hunters were conducted in order to allow scientific knowledge and traditional Inuit knowledge to complement each other. Discussions with hunters were hoped to bolster and verify the results of biophysical data analysis and provide additional contextual insight. The aims of the interviews were to characterize the environmental conditions they experienced on the land during winter 2010/2011 compared to previous years (*exposure*), describe the impacts these conditions had on the hunters themselves as well as the wildlife (*sensitivity*), and identify what coping mechanisms they used to deal with environmental stresses (*adaptive capacity*)[1].

A total of 25 semi-structured interviews were conducted with local hunters during May 2011. In order to participate, hunters must have lived in Iqaluit for at least 5 years in order to have some baseline understanding of local environmental conditions. Hunters were also required to have been on the land during winter 2010/2011, thus enabling them to discuss how biophysical conditions "this year" (i.e. winter 2010/2011) compared to

[1] For the interview please refer to Appendix A.

"previous years" (i.e. winters preceding 2010/2011). The sample included Inuit as well as non-Inuit hunters, as all hunters contribute to the overall food security of the community. The sample was not restricted based on age, gender, or hunting experience because the interviews aimed to include a variety of perspectives in order to identify diverse determinants of exposure, sensitivity, and adaptive capacity. A purposive sampling strategy was used to identify participants who were involved with hunting and were knowledgeable about the local area. This strategy involved a variety of methods. Hunters with whom the Climate Change Adaptation Research Group had previously collaborated for the Iqaluit Land Use Mapping Project (Ford et al. in review-b) were contacted. Additional names of potential participants were provided by key informants from Amarok Hunters and Trappers Association, Nunavut Arctic College, Nunavut Research Institute, Project Nunavut, Iqaluit Enterprises, and Tukisigiarvik. Participants were also sought through CBC radio advertisements that aired in Iqaluit and through poster advertisements that were displayed at various locations throughout Iqaluit. Finally, the Country Food Market, an event where local hunters sell their country food to community members, was canvassed. A snowballing sampling strategy was subsequently used to further identify interviewees, whereby participants identified people who may be willing to take part, who in turn suggest others who might also wish to become involved (Berg 1988). A set of questions was designed to structure the interview, but also to allow for flexibility to explore emerging themes as they developed. Themes discussed during the interviews included perceived changes in environmental conditions; perceived changes in animal availability, access, and quality; challenges and opportunities presented by climatic extremes; adaptive strategies used to cope with environmental stresses; as well as factors affecting the ability to hunt. Throughout the interview, participants were encouraged to specifically compare environmental conditions during winter 2010/2011 to previous years. Participation was on a voluntary basis, and all interviewees provided informed consent. The number of hunters interviewed was wished to be determined by theoretical saturation whereby information presented becomes redundant (Eisenhardt 1989). However, due to the vast amounts of knowledge available as well as funding and time restraints, this was not possible. However, consistent trends and themes did emerge from the 25 interviews. Interviews were conducted at Nunavut Arctic College, Nunavut

Research Institute, or at the requested location of the participant. Interviews were not audio recorded and ranged from 20 to 40 minutes, and interviewees received a $40 gift certificate to Baffin Gas & Convenience as compensation for their participation.

4.6.3 SURVEYS WITH PUBLIC HOUSING RESIDENTS

Household surveys with public housing residents were conducted to explore the impacts that climatic extremes had on traditional food security in Iqaluit. A survey was used because it allows for a quantified baseline to be established with regards to food system and food security statuses during winter 2010/2011. Results from the survey can be analyzed statistically in terms of multiple variables, identifying determinants of food security. The standardized nature of the survey's closed-ended questions also allows for follow-up questionnaires, or comparative studies in other communities. Open-ended questions were added at the end to provide further description and contextualization of responses. The survey aimed to examine the extent to which environmental conditions during winter 2010/2011 were perceived to be anomalous compared to previous years (*exposure*), identify how country food was impacted and the challenges these conditions posed to the hunters in terms of procuring wildlife (*sensitivity*), and describe and characterize what coping mechanisms the residents used to deal with food-related stresses (*adaptive capacity*)[2].

A total of 100 household surveys were completed with Iqaluit residents living in public housing during May and June 2011. Public housing data were provided by the Iqaluit Housing Authority. Of the 471 households within Iqaluit's public housing jurisdiction, 398 were occupied at the time of field work. Of these 398 households, 81 (20%) were unilingual and spoke only Inuktitut. A randomized list of house numbers was created using Microsoft Excel's random number function and the list was subsequently ranked. A total of 266 houses were selected as the sampling frame until the desired sample size of 100 (25% of the total sample) was achieved. This sample size was selected because it was considered to be large enough to be representative but a manageable size

[2] For the survey please refer to Appendix B.

to be attainable within the length of the field season. Of the 266 households comprising the sampling frame, 88 were not available (i.e. were not home or were not accessible), 74 were not interested (i.e. did not wish to participate), 4 were not applicable (i.e. did not eat country food), and 100 were completed. Of the 100 surveyed households, 20 (20%) were unilingual and spoke only Inuktitut, which was a representative proportion of all public housing units.

The person who was most involved in making food choices of the household was asked to participate in the survey, which was based on the logic that they would be most knowledgeable about sharing and purchasing food for the household. As such, there were no gender requirements but women were expected to participate more frequently. The household was chosen as the unit of analysis because the household determines the relations, inside and outside the home, which are consequently relevant to analysis (Chabot 2003). Participants were required to be self-identified consumers of country food, specifically having eaten country food both this year and previous years in order for a meaningful comparison to be made in terms of country food availability, accessibility, and quality. The surveys were conducted using Apple iPads through Polldaddy application software. Polldaddy uses a website that allows users to create a survey, upload the survey to the iPad, upload responses to the server, export data in multiple formats, and share results with others. Both close-ended and open-ended questions were administered, covering themes such as household characteristics; prevalence of household hunters and/or workers; extent of sharing networks; perceived changes in country food availability, access, and quality; as well as coping mechanisms used to deal with food-related stresses. The survey was piloted with three volunteer community members before being administered to the larger sample. Participation was on a voluntary basis, and all participants provided informed consent. Surveys were completed at the home of or at the requested location of the participant. Surveys ranged from 20 to 30 minutes in length, and respondents received a $30 gift certificate to North Mart grocery store as compensation for their participation.

4.6.4 Interviews with Key Informants

Semi-structured interviews were conducted during November 2011 with key informants, such as municipal and territorial government representatives, local entrepreneurs, as well as wildlife biologists (please refer to Appendix C). These interviews provided additional contextual information that helped to understand the broader socioeconomic factors affecting Iqaluit's traditional food system.

4.6.5 Participant Observation

Participant observation involved nine weeks of field work during which the researcher experienced daily life in Iqaluit. This included going hunting with local hunters in order to experience the human-environmental interaction that is central to Inuit livelihood strategies. This method also involved participating in community feasts, attending public hearings regarding the Nutrition North program, going dog sledding, visiting Project Nunavut's Country Food Market, as well as partaking in both Inuit Culture Week and *Inuit Qaujimajatuqangit* Day. A research journal was kept in order to record relevant observations, impressions, and experiences.

4.7 Data Analysis

4.7.1 Instrumental Data

Detailed analysis of climate and sea ice data regarding the shoulder seasons of times of the year identified as a period of enhanced vulnerability and the period when changing conditions have their greatest effect on local hunters (November to December and April to May) (Ford et al. in review-b). This analysis was conducted by colleagues from the University of Toronto, Dr. William Gough and Rick Siewierski. Least squares regression was used to identify linear trends in sea ice and climatic variables over time, with tests considered significant at the 95% confidence level. The models for all

regressions were run using Excel's linear regression calculation and verified using the statistical software package STATISTICA for consistency.

4.7.2 Interviews and Surveys

Interviews, surveys, and participant observation notes were transcribed and analyzed using qualitative content analysis to identify key themes related to exposure, sensitivity, and adaptive capacity (Ford et al. 2008a, Ford et al. 2006c, Ford, Smit and Wandel 2006a). According to Gillham (2000), the "essence of content analysis is identifying *substantive* statements – statements that really say something" so interviews and surveys were analyzed as such. This thesis uses Mayring's method of qualitative content analysis (Mayring 2002), which applies a systematic, theory-guided approach to text analysis using a category system (Kohlbacher 2006). Specific attention was directed toward identifying opportunities and challenges presented during winter 2010/2011 in comparison to previous years. Narratives from the interviews and surveys were cross-referenced with instrumental data, archival sources, and participant observation, enabling data to be checked for consistency and credibility. Statistical analysis of survey data was conducted using IBM SPSS Statistics 19. Pearson's chi-squared analyses were conducted using a 95% confidence level. Fisher's exact tests were conducted using a two-sided alpha level of 0.05.

4.8 Positionality

It is important to recognize that the process of 'knowledge production' is socially constructed, situated, and value-laden (England 1994, Haraway 1991, Rose 1997), and that with this process comes the responsibility of acknowledging that power relations are embedded within the research process. The relationship between researcher and research participants is entrenched within complex social structures that influence the way they understand and perceive one another (Descartes 2007). It is therefore imperative to recognize how my positionality plays a role in my research (Rose 1997, Valentine 2002).

In the eyes of Iqaluit residents, my initial defining characteristics are that I am a young, middle-class, educated, *Qallunaat* (white) woman from a prominent university located in a large southern city. These characteristics can imply a sense of privilege and power. However, Iqaluit contains larger proportion of non-Inuit residents when compared to other Nunavut communities. As such, my presence and position was not as pronounced as it would have been conducting social science research elsewhere in the Canadian Arctic. Regardless, many academics have stressed the need to recognize and address asymmetrical power relations when doing cross-cultural research (Rose 1997). As such, I made many efforts to bridge the gap between researcher and resident in an attempt to adopt a role that would favour a reciprocal relationship (England 1994). In preparation for fieldwork, I conducted two preliminary visits to Iqaluit that served to familiarize myself with the local culture and customs. While living in Iqaluit, I immersed myself in the community as much as possible. For example, I learned basic greetings and phrases in Inuktitut despite my rudimentary knowledge of the language. I also attended various events that displayed my interest in the community beyond the context of my own research. While conducting interviews and surveys, I recognized that my academic position (in that I was conducting research) and my financial position (in that I was providing compensation) could influence the types of knowledge being divulged. A response to this was critical reflexivity, in that I constantly considered the impact that my positionality had on the collection of information as well as the analysis and interpretation of results (Valentine 2002). Identifying my positionality has allowed me to write this thesis critically, recognizing my impact on the research process and vice versa.

5. RESULTS

This chapter presents the results of quantitative and qualitative analyses. The food system of Iqaluit is described, with specific attention to those living under the jurisdiction of public housing. The vulnerability of the traditional food system is then analyzed in the context of exposure, sensitivity, and adaptive capacity. Barriers to adaptation are then explored.

5.1 INSTRUMENTAL DATA RESULTS

With regards to instrumental data analysis, the models for all regressions showed significance (p-value <0.01) for each model run, and all correlations were moderate (+/- 0.3-0.7). More specific results are incorporated throughout section 5.4 Exposure.

5.2 INTERVIEW AND SURVEY RESULTS

Twenty five interviews were conducted with local hunters (Table 3). The majority of hunters were male (92%) and Inuit (84%). Most were not originally from Iqaluit (64%), and of those born elsewhere the majority have been living in Iqaluit for between 10 and 20 years (36%). The hunters were asked to self-identify their hunting status, and referred to themselves as either full-time, part-time, or weekend hunters. Most interviewees identified themselves as being part-time (68%) hunters, with 20% hunting on the weekend and only 12% hunting full-time.

TABLE 3. Summary of key interview results[3].

		n (%)
Sex	Male	23 (92)
	Female	2 (8)
Inuit	Yes	21 (84)

[3] For full results please refer to Appendix D

	No	4 (16)
Age	20-29	4 (16)
	30-39	7 (28)
	40-49	6 (24)
	50-59	6 (24)
	60-69	2 (8)
Originally from Iqaluit	Yes	9 (36)
	No	16 (64)
Years living in Iqaluit (if not originally from Iqaluit)	Between 5 and 10	3 (12)
	Between 10 and 20	9 (36)
	More than 20	4 (16)
	Not applicable	9 (36)
Self-identified type of hunter	Part-time	17 (68)
	Weekend	5 (20)
	Full-time	3 (12)
Trend in number of people they support with their country food	Increasing	12 (48)
	Decreasing	3 (12)
	Staying the same	5 (24)
	No answer	4 (16)
Cost of hunting during 2010/2011 compared to previous years	Increased	14 (56)
	Decreased	3 (12)
	Stayed the same	8 (32)
Factor that had the greatest impact on the ability to hunt during winter 2010/2011	Environmental conditions	4 (16)
	Other factors	4 (16)
	Both environmental conditions and other factors	4 (16)
	No answer	13 (52)
Overall opinion regarding the relationship between environmental conditions and the ability to hunt during winter 2010/2011	Problematic	14 (56)
	Beneficial	0 (0)
	Problematic and beneficial	6 (24)
	No noticeable effect	5 (20)

One hundred surveys were conducted with public housing residents (Table 4). Most respondents were female (64%), with a bimodal age distribution of those aged 20-29 and 40-49 (each 25%). The majority of respondents were from Nunavut (94%), and over half of respondents were originally from Iqaluit (52%). Those who were not originally from Iqaluit have mostly lived there for more than 20 years (20%) and moved to Iqaluit for family reasons (25%). Most respondents were employed (28%), followed by similar proportions of unemployed (20%), retired (20%), or stay-at-home parents (19%). The most prevalent primary household income source was waged-employment (38%), followed by income support (25%). However, 54% of households claimed some sort of government assistance as a contributing, if not dominant, source of income. Many households indicated financial challenges; in terms having enough money to meet basic

needs, 39% of households described rarely or never having enough, 27% of households stated they sometimes have enough money to meet household needs, and only 34% of households often or always have enough. Almost half (45%) of households did not have any children under the age of 18. The majority (62%) of households confirmed the presence of a worker, but only 48% had at least one full-time worker. The public housing members were asked to self-identify hunting statuses, and referred to household hunters as either full-time or part-time hunters. While 38% of households confirmed the presence of a hunter, only 11% of households contained at least one full-time hunter.

TABLE 4. Summary of key survey results[4].

Individual Characteristics		
Sex	Male	36
	Female	64
Age	19 or younger	2
	20-29	25
	30-39	14
	40-49	25
	50-59	8
	60-69	12
	70 or older	14
Originally from Iqaluit	Yes	52
	No	48
Province of origin	Nunavut	94
	Quebec	4
	Ontario	1
	Other	1
Years living in Iqaluit (if not originally from Iqaluit)	Less than 5	5
	Between 5 and 10	10
	Between 10 and 20	13
	More than 20	20
	Not applicable	52
Reason for moving to Iqaluit (if not originally from Iqaluit)	Family	25
	Work	9
	School	6
	Personal	5
	Health	2
	Refused to answer	1
	Not applicable	52
Occupation	Worker	28
	Retired	20
	Unemployed	20

[4] For full results please refer to Appendix E.

	Stay-at-home mother/father	19
	Other	7
	Worker and hunter	3
	Hunter	3
Household Characteristics		
Primary household income source	Working	38
	Income support	25
	Old Age Pension	14
	Working and income support	10
	Other	8
	Working and Old Age Pension	5
Household income status	Always enough to meet basic needs	15
	Often enough to meet basic needs	19
	Sometimes enough to meet basic needs	27
	Rarely enough to meet basic needs	24
	Never enough to meet basic needs	15
Number of people living in the household	1	19
	2	21
	3	17
	4	14
	5	20
	6	3
	7	5
	8	1
Number of children under the age of 18 living in the household	0	45
	1	25
	2	15
	3	9
	4	4
	5	1
	6	1
Number of full-time workers living in the household	0	52
	1	36
	2	9
	3	3
Number of part-time workers living in the household	0	74
	1	25
	2	1
	3	0
Number of full-time hunters living in the household	0	89
	1	10
	2	1
	3	0
Number of part-time hunters living in the household	0	70
	1	25
	2	5
	3	0

5.3 IQALUIT'S FOOD SYSTEM

Iqaluit's food system is similar to that of other Inuit communities, and is based on both traditional country food and contemporary store food. While Iqaluit displays the dual food system characteristic of Canadian Arctic communities, it is becoming progressively dominated by store food at the expense of country food. Although Iqaluit has a variety of commercial food sources atypical to traditional Inuit communities, high costs and low incomes can cause these food resources to be prohibitive. Rapid population growth combined with augmented hunting pressure and decreased prevalence of hunters has impeded the availability/accessibility of traditional foods to those living in public housing. Since the amount of country food reaching the community anecdotally appears to be declining, the consumption of country food is hence reduced. As such, the cultural importance of traditional foods is seemingly stronger than ever amongst public housing residents as they value this increasingly limited food source.

5.3.1 IQALUIT RESIDENTS IN GENERAL

The food system of Iqaluit residents in general is representative of the typical Inuit dual food system. Country food is harvested by local hunters throughout the year. In terms of relevancy to this thesis, the most prevalent species harvested during the sea ice season and its shoulder seasons (identified here as November to May) include caribou, ringed seal, and Arctic char (NWMB 2004). Not only are these species the most commonly harvested, but they also account for the largest number of hunters harvesting them (NWMB 2004). Additional species harvested during this timeframe include ptarmigan, polar bear, walrus, narwhal, amongst others (NWMB 2004). Local hunters provide country food for their family and friends, and it is also common for Iqalummiut to attend communal feasts and informal gatherings for consuming traditional foods.

There are many grocery stores that offer store food in Iqaluit, the two largest being NorthMart and Arctic Ventures, as well as several restaurants. There are also commercial fast food chains including Tim Hortons, Pizza Hut, and Kentucky Fried

Chicken. These retail outlets provide Iqaluit with a more "southern" food system when compared to smaller Canadian Arctic communities that lack these options. Iqaluit's designation as the territorial capital has resulted in the community becoming increasingly accessible by plane, thus increasing the frequency of supply shipments. As such, Iqaluit does not suffer from flight delays as often as smaller communities whose transportation infrastructure is inferior. These flight delays are often associated with declining quality of perishable food items such as fresh fruits and vegetables (Beaumier and Ford 2010, Ford 2009, Ford and Beaumier 2010, Hopping et al. 2010) that have been associated with chronic disease prevention (Bazzano et al. 2002, Steffen 2006, Van Duyn and Pivonka 2000). While food prices are considered to be high in Iqaluit, they are more affordable than those in smaller communities. Iqaluit is one of the few communities in the Canadian Arctic with a number of community-based food programs. This includes a food bank that distributes food on a bi-monthly basis, a soup kitchen that serves meals daily, and a drop-in centre – the Tukisigiarvik Friendship Centre – that provides traditional foods daily.

5.3.2 Public Housing Residents in Particular

Only 4 of the 178 available public housing units contacted did not consume country food at all and were excluded from the survey. According to response criteria, all participating survey respondents consumed country food to some extent. Some households provided country food for themselves, with 11% having at least one full-time hunter and 30% of households having at least one part-time hunter. However, 62% had no hunter(s) in the household, and instead relied upon alternative sources of country food. When asked where they obtained country food from, respondents most commonly affirmed family (81%) and friends (78%) (Figure 6). These sharing sources were more common than buying country food from Iqaluit Enterprises (43%), obtaining it from Tukisigiarvik (26%), or purchasing it from the Country Food Market (25%). While proportions of country food and store food consumption were not sought in the survey, some households were anecdotally more reliant on store food than others. This dependence may be influenced by the absence of hunters in the household, strength of

sharing networks, presence of workers in the household, access to resources, or other factors.

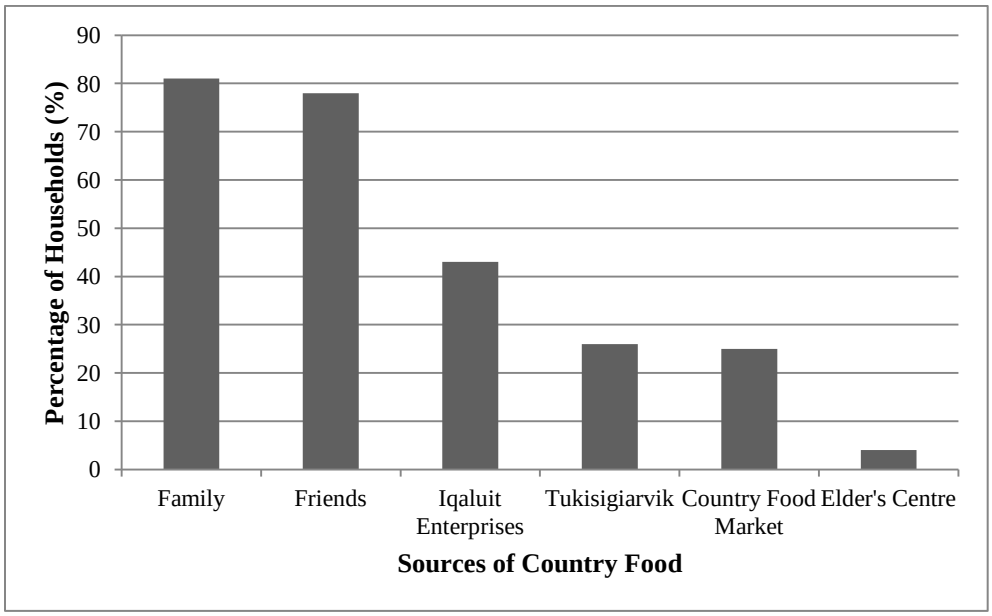

FIGURE 6. Sources of country food amongst public housing residents.

Seasonal variations were evident with regards to households having enough country food to meet household needs (Figure 7). In general, the most abundant seasons for country food were reported to be summer and spring, with 68% and 57% of households having enough or more than enough country food to meet household needs, respectively. The most challenging seasons were reported to be fall and winter, with only 50% and 51% of households having enough or more than enough country food to meet household needs, respectively. This emphasizes the importance of assessing the vulnerability of the traditional food system during winter 2010/2011, which coincides with when it is more difficult to obtain country food.

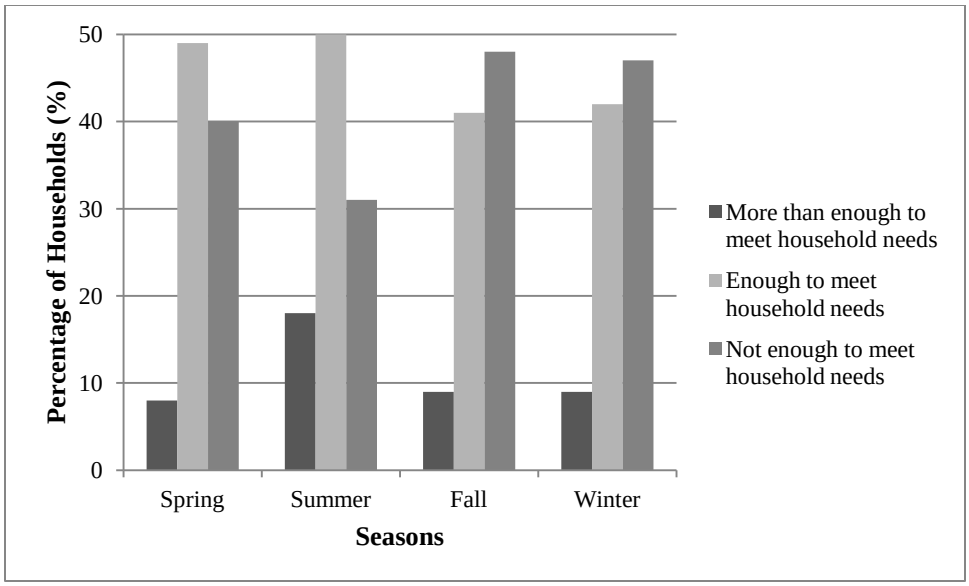

FIGURE 7. Seasonal availability/accessibility of country food amongst public housing residents with regards to meeting household needs.

An indication of the extent of food insecurity was drawn from the question, "Did you or anyone in your household not have enough money to buy store food and you could not get country food?" With regards to winter 2010/2011, 54% of households affirmed the validity of this statement. This displays a higher prevalence than previous years as only 46% of households confirmed this. Those that could not afford store food or could not get country food in previous years were more likely to encounter this situation during winter 2010/2011 (χ^2 = 35.56, df = 1, p < 0.01), suggesting chronic food security challenges. In order to gain a more accurate prevalence of food insecurity, a standardized food security questionnaire is required, such as the U.S. Department of Agriculture's food security survey module (FSSM). However, this was beyond the scope of this thesis.

5.4 EXPOSURE

Drawing upon instrumental data and hunter interviews, this section utilizes both scientific and traditional knowledge to characterize environmental conditions during winter 2010/2011 (Table 5). Some observations may appear contradictory, which could

be due in part to differences in timing or duration of hunting, or differences in hunting grounds frequented. These observations provide only a snapshot from winter 2010/2011 and are by no means exhaustive. However, many remarks are consistent with those noted in "*Inuit Qaujimajatuqangit* of Climate Change in Nunavut" which highlights a larger sample of Inuit experiences of recent climate and environmental change in Iqaluit (Government of Nunavut 2005), and the long-term Iqaluit Land Use Mapping Project (Ford et al. in review-b).

TABLE 5. Hunters' perceptions of environmental conditions during winter 2010/2011 compared to previous years. The number of hunters who made these observations is shown in parentheses, out of a possible total of 25 hunters.

General Weather	Sea Ice	Land

• Unpredictable weather (4)
• Extreme weather (2)
• Shift in season (later) (2)
• Temperature
  • Warmer (7)
  • Sun is stronger (1)
  • Only brief cold periods (3)
• Wind
  • Unpredictable prevailing wind patterns (3)
  • Shifts constantly (2)
  • More intense (1)
  • SE wind in the fall (mild conditions) but N wind in the winter (cold conditions) (2)
• Rainfall
  • More rain in the fall/winter (8)
  • Less rain in the spring (2)
  • Lots of rain (1)
• Snowfall
  • Fewer storms/blizzards (6)
  • More storms/blizzards (1)
  • Less snow in fall/winter (8)
  • More snow in spring (4)
  • Unusual snow patterns (2)
  • Less snow (3)
  • More snow (1)
	• Late freeze-up (25)
	• Predicted early break-up (9)
	• Thin ice (12)
	• Dangerous ice (10)
	• Unstable ice (3)
	• Unpredictable ice thickness (4)
	• "Rotten" ice (4)
	• Soft ice (2)
	• Closer floe edge (3)
	• Dynamic ice at floe edge (1)
	• Less snow on the sea ice (1)
	• Larger polynyas (1)
	• New polynyas (1)
	• Abnormally high tide (1)
		• Conditions were normal (4)
		• Thin snow (5)
		• Snow on ice (5)
		• Icy conditions (6)
		• Snow texture
		  • Softer (3)
		  • Harder (2)
		• Rapid snow melt (1)
		• Thick river ice (1)

5.4.1 General Weather

"We've had bad years in the past. This was extreme. This was special."[A5]

"The conditions are unpredictable now. They are different conditions than we've had before [winter 2010/2011]." [A]

"We had rain in February, and Inuit don't expect that. It's supposed to be the coldest time of year." [B]

With regards to general weather conditions, hunters reported numerous perceived environmental anomalies during winter 2010/2011 compared to previous years (Table 5). According to hunters, a common trend was that weather was more extreme and unpredictable than ever before. In terms of wind, unpredictability has manifested through erratic prevailing wind patterns affecting both directions (wind dominance) and strength (wind speed). Annual wind data, excluding summer, show a decrease in the dominance of wind from any particular direction from 1982 to 2010 (7% decrease in wind dominance, $p<0.01$). Winds are becoming more variable particularly during Nov-Dec, with an 18% decrease in wind predominance between 1982 and 2010. Whereas hunters could traditionally rely on personal observations for assessing weather conditions, this is becoming less feasible due to unpredictable winds. As such, it was reported that there is increased reliance on weather forecasts. Volatile weather can prove dangerous for those on the land. Hunters who could traditionally predict the onset of storms or blizzards are increasingly caught off guard, potentially placing them in perilous situations. Wind data – collected at the airport but indicative of general trends in the region – also indicate a significant ($p<0.01$) increase in wind speed of 1m/s over the observation period, most pronounced during Nov-Dec when speed has increased by 1.6m/s ($p<0.01$), and by 1.8m/s in Jan-Feb ($p<0.01$). Average wind speed for the months Apr-May show a slighter increase of 0.79m/s ($p=0.04$) over the observation period, which is less pronounced but may still contribute to earlier ice break-up. Stronger winds were also reported in interviews, and can be dangerous while boating, can cause whiteout conditions in winter, and can rapidly disintegrate the ice during break-up. Using a rough wind speed threshold of 5.56m/s (20km/h) after which hunters are less inclined to hunt due to wind chill, white

[5] For characteristics of individuals quoted, please refer to Appendix F

out, and implications for boat use (Wenzel, personal communication), analysis of wind data indicates a significant ($p<0.01$) increase in the number of days when average wind exceeds this threshold, extending the number of days when we infer hunting is not possible by 44.8. This trend is being driven primarily by increased wind speed in Nov-Dec and Jan-Feb.

With regards to temperature, hunters noted that winter 2010/2011 was generally warmer than previous years. While cold temperatures were also experienced, hunters noted that they only lasted for a brief period of time. Weather station data indicate an increase in annual average temperature of ~1.3°C/decade over the 1982-2010 period for a total of 3.6°C ($p<0.01$) (Figure 8). The year 2010 was anomalous throughout the recorded temperature data: average annual temperature was -4.3°C which is 4.9°C warmer than the average (-9.2°C), maximum average temperature was 2.4°C warmer than the warmest year previously, while minimum average temperature of -8.0°C in 2010 was 5.1°C warmer than the average (-13.1°C). This anomalous warmth contributed to late freeze-up as it prevented ice from forming. Warm temperatures also melted existing snow, thus leading to icy conditions when temperatures subsequently dropped. The strength of the sun was also believed to be stronger, and was reported to be causing sunburns that were previously unheard of/were not typically experienced. Warm temperatures, however, were also beneficial in that exposure to extreme cold was reduced and more hunters were able to go on the land. Usually, extremely cold conditions prevent some hunters from leaving town.

To further solidify winter 2010/2011 as an anomaly, the average minimum temperature for 2010 (Nov-Dec aggregated) should be discussed (Figure 9). The *minimum* temperature for Nov-Dec 2010 was -8.6°C. Previous to 2010, the *highest maximum* temperature recorded over the study period was -7.0°C in 1985. This is only 1.6°C warmer than the record high minimum temperature of 2010, meaning that the 2010 record minimum temperature approached the post-2010 highest maximum temperature, indicating that 2010 was an anomalous year and does not confer with the trend of the previous 28 years.

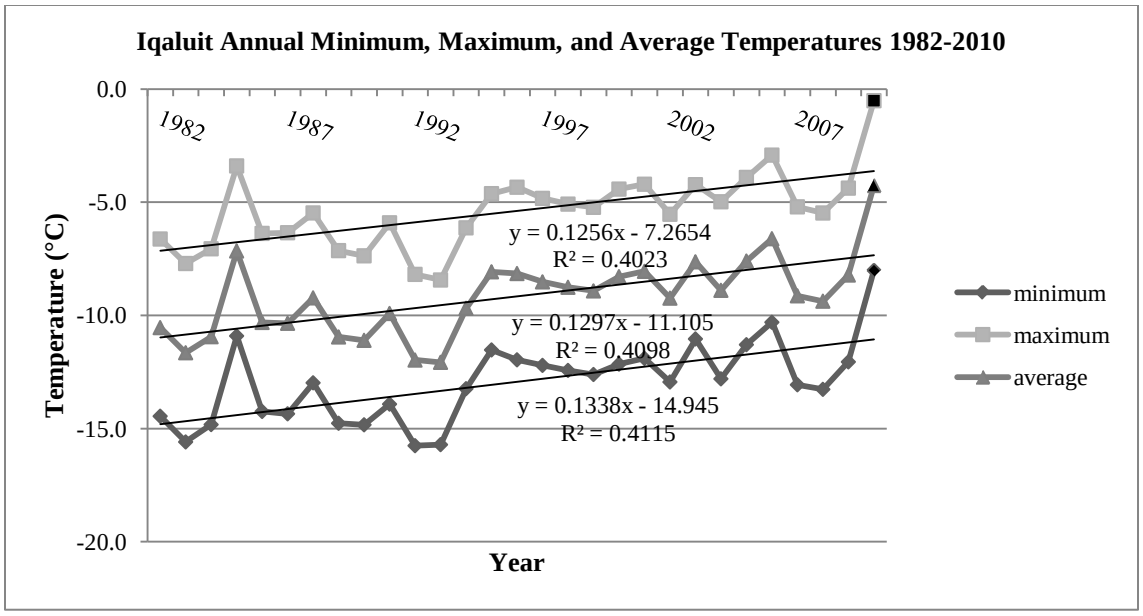

FIGURE 8. Iqaluit annual minimum, maximum, and average temperatures 1982-2010, with 2010 highlighted in black (provided by Rick Siewierski).

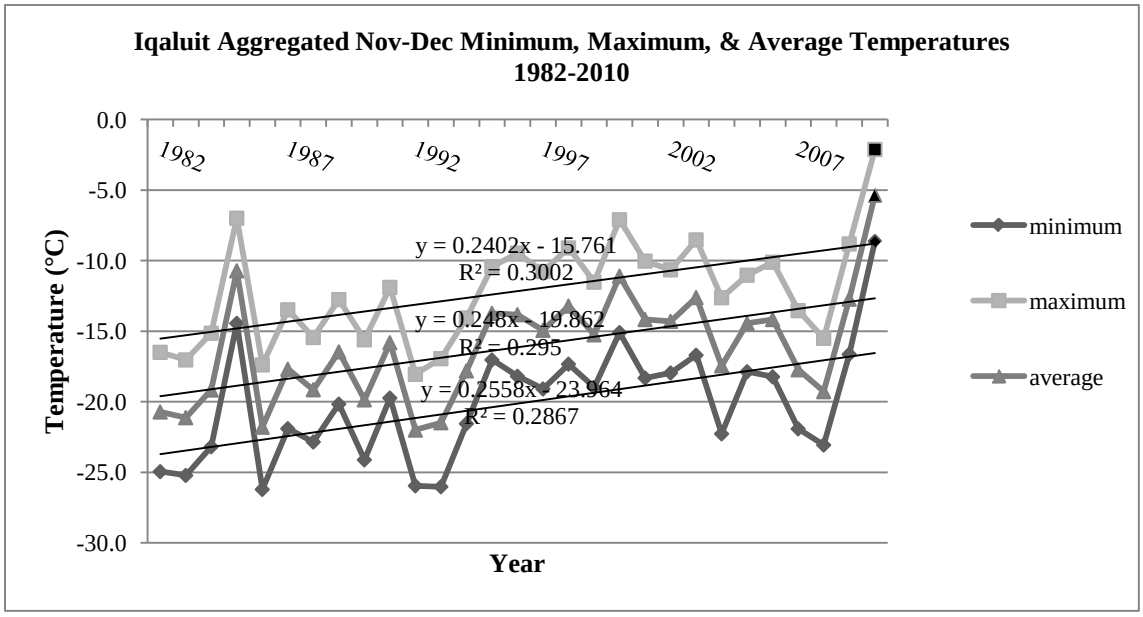

FIGURE 9. Iqaluit aggregated Nov-Dec minimum, maximum, and average temperatures 1982-2010, with 2010 highlighted in black (provided by William Gough and Rick Siewierski).

Precipitation patterns were also described as atypical during winter 2010/2011 compared to previous years. Hunters noticed more rain during the fall and winter, and less rain during the spring. In contrast, hunters reported less snow in the fall and winter, and more snow in the spring. These anomalies were perhaps summarized best by one hunter who stated in May 2011 that the "season has shifted." Instrumental data on precipitation are not available.

5.4.2 SEA ICE

"Now ice is not forming as quickly as the past. That's something I've learned and seen."[C]

"Very knowledgeable hunters have had accidents [this year], and that says a lot, to me."[D]

When asked which conditions had the most significant effect on their hunting activities during winter 2010/2011, the majority of hunters (68%) described abnormal sea ice conditions. These conditions were described as generally unfavourable (Table 5). Poor sea ice conditions are problematic since, according to Riewe (1991), 32% of Iqaluit's hunting territory is traditionally situated upon sea ice, thus reducing extant hunting areas, and many inland trails requiring travel over the frozen ocean, lakes, and rivers. Interviewees unanimously noted that the timing of freeze-up was much later than traditionally. Indeed, winter 2010/2011 was statistically anomalous in that freeze-up did not happen until January 24, 2011 – the latest ever recorded, occurring 59 days later than the 1982-2010 average of November 26th (Figure 10). Previous to the CIS sea ice record, the formerly anomalous late freeze-up date, as of 1967, was December 4th, which occurred in 1973 (No Author 1976). Late freeze-up severely impeded typical hunting activities because hunters were unable to use the sea ice of Frobisher Bay to access traditional hunting grounds until very late in the sea ice season. For example, the trail that leads to the community of Kimmirut is located across Koojesse Inlet, and was inaccessible until January due to the absence of sea ice. This forced hunters to rely on alternative hunting grounds (i.e. land-based areas) or alternative hunting methods (i.e. boating).

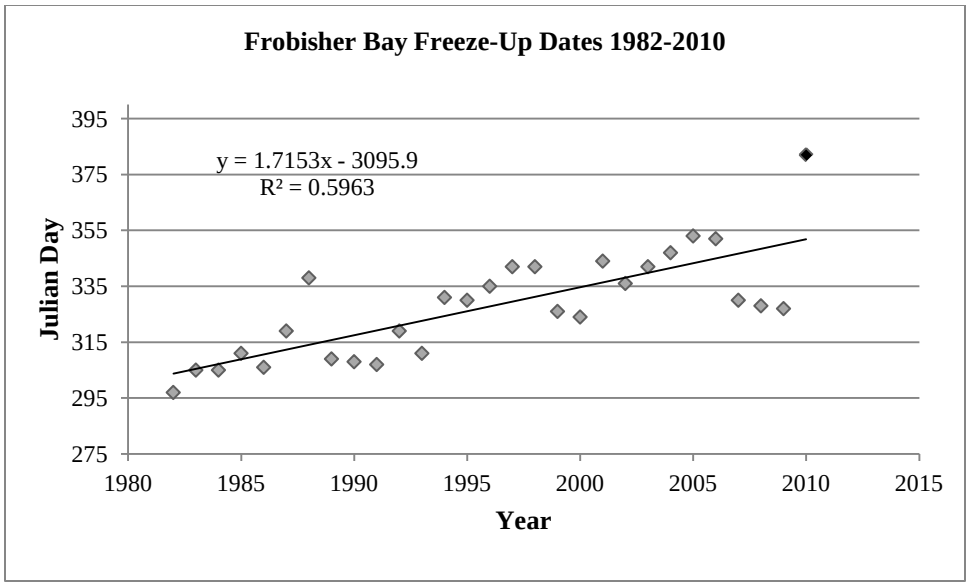

FIGURE 10. Frobisher Bay freeze-up dates 1982-2010, with 2010 highlighted in black. Since 2010 freeze-up occurred on January 24, 2011, the Julian Day indicator is extended beyond 365 days, resulting in a total of 381 days (provided by William Gough and Rick Siewierski).

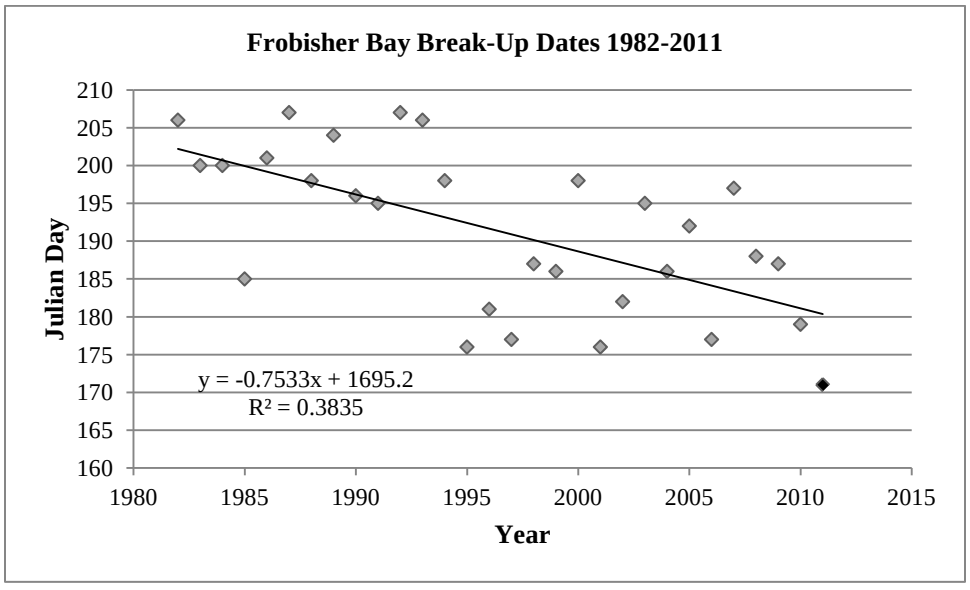

FIGURE 11. Frobisher Bay break-up dates 1982-2011, with 2011 highlighted in black (provided by William Gough and Rick Siewierski).

During winter 2010/2011, break-up occurred on June 20, 2011 (Figure 11). Previous to the CIS sea ice record, the formerly anomalous early break-up date, as of 1967, was June 27, which occurred in 1976 (No Author 1976). When combined with late freeze-up, this led to a shorter sea ice season. Analysis of CIS charts indicates a significant delay in ice freeze-up of 1.7 days per year or 50 days between 1982-2010 ($p<0.01$). Not as pronounced but still significant, ice break-up has occurred 0.8 days earlier per year ($p<0.01$) or 23 days earlier over the same timeframe. Concurrent with these trends, the open water period has extended by 2.4 days per year, with the period of open water during 2010 lasting for 203 days. This is the first time throughout the observation period that the open water period has exceeded the stable ice period (Figure 12). The shorter sea ice season limited the amount of time during which hunters could use the sea ice as a platform for hunting or for accessing hunting grounds. On the other hand, late freeze-up and early break-up also meant that there was a longer open water season, enabling hunters to boat for a greater length of time.

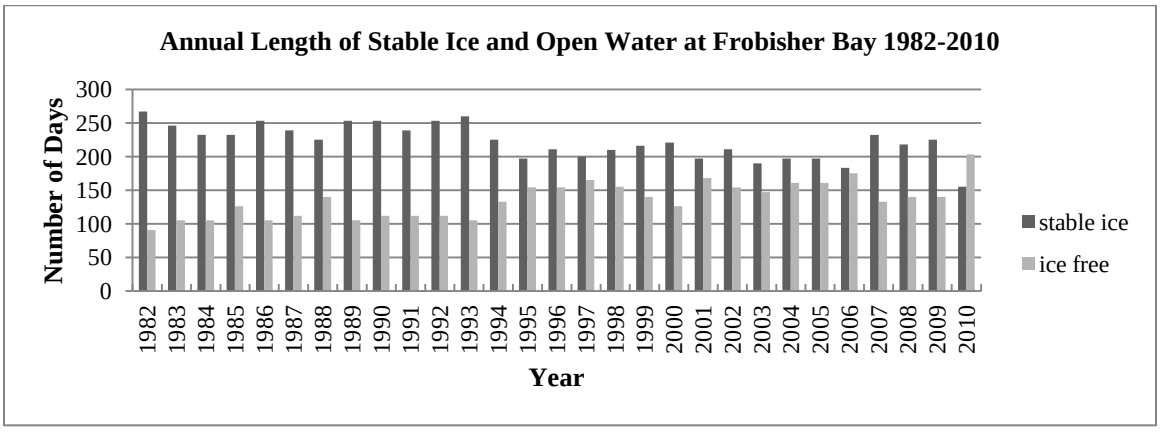

FIGURE 12. Annual length of stable ice and open water at Frobisher Bay 1982-2010 (provided by William Gough and Rick Siewierski).

When the sea ice finally formed, hunters noted it was thinner and more dangerous than previous years. Hunters who were normally able to predict the thickness and safety of the sea ice were unable to confidently navigate across the bay. A few hunters attributed

this to a difference in the way in which the sea ice melted in the spring. They explained that the ice melted more often from the bottom via oceanic convection rather than from the surface via solar radiation. Under normal conditions, heat from the sun causes overlying snow to melt and form pools of water on the surface of the ice. As the melt ponds grow, albedo decreases and absorption of solar radiation increases, causing the melted pools to eventually deepen and reach the ocean water below (NOAA 2003). Then, cracks caused by strong tides widen into open leads, giving rise to ice movement and final break-up which is affected by brisk and changing winds (No Author 1976). However, energy to melt sea ice can be provided by other sources than direct solar radiation. Increasingly warm surface water beneath the sea ice causes the *bottom* of the ice to melt rather than the *top* (NSIDC 2011a). This less familiar process is becoming increasingly common as oceanic temperatures rise. The hunters consider these changing sea ice thermodynamics to be problematic since the "rotten ice" is often unidentifiable from above, causing concern since these soft spots pose as a hazard.

The position of the floe edge varies from year to year according to severity of weather conditions and the date of freeze-up (Meldrum 1975). Hunters noted that the floe edge was closer to Iqaluit during winter 2010/2011 than in previous years. This caused problems for those wishing to access hunting grounds located further down the Bay, beyond the more proximal floe edge. In these instances, hunters were required to take less favourable overland routes instead of traversing the sea ice like normal, thus increasing the amount of time, fuel, and skill necessary. Despite these inconveniences, the closer floe edge was also viewed as an opportunity. The reduced distance was beneficial for those who went seal hunting at the floe edge as shorter trips were required.

The variable sea ice conditions during winter 2010/2011 had ramifications in terms of hunter safety as it was increasingly difficult for hunters to navigate through dangerous areas of instability. It was anecdotally noted that more accidents happened during winter 2010/2011 due to the extreme and unpredictable conditions. Two hunters reported having to rescue people who had fallen through the sea ice during the past winter. One hunter described a personally harrowing ordeal that involved falling through the sea ice while polar bear hunting almost 200 kilometres from Iqaluit. He managed to

stay afloat by climbing onto his snowmobile and empty gasoline containers while he waited for a rescue team to arrive. He was fortunate to be saved, and the loss of his snowmobile and equipment was rendered insignificant compared to his loss of trust of the sea ice. The accident did not necessarily prevent him from using the sea ice, yet he was admittedly more cautious and preferred traveling over land when given the option. As a prolific hunter with 20 years experience, he said that "the ice was different than anything else I've ever traveled on," reinforcing the abnormality of the sea ice conditions last year. While experienced hunters are more likely to have the skills necessary to avoid hazards on the sea ice, it is evident that they are not exempt from danger.

5.4.3 LAND

"Land-wise it's not so bad."[B]

Conditions on the land were widely regarded as more favourable than those on the sea ice (Table 5). In fact, some hunters reported that conditions on the land were normal and did not differ from previous years. Other hunters reported that conditions on the land were not without issue. Unfavourable conditions described by local hunters appear to coincide with those outlined by the ILMP hunting team (Ford et al. in review-b). Grievances on the land, although unfavourable, were not necessarily worse during winter 2010/2011 than they have been during recent years. It should be noted, however, that these issues certainly deviate from long term observations. Regardless, environmental conditions on the land during winter 2010/2011 are still described because, when combined with the anomalous sea ice conditions, they exacerbate the level of exposure to which the traditional food system was subjected.

A common grievance was that the snow was thin, and did not adequately cover the terrain over which hunters would travel. In Iqaluit, common routes were no longer useable because there was not enough snow coverage to travel by snowmobile. Exposed rocks led to increased damages to equipment such as snowmobiles and *qamutiit* (traditional Inuit sleds), thus requiring hunters to pay for the damages when affordable or prohibiting them from hunting when unaffordable. Thin snow also caused problems for

liquid cooled snowmobiles that require adequate snow cover in order to function properly. These snowmobiles overheat when there is not enough snow thrown from the skis and track onto the heat exchangers to cool the engine. Owners of liquid cooled, as opposed to fan cooled, snowmobiles were therefore more greatly impacted by these particular environmental conditions, suggesting differential sensitivity to inadequate snow cover.

Another unfavourable observation on the land was the presence of icy conditions, with specific attention being paid to snow overlaying ice. Warm temperatures and late winter rainfall were followed by freezing temperatures, leading to icy conditions on the terrain. Subsequent snowfall then covered the ice, causing problems for those who could not recognize the obscured hazard. This had implications in terms of hunter safety, as one interviewee slipped and injured himself when trying to walk up a slippery hill to retrieve a ptarmigan he had shot. Afterward, he was unable to hunt for some time due to this injury. Hunters also noted changes in snow texture, which affected their ability to hunt. Softer snow makes it more difficult to travel by snowmobile, thus increasing the amount of gasoline required and the price of hunting. On the other hand, harder snow associated with freeze-thaw cycles was still problematic. Again, issues with liquid-cooled snowmobiles overheating arose due to the fact that solid snow could not be adequately thrown onto the engines.

5.5 SENSITIVITY

This section describes the sensitivity of Iqaluit's traditional food system to the aforementioned anomalous conditions experienced during winter 2010/2011 (exposure). Interviews with hunters and surveys with public housing residents respectively outline variation in wildlife on the land and country food in the community. Hunters noted variability in the availability, accessibility, and quality of wildlife, and public housing residents consequently noted similar changes in that of country food in Iqaluit.

5.5.1 WILDLIFE

Interviews with local hunters described availability, access, and quality of wildlife during winter 2010/2011 (Table 6). Although hunters commented on a variety of species, this section focuses on ringed seal (hereafter "seal"), caribou, and Arctic char. This focus is warranted as these species are deemed to be the most significant in terms of amount harvested (NWMB 2004) and are actively hunted during the winter 2010/2011 timeframe considered for this study.

TABLE 6. Hunters' perceived changes in wildlife availability, accessibility, and quality, as well as amount harvested during winter 2010/2011 compared to previous years. The number of hunters having made these observations is shown in parentheses, out of a possible total of 25 hunters.

Species	Availability	Accessibility	Quality	Amount Harvested

Seal	• More (15)
	  • Most ever (3)
	• Fewer (3)
	  • Fewer seal pups (due to melted snow dens and increased polar bear prevalence (1)
	• More harp seals (3)
	• More ringed seals (1)
	• Fewer ringed seals (1)
		• More accessible (5)
		  • Due to close proximity to town (2)
		  • Due to thin ice (1)
		  • Due to late freeze-up (1)
		  • Seal pups due to melted snow dens (1)
		• Inaccessible due to poor ice conditions (2)
			• Less fat/thinner (4)
			• Stressed due to increased polar bear prevalence (1)
			• Burnt skin (2)
			  • Difficult to work with (1)
			• Tastes different (3)
			  • Tastes burnt (1)
			• Hairless (1)
			• Sores (1)
				• More (4)
				• Fewer (1)

Caribou	• Fewer (14)
	• Herd has not returned (2)
	• Herds are smaller (2)
		• Further away (15)
		  • Furthest ever (1)
		• No longer near Ward Inlet (1)
		• Near Amadjuak Lake (3)
		• Toward Pangnirtung (1)
		• Closer to town (1)
			• Less fat/thinner (6)
			• Burnt skin (1)
			• Healthy (1)
				• More (2)
				• Fewer (7)
				• Same (3)
				  • Delayed (1)

Arctic Char	• More (5) • Same (3) • Fewer (1)	• More accessible (due to thin ice) (1) • Less accessible (1)	• N/A	• More (1) • Same (1)
Generic	• Same (2)	• Location and patterns of movement are	• Same (14) • Tastes better because it's less	• More (2) • Less (7) • Same (9)

	different (1) • Land-based animals are far (1) • Sea-based animals are normal (1)	common (2)	• Same, but different timing and distribution (3)

AVAILABILITY & ACCESSIBILITY

"There was a window of opportunity for seals."[E]

"This year, we did not see a lot [of caribou]. We only saw small amounts. When we did see them, all of them got shot."[A]

"When I'm boating, I see char galore."[B]

"For caribou you have to go a distance. It has been close to 10 years since caribou were really close by."[F]

Most hunters reported that winter 2010/2011 brought more seals to Frobisher Bay compared to previous years, and a few hunters even stated that this was the best year ever in terms of seal availability. While there were discrepancies between observations, the general trend was that the seal population was thriving. Perhaps there was a greater number of seals, but a more likely reasoning would be that the seals were simply more accessible during winter 2010/2011 for a variety of reasons. Hunters suggested that the seals were coming closer to town, reducing the distance they would have to travel to reach them. Another hypothesis was that the thinner ice allowed seals to make breathing holes more easily, increasing the likelihood of seals surfacing and becoming visible to the hunter. An alternative proposition was that late freeze-up allowed a longer period of boat access when sealing, which was, for some, more preferable than traversing the dangerous sea ice. The accessibility of seal pups was also believed to have increased as warm temperatures melted their snow dens, leaving them exposed on the sea ice. This has been observed on the coast of southeast Baffin Island in the past, when periods of warm weather and heavy rainfall caused the slumping and collapse of subnivean lairs, increasing the exposure of young seal pups on the sea ice, where they were subjected to thermoregulatory stress as well as increased levels of predation by polar bears and arctic foxes (Stirling and Smith 2004). While these observations of increased accessibility seem positive, the hunters did not neglect the fact that poor sea ice conditions prohibited many hunters from accessing hunting grounds and capitalizing on this opportunity. In some

instances, increased availability was negated by decreased accessibility associated with poor ice conditions.

In contrast to seals, most hunters reported that caribou were less available during winter 2010/2011 compared to previous years. Two hunters stated that that the caribou herds had not returned, and those herds that did return were smaller than previous years. In addition to the reduced amount of caribou, the caribou herds were widely reported to be further away from Iqaluit. While this has been observed over the past few decades, it was especially notable during winter 2010/2011. According to Kivalliq regional biologist Mitch Campbell, icing is usually most severe along the coast where there are open leads. Previous years have encountered incidents of severe icing, and during those years caribou collars showed a dramatic movement far inland to where icing was either non-existent or much less severe. This might account for why caribou in Iqaluit were so distant during winter 2010/2011 – icy conditions due to freeze-thaw cycles were prevalent.

Caribou harvesting statistics from 1965 and 1966 indicate that hunting pressures were previously focused along the northeast coast of Frobisher Bay, with the greatest annual kill density adjacent to the community itself (Figure 13). However, this is no longer the case. During winter 2010/2011, hunters described having to travel to Amadjuak Lake and toward Pangnirtung to find caribou, both of which are much further than traditional hunting grounds. For example, the distance to Amadjuak Lake is 150 to 200 kilometers, depending on the route taken. In the 1940s, sufficient caribou could be found within a 75 mile (~120 kilometer) radius to meet the needs of the Inuit inhabiting Frobisher Bay and the west end of Cumberland Sound (Journal and Wright 1944). The hunting areas around Amadjuak Lake and toward Pangnirtung do not solely pertain to winter 2010/2011, but the regularity of their use increased last year due to necessity for reaching distant caribou. These areas frequented during winter 2010/2011 had the second and third lowest caribou kill densities during 1965 and 1966 (Figure 13). When considering availability of caribou, it should be noted that this caribou kill density map also reflects caribou migration patterns that vary broadly from year to year as well as hunter preferences that may be influenced by factors other than caribou distribution. In terms of caribou accessibility, favourable environmental conditions on the land did not

prevent hunters from accessing the animals. However, since the herds were so far away some hunters had neither the financial means nor the available time required to go such distances. For instance, full-time hunters who had ample time to go hunting sometimes could not afford the extra gasoline. On the other hand, weekend hunters engaged in wage labour throughout the week could not complete such distant hunting trips given their mere two days off work. For caribou, normal accessibility associated with decent conditions on the land was negated by both decreased availability (i.e. smaller herds) and decreased accessibility (i.e. further herds).

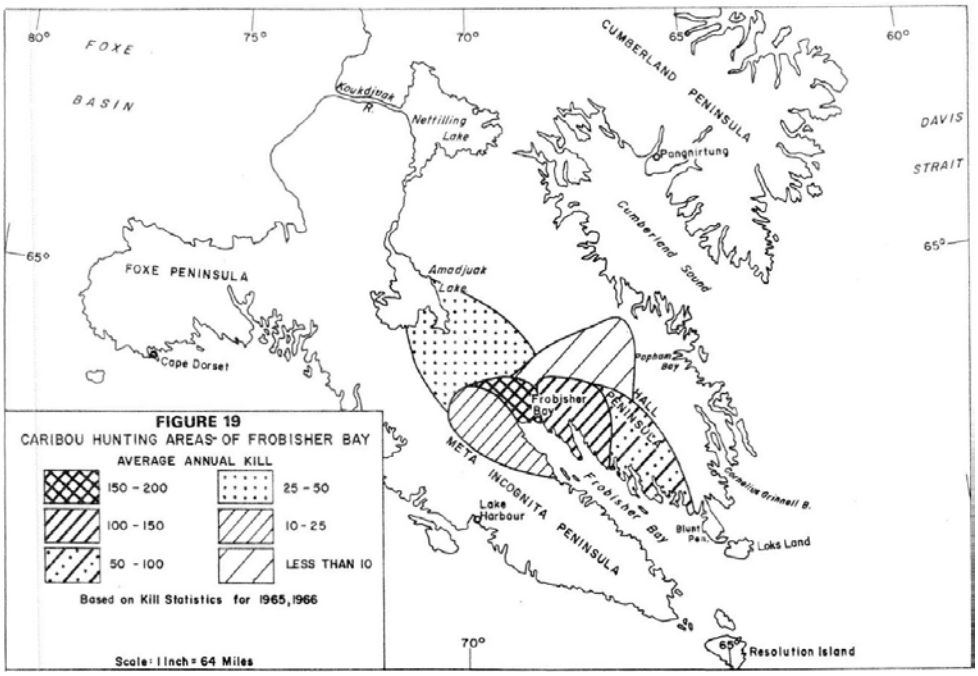

FIGURE 13. Map of traditional caribou hunting areas surrounding Iqaluit (Frobisher Bay) during 1965 and 1966. Hunting pressures were previously focused along the northeast coast of Frobisher Bay, with the greatest annual kill density adjacent to the community itself (Meldrum 1975).

Arctic char were less noteworthy in that hunters did not often discuss the availability and accessibility of char during their interviews. Most hunters who discussed the availability of Arctic char stated that there were more during 2010/2011 than previous years. However, almost as many hunters believed that the amount of Arctic char was the

same. The accessibility of Arctic char was not a common discussion point; only one hunter hypothesized that they were more accessible due to thinner sea ice that facilitated boring holes. As such, findings regarding Arctic char were inconclusive.

QUALITY

The majority of hunters believed that the overall health of wildlife had not changed from previous years. However, some hunters noted that seal and caribou were thinner and had less fat during winter 2010/2011. For caribou, accessibility of winter forage depends on plant biomass, snow depth, and snow hardness; exceptionally deep snow or ice crusts may result in starvation and increased animal mortality (Heggberget, Gaare and Ball 2010). While deep snow was not a concern during winter 2010/2011, ice crusts were. Local caribou were impacted by icy conditions that prevented many herbivores from accessing their forage. Vegetation became locked into the ice, and was therefore unavailable for the animals to eat. In severe cases this can cause starvation, and these conditions have proved harmful to wildlife health in the past. Another observation regarding quality was that seals and caribou were described as having burnt skin. Hunters hypothesized that this may have been due to increased strength of the sun. This is thought to have caused differences in taste, as well as challenges when preparing skins for clothing since the skin is less malleable.

5.5.2 COUNTRY FOOD

Surveys with public housing residents described availability, access, and quality of country food during winter 2010/2011. Although residents commented on a variety of country foods, this section focuses on caribou, seal, and Arctic char in accordance with the previous section. These three species are the top contributors to protein in the Baffin diet, offering 32.6%, 11.5%, and 10.4% of energy, respectively during the late-winter (Egeland et al. 2009).

AVAILABILITY & ACCESSIBILITY

"This is the worst year [for obtaining country food] since I can remember."[G]

"There is [sic] not many places I can get it. Even from friends. There is not much available."[H]

"Last year my freezer was full. Now it's empty."[I]

"This year there was barely any country food. Everyone is searching for it."[J]

When discussing the availability/accessibility of country food in Iqaluit, a recurring trend among public housing residents was that winter 2010/2011 was more challenging than previous years (Figure 14). Statements were frequently made regarding the general difficulty in obtaining traditional food.

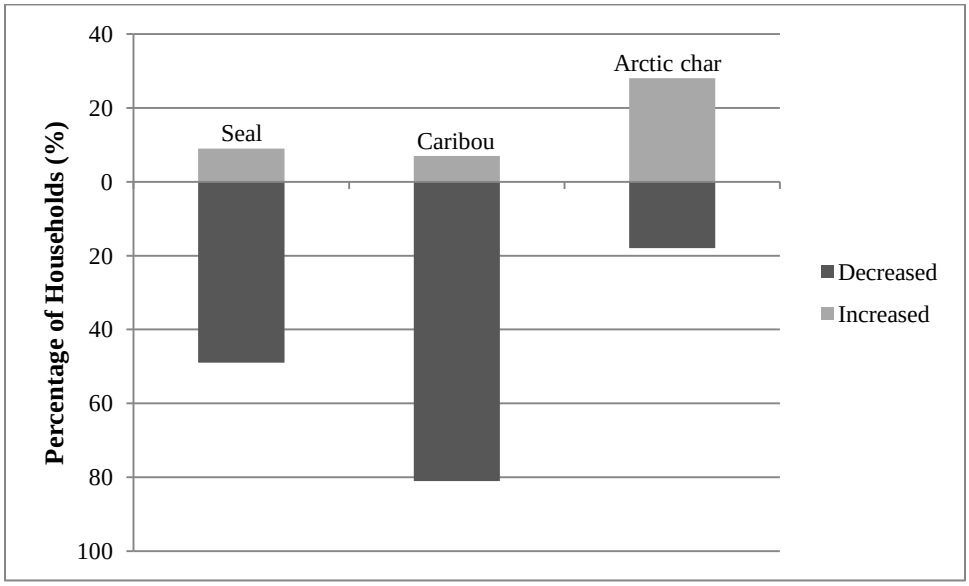

FIGURE 14. Availability/accessibility (discussed in junction) of seal, caribou, and Arctic char during winter 2010/2011 compared to previous years as reported by public housing residents.

Even though hunters noted increased availability of seals, the reduced accessibility likely prevented them from capitalizing on this opportunity. Evidently, the supply of seal to the community has been affected as 49% of residents said that seal was more difficult to get during winter 2010/2011 compared to previous years. While 60% of

hunters expressed that seals were more available during winter 2010/2011, only 20% of hunters thought that they were more accessible (Table 6). Indeed, only 16% of hunters claimed to have successfully hunted more seals during winter 2010/2011 compared to previous years. Therefore, despite the fact that the majority of hunters found seals to be abundant, harvesting them was likely impeded by lack of access to a boat during the open water season and dangerous ice conditions during the stable sea ice season. As such, anomalous environmental conditions during winter 2010/2011 prevented hunters from taking advantage of this opportunity for harvesting seals, potentially causing the decreased availability/accessibility seal meat amongst public housing residents.

Hunters widely reported decreased availability and accessibility of caribou, thus impeding their ability to harvest this species. This likely translated to challenges in obtaining caribou meat in town, as 81% of residents believed it was more difficult to obtain caribou meat during winter 2010/2011 compared to previous years. This dramatic decrease in availability/accessibility is interesting in that caribou access is largely determined by land access, yet land routes were not considered to be particularly anomalous during winter 2010/2011. So, while environmental conditions did not impact the hunters themselves they did affect the distribution of caribou. The icy conditions that resulted from warm temperatures likely caused the caribou to seek alternative foraging grounds further inland, reducing both the availability and accessibility of caribou herds. These further distances were not feasible for some hunters to travel due to financial barriers or employment constraints. As such, these broader socioeconomic conditions have influenced the sensitivity of the traditional food system.

The supply of Arctic char was less volatile, and a plurality of residents (47%) believed the availability/accessibility of Arctic char was the same as previous years.

Difficulties obtaining traditional food resulted in changes in the consumption of country food (Figure 15). As expected, patterns of consumption for seal, caribou, and Arctic char coincide with those of availability/accessibility. Seal and caribou were mostly reported to be more difficult to obtain (49% and 81%, respectively), and the majority of residents reported a decrease in consumption of these species (51% and 56%, respectively). The availability and accessibility of Arctic char was predominantly the

same as previous years (47%), and the consumption was primarily reported to be the same as well (59%). Overall, 21% of respondents did not eat less of any of these three species this during winter 2010/2011 compared to previous years. However, 43% reported eating less of one species, 25% reported eating less of two species, and 11% reported eating less of all three species. Interestingly, the presence of a hunter in the household meant that households were less likely to reduce their consumption of multiple species (χ^2 = 12.74, df = 3, p = 0.05). Other factors such as the presence of a worker in the household, strength of sharing networks, and engagement in intercommunity sharing networks did not predict reduced consumption of multiple species. This decrease in consumption of country food might lead residents to seek alternative sources of nourishment, such as consuming greater quantities of store food, thus contributing to the nutrition transition.

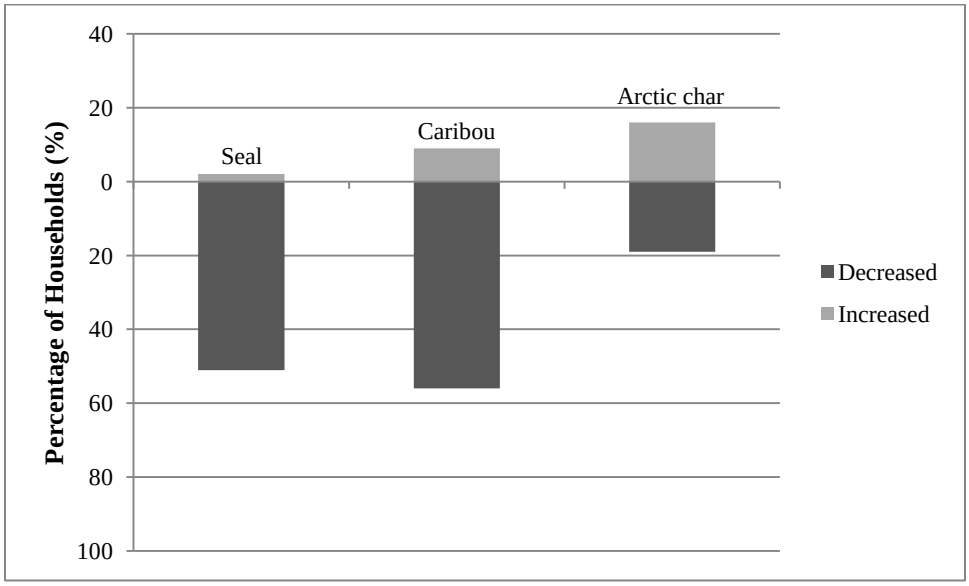

FIGURE 15. Consumption of seal, caribou, and Arctic char during winter 2010/2011 compared to previous years as reported by public housing residents

QUALITY

"The quality is different. The taste is different. The caribou are a bit skinny, and that makes a big difference because we eat [caribou meat] all year round."[H]

Public housing residents widely reported differences in the quality of country food, which is important because quality is one of the influential components of food security. Many residents noticed that animals were skinnier and had less fat than expected. This observation was noted predominantly for caribou, but also for seals, geese, ptarmigans, rabbits, belugas, and walruses. Residents suggested that herbivores were skinnier this year due to icy conditions that prevented the animals from foraging, which is consistent with the hunters' observations on the land. Some residents reported that the taste of country food is different compared to previous years. Both caribou and seal meat was said to taste less fresh than before, even though it was consumed quickly after harvest. Another observation was the presence of small "white balls" found in caribou meat, specifically the flesh and muscle. Residents noted that they were more often found in unhealthy caribou. One resident claimed to have noticed these ten years ago, while another resident only started noticing them this year. Regional biologist, Mitch Campbell, suggested that these "white balls" are likely parasitic tapeworm cysts from the species *Taenia krabbei*, which is by far the most common species found in northern caribou. Attempts at identifying the implications of these observations were unsuccessful due to an aversion to discussing this topic. Other observations regarding quality include an increased number of insects in the fur of rabbits and the plumage of geese, as well as poorer quality of seal fur after the skins have been dried.

5.5.3 HUMAN HEALTH IMPACTS

"If we don't get country food for several months, our bodies start feeling sick."[H]

"A month ago I finally ate some meat and I was nervous to eat it because I hadn't had it in a long time."[I]

"Our blood is not as normal as it used to be. We don't get enough iron from store bought stuff."[H]

"It is hard to get [country] food now… so we start eating more Qallunaat [white people] food and it has so much sugar and calories we get diabetic and fat."[K]

Public housing residents were concerned about the health implications associated with their country food consumption, or lack thereof. One issue raised by residents was

that they did not consume country food regularly, so when they did eat foods such as caribou meat or seal meat they had digestive difficulties. Symptoms were described as having hot flashes, heartburn, and stomach pains. One woman decided to eat less seal because of her digestive problems, thus creating a positive feedback loop whereby her reduced consumption caused digestive issues when she did consume thus leading her to reduce consumption even further. To the author's knowledge, it is unclear whether or not these claims have any scientific or nutritional basis.

Another issue described by public housing residents was country food being too difficult to obtain, forcing them to switch to store food instead. These nutritionally inferior food choices led residents to "feel cold" and "feel empty" compared to when they consume country food. Respondents knew that they were not getting as many essential vitamins and minerals from *Qallunaat* food, and were unsatisfied with this. As such, residents did not feel as though relying more heavily upon store food than country food was an acceptable trade-off. Respondents also raised concern about the increased prevalence of diabetes and obesity in Nunavut as a result of consuming more store foods. One woman stated how "it's healthier to eat country food" because "it's all [Inuit] know" – at least until relatively recently. She explained that "store foods come in a bag and it doesn't say if it's good or bad," perhaps alluding to the lack of knowledge regarding how to read nutrition labels. In contrast, she raised the point that "in country food, there is no 'fat' or 'cholesterol' label because it's all good!" Indeed, store foods are nutritionally inferior and substitution may lead to nutritional deficiencies and associated risks to Inuit health (Kinloch, Kuhnlein and Muir 1992).

Switching from country food to store food not only has physical health impacts resulting from nutritional inadequacies, but also mental health impacts resulting from altering the social and cultural life of Arctic communities (Searles 2002). Even if public housing residents did not consume large amounts of country food, the passion with which they spoke about their traditional foods was indicative of the immense cultural value they placed on them. Country food can be an effective and powerful symbolic resource in the making of Inuit identity (Searles 2002), and this was evident as many participants strongly identified with various aspects of harvesting, preparing, sharing, and consuming

these foods. While the traditional food system is important in creating and maintaining Inuit identity, it is not believed that an individual can lose his or her Inuit identity if he or she does not eat country food (Searles 2002). However, residents described how stresses to this traditional food system can greatly affect the mental health of themselves and other Inuit.

5.6 Adaptive Capacity

This section evaluates the adaptive capacity of Iqaluit's traditional food system by identifying coping strategies used by hunters (i.e. food suppliers) for dealing with climate-related stress and by public housing residents (i.e. food consumers) for dealing with food-related stress, noting that some households in the sample combine both suppliers and consumers. Adaptive mechanisms span multiple spatial scales, and are organized accordingly. Categories include individual/household-level, community-level, and regional/national-level adaptations. It should be noted that these adaptive strategies are not necessarily unique to winter 2010/2011. However, there are instances where some coping mechanisms were increasingly important during this period of extreme climatic conditions that resulted in a stressed traditional food system.

5.6.1 Individual/Household-level

Altered Hunting Behaviour

"Hunters have a certain degree of resilience; it's very hard to erode that."[L]

"We just adapted; it did not have a positive or negative effect."[M]

"We would always be precautious, but now we are a lot more precautious."[F]

In order to cope with varying environmental conditions, hunters reported altering their hunting behaviour. A common coping mechanism was to adjust their routes so that they could access traditional hunting grounds. Where the sea ice was unstable, hunters traversed the land instead. For example, a participant observation-oriented hunting trip to

the floe edge during February 2011 was impacted by an unanticipated retreat of the ice. Whereas the hunters were able to gain further access down the bay the prior week, high tides caused by the full moon resulted in the deterioration of the unstable sea ice. This forced the hunters to travel across the land adjacent to Frobisher Bay, to which they were less accustomed. While this coping mechanism eventually allowed the hunters to access their hunting grounds, it was not ideal as overland routes are commonly longer and therefore more time and cost intensive than sea ice routes. Hunters noted that common land routes surrounding Iqaluit were also impassable due to exposed rocks resulting from thin snow cover. In these instances, hunters made new trails. The use of these new trails can be problematic for inexperienced hunters who do not typically veer from traditional hunting routes, as they may lack the skills required to safely navigate the unfamiliar landscape.

When adjusting their routes was not possible, hunters used alternative hunting grounds. For example, the absence of sea ice in Koojesse Inlet until January prevented hunters from accessing the Kimmirut trail. As such, hunters instead focused on areas such as those surrounding Amadjuak Lake. This modification may have implications in terms of wildlife sustainability in the future, since increased hunting pressure may result in the overharvesting of certain herds. This would have been less of a problem historically due to semi-nomadic lifestyles and smaller population pressures, but this may become too much for the ecosystem to handle as Iqaluit's population grows and demand for such wildlife increases.

Hunters also described altering the time of day they went hunting. Toward the end of the winter 2010/2011 sea ice season, unusually warmer temperatures softened the sea ice sooner than anticipated. As such, hunters were forced to travel very early in the morning or very late at night when the temperatures were cooler and the ice was more solid. This method of seeking more stable ice is common practice, yet hunters were required to do this earlier in the year during winter 2010/2011 than normal due to the thin and unstable ice. Travelling during the early morning or late evening is not preferable as the darkness increases the risk of encountering unforeseen hazards.

The longer open water season experienced during winter 2010/2011 meant that the amount of time during which hunters could use the sea ice was reduced. This led hunters to alter their hunting method. While some viewed this as a challenge, other hunters saw this as an opportunity to go boating for longer. Hunters were able to go boating until December and even January – something considered unrealistic until this year. Indeed, some hunters took advantage of this opportunity and reported being able to harvest more clams, seals, and marine mammals. However, others were only able to recognize, rather than benefit from, this opportunity as external factors, such as lack of access to a boat, prohibited them from capitalizing on it. One hunter suggested that "boating is the most expensive way to hunt," due to high upfront costs and expensive fuel requirements, and did not have access to sufficient financial resources to do so. Another hunter anticipated a normal freeze-up and had put his boat away for the winter accordingly. Winterizing a boat involves bringing it to shore, removing the engine, and generally preparing it for harsh winter weather conditions. By the time the hunter realized that freeze-up was delayed, he decided that the effort of preparing his boat for the water again was not worth the prospective benefit. He suggested that perhaps next year he won't be so eager to put his boat away, indicating responsive learning.

Another adaptive strategy related to switching hunting grounds is switching species harvested. This was very important during winter 2010/2011 due to the variable conditions on the land and sea ice. For instance, some hunters reported hunting seals instead of caribou during the longer open water boating season, while other hunters mentioned hunting land-based animals rather than marine-based animals during the dangerous sea ice season. This suggests differential adaptive capacity. Some hunters were unable to hunt seals due to lack of access to a boat or lack of experience on the dangerous sea ice. Others were unable to hunt caribou due to lack of available time to travel so far or lack of money to pay for the large amounts of fuel required.

Due to exceptionally unpredictable weather patterns and dangerous sea ice conditions during winter 2010/2011, hunters reported using more caution and discretion. Hunters found it increasingly necessary to check the weather forecast and listen for radio warnings. One hunter who could not speak Inuktitut noted that these radio warnings are

often broadcast in the local dialect, and therefore relied on friends to pass the information on to him. Other hunters increased their safety by ensuring they did not go hunting alone. However, this is not an easy task as more hunters are engaged in wage-based employment, and differing schedules are challenging to coordinate. Hunters who endured the anomalous conditions ensured that they were well-prepared for potential hazards, and brought along extra safety equipment such as ropes, GPS units, SPOT devices, as well as spare clothing and provisions. These emergency preparedness items come at an increased cost that is unfeasible for many hunters who lack access to financial resources. Hunters also reported simply avoiding danger altogether, even if this meant staying in town. This extreme coping mechanism of not hunting at all is detrimental for those who do not feel comfortable traversing the land or sea ice because they are unable to procure country food. On the other hand, those hunters who are confident navigating through dangerous conditions were pleased with the reduced amount of hunting competition for wildlife.

Financial Awareness

Some hunters were able to offset increasing hunting expenses by capitalizing on cost-effective opportunities. Ordering supplies such as bullets or rifles from the south was preferred because they are cheaper than buying them in Iqaluit. Some also purchased more efficient snowmobiles, which offset the increased cost incurred during winter 2010/2011 when traveling further due to distant caribou or longer overland routes. One hunter mentioned the ability to buy gasoline at wholesale prices from local suppliers. In the past, hunters could buy a drum of gasoline at a reduced price and then share it amongst themselves. However, the bulk agent no longer sells single drums, but instead requires a minimum purchase of five drums. Unfortunately, some hunters might not have access to a credit card and might not be able to afford to invest that much money at a given time. As such, hunters with access to financial resources are at an advantage compared to those who are on a limited budget.

A number of public housing residents mentioned increasing their financial awareness in order to cope with the high costs of living in the north. Residents noted that informed shopping can make a big difference in terms of grocery expenses. Some

respondents emphasized the importance of informing themselves about different products and prices at different stores, and shopping more efficiently and affordably according to the best prices. One respondent described the value of buying items such as frozen meat in bulk, and noted that other residents may be intimidated by the higher upfront costs and do not recognize the money saved in the long run. Simple shopping habits that may be taken for granted in the south have a much greater impact when groceries are so much more expensive in the north. This was especially important during winter 2010/2011 because residents were forced to rely more heavily upon store food to compensate for less country food. As a generally poor population, many of the public housing residents were not economically stable enough to incur the increased financial burden of buying more groceries. Therefore, efficient and affordable shopping habits were more crucial during winter 2010/2011 than previous years.

FOOD-RELATED COPING MECHANISMS

Coping mechanisms are defined as "short-term responses to situations that threaten livelihood systems, often taking the form of emergency responses in abnormal seasons or years" (Berkes and Jolly 2002). Coping mechanisms often emerge quickly over short time scales and across small spatial scales, commonly at the individual or household level. They differ from adaptive strategies, which are longer-term and occur at larger spatial scales, often involving modification of institutions and structures to secure livelihoods (Berkes and Jolly 2002). Certain food-related coping mechanisms have been identified as important strategies elsewhere in the Canadian Arctic (Lardeau et al. 2011), and were therefore considered during the survey. These four food-related coping mechanisms include: 1) substituting food, 2) eating less, 3) eating elsewhere, and 4) selling belongings (Figure 16). It was found that households that used multiple food-related coping mechanisms in previous years were more likely to use multiple food-related coping mechanisms during winter 2010/2011 (Fisher's Exact Test, $p < 0.01$), suggesting entrenchment.

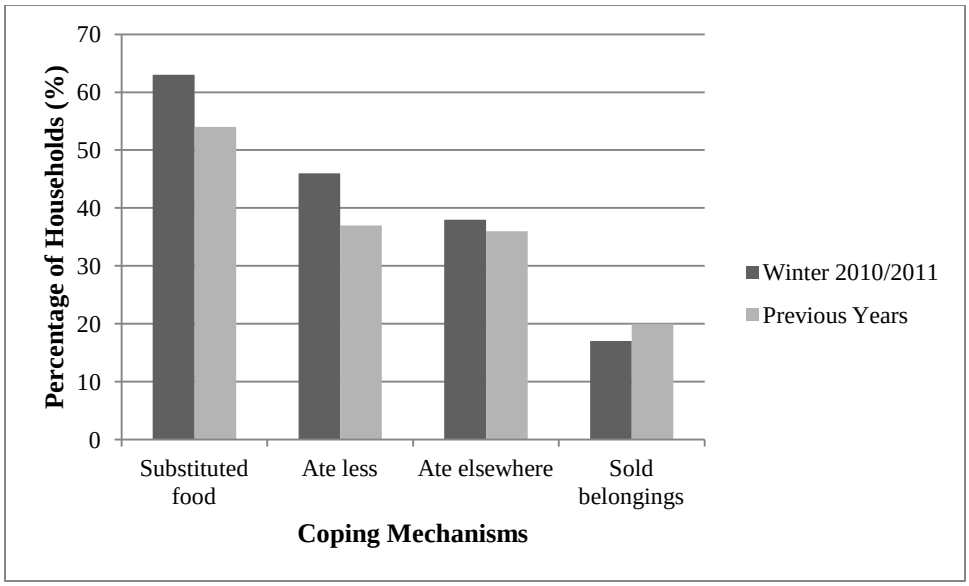

FIGURE 16. Use of food-related coping mechanisms amongst public housing residents during winter 2010/2011 compared to previous years.

Substituting Food

"The kids don't like hamburger meat, but that's the cheapest there is. A t-bone steak costs $17. The first time I bought a t-bone steak, my daughter said, 'Real food?!'"[N]

The most common coping mechanism used by public housing residents was substituting food, which involves eating less preferable foods because they are either easier to access or more affordable. 63% of residents reported substituting food during winter 2010/2011 while only 54% of residents used this coping mechanism previous years (Figure 16). This increase in substituting food could be due to the challenge of obtaining traditional food during winter 2010/2011, as residents explained an increased reliance on store food this year. This trade-off is deemed less preferable due to its lack of cultural importance and its lower nutritional value. Other residents reported eating cheaper store food instead of more expensive store food. This might involve buying ground beef instead of fancier cuts of meat, or purchasing chips and pop instead of fresh fruits and vegetables. There is an economic imperative to purchase highly energy-dense foods as part of the adaptation to poverty (Drewnowski and Darmon 2005, Drewnowski and Specter 2004) and due to the low cost of added sugars and fats, those foods providing

the most energy per dollar are usually those that are the most calorie-dense (Meyers, Karp and Kral 2006). As such, the use of this coping mechanism may have long-term health impacts because nutritional requirements may be unfulfilled.

Reducing Food Intake

"I don't eat a lot, but I don't starve."[Q]

"One week we had no food. We only had one dried noodle pack for 4 people. We can't live like that."[N]

"Sometimes we don't even have supper."[H]

The second most prevalent coping mechanism was reducing food intake, which involves reducing the size of meal portions or, in extreme cases, skipping meals altogether. Almost half (46%) of residents utilized this coping mechanism during winter 2010/2011, which is 9% more than what was reported to occur in previous years (37%) (Figure 16). Previous studies have found that parents, most notably low-income lone mothers, compromise their own diet for the sake of their children, and that their nutrition is consistently poorer than that of their children (McIntyre et al. 2003, Willows et al. 2009). Indeed, this was anecdotally evident among public housing residents. Some of the parents explained that they would ensure that their children were fed before they would feed themselves. One woman said that "as long as the kids have a bite, that's what's important; then we have some" thus increasing the food security of her children at the expense of her own. It is not apparent whether the increase in reducing food intake was caused by environmental factors or broader socioeconomic conditions.

Eating Elsewhere

"If there isn't enough food, my kids will go to another house, my parents', to eat. But not me, I'll wait and eat another time."[R]

"When I have absolutely nothing in the house, I go look elsewhere when I am craving for it."[K]

The third most common coping mechanism involved eating elsewhere, such as at a friend's or family member's house, specifically due to a lack of food in their own home. This was explicitly distinguished from merely being invited over for a meal, which is an important clarification due to the commonality of shared meals and communal feasts that are a significant component of Inuit culture. Some residents described going to their family members' house uninvited if they did not have any food to eat. Other residents mentioned that their child or grandchild would make an effort to eat at a friend's house while they were playing. Again, it is inconclusive whether or not the apparent increase in eating elsewhere was caused by environmental factors or broader socioeconomic conditions.

Selling Belongings

"I sold an extra skidoo in January. Even though both my wife and I had work, we had to sell it to get enough food."[R]

"I don't have anything here. Nothing to sell."[P]

The least common coping mechanism involved selling belongings in order to obtain extra money to pay for food and/or hunting equipment. This coping mechanism specifically required selling items previously owned by the respondent, and was distinguished from livelihood strategies that involved gaining extra income through sewing skins, knitting hats, or carving soapstone. Only 17% of residents reported selling belongings this year, which shows a 3% decrease from previous years during which 20% of respondents engaged in this strategy. Some residents hosted garage sales in order to make extra money. Other residents made use of their sewing, knitting, or carving skills and sold their handicrafts to obtain supplemental income. A few residents sold snowmobiles or hunting equipment so they could buy store food, which was deemed more feasible than hunting their food themselves. Although country food is preferable to store food, the extra expenditure of time and money is not realistic for all. Selling hunting gear may result in further entrenchment because it is difficult to gain enough capital to afford such significant purchases if they are needed in the future. Therefore, while selling hunting equipment may provide short-term benefits, it may hinder access to country food

in the long-term. Selling belongings is perhaps less common during winter 2010/2011 than previous years due to its short-term nature. If someone had sold their belongings during previous years, perhaps they no longer owned items to sell this year (or in future years). This coping mechanism was not as prevalent as those previously mentioned. The reality is that some public housing residents simply do not have any extra belongings to sell. This particular demographic is more likely to be impoverished and therefore has few, if any, expendable items. Of course, some residents did not engage in this coping mechanism simply because they did not want to sell their belongings due to their sentimental value. As such, other coping mechanisms were deemed more preferable.

5.6.2 COMMUNITY-LEVEL

INTRA-COMMUNITY SHARING NETWORKS

"A lot more people were sharing this year. The more experienced guys were out hunting, and the less experienced stayed in town and got it from the others."[R]

"Even if it's not country food, a pork chop even, we share it."[K]

"My father is a 100% hunter! All year, every Sunday, we have a feast at my mom's house."[AD]

The majority of public housing residents obtained their country food through sharing networks. When asked about particular sources of country food, residents most commonly affirmed that they obtain their country food from family and friends (81% and 78%, respectively). These sources were more commonly used than the commercial sources, and residents often expressed a strong preference for sharing rather than purchasing country food. Some households reported being both the recipients and providers of country food. Not only did residents believe that sharing country food contributes to their physical well-being, but that it is also an integral component of their emotional well-being. Gathering for communal dinners was said to build their sense of community and enforce important aspects of their culture.

With the increased stress to the traditional food system associated with extreme climatic conditions during winter 2010/2011, it was thought that sharing networks could provide some sort of buffer against times of scarcity. However, the amount of sharing

primarily either stayed the same (seal and Arctic char) or decreased (caribou) (Figure 17). For those households whose sharing was unchanged, it was thought that they engage in stronger and more stable sharing networks than those households whose sharing networks declined. In fact, those residents whose friends and/or family that "always" share with them were less likely to have received less seal ($\chi^2 = 6.07$, df = 1, $p = 0.01$) or caribou ($\chi^2 = 11.77$, df = 1, $p < 0.01$) during winter 2010/2011. Interestingly, this did not hold true for Arctic char. This might suggest that the continuation of seal and especially caribou sharing during times of scarcity is dependent on the strength of the sharing network. Arctic char, on the other hand, is seemingly shared more freely. Therefore, those with stronger sharing networks are more secure in terms of obtaining seal and caribou when supply is stressed.

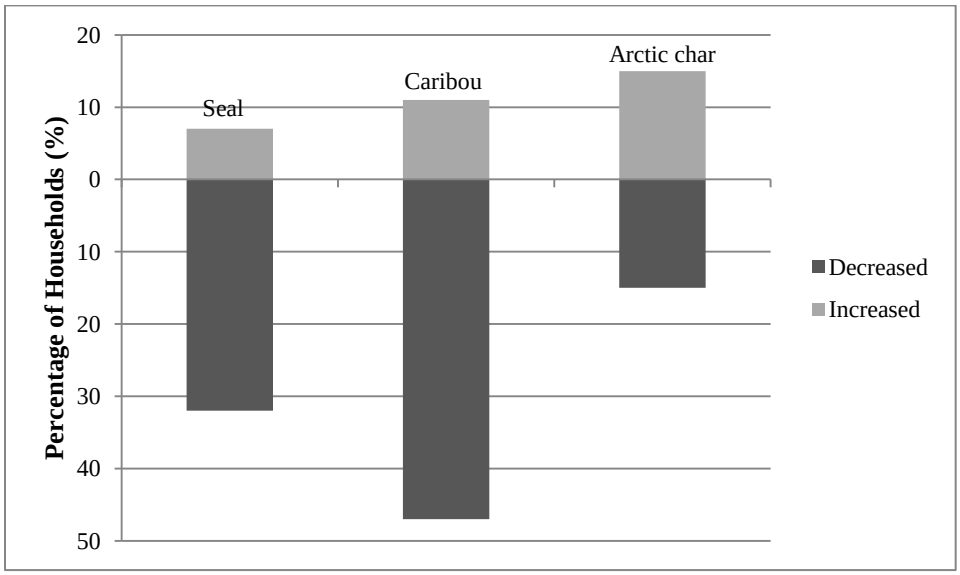

FIGURE 17. Amount of sharing of seal, caribou, and Arctic char during winter 2010/2011 compared to previous years.

Some residents were apprehensive about the state of their traditional sharing networks during winter 2010/2011. Since unfavourable environmental conditions during that timeframe caused challenges in terms of harvesting wildlife on the land, it was increasingly difficult for community members to procure country food in Iqaluit.

Residents believed that since there was so little country food available, people did not have as much excess country food to share and therefore tended to keep what they had for themselves. Also, residents suggested that high costs of hunting during winter 2010/2011 caused hunters to sell their country food instead of share it so that they could offset their expenditures.

It was discovered in the survey results that reciprocity is an important factor in maintaining strong sharing networks, consistent with general scholarship of food sharing practices (Chabot 2003, Kishigami 2000, Wenzel 1991) (Figure 18). A significant relationship was found with regards to the frequency with which respondents and their friends/family share with one another. Residents who "always" shared their country food with friends and/or family were more likely to have friends and/or family who "always" share with them (Fisher's Exact Test, $p < 0.01$). This may have implications for households who either do not hunt or cannot obtain their own country food, limiting the potential for access to country foods through reciprocal exchange, thus exacerbating difficulties in accessing country food. As such, the system of reciprocity may be threatened when exchange partners do not maintain the flow of resources equally. It was also shown that households with strong sharing networks (friends and/or family "always" share) have a more secure country food status during the fall (Fisher's Exact Test, $p < 0.01$), suggesting a buffering effect of sharing against traditional food insecurity during this season. However, this buffering effect was not evident during the winter, perhaps indicating that other factors, such as decreased harvests, override the benefit of strong sharing networks during this season. This also might suggest seasonally variable sharing practices that may change or fluctuate depending on species harvested or amounts harvested during a given season.

In general, strong sharing networks (friends and/or family "always" share with the respondent) did not reduce the likelihood that the household lacked seal, caribou or Arctic char, nor did it reduce the likelihood that the household consumed less seal, caribou or Arctic char. The exception was caribou consumption, which was less likely to decrease if friends and/or family "always" share with the respondent ($\chi^2 = 4.20$, df = 1, $p = 0.04$). This suggests that strong sharing networks act as a potential buffer in terms of

caribou consumption. Sharing networks may therefore be important be for maintaining access to caribou meat but less so for seal and Arctic char.

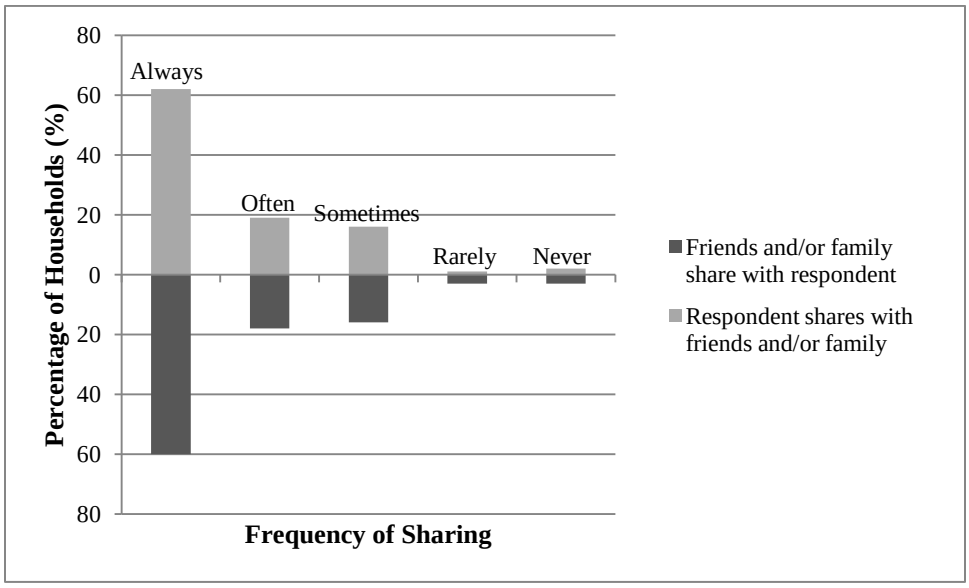

FIGURE 18. Frequency of sharing between public housing residents and friends and/or family.

COMMUNITY FOOD PROGRAMS

Iqaluit is one of the few Canadian Arctic communities that offer food programs to residents free of charge. These community food programs include the Niqinik Nuatsivik Food Bank (hereafter Food Bank), Qayuqtuvik Soup Kitchen (hereafter Soup Kitchen), and Tukisigiarvik Centre (herafter Tukisigiarvik). A 2010 study found that these programs have an average of 1062, 9984, and 3500 visits per year, respectively, indicating strong usership of these amenities (Lardeau et al. 2011), and demand for these services has dramatically increased in recent years. Users were identified as being primarily Inuit, born in Iqaluit, unemployed, and having not completed high school (Ford et al. in review-a). The majority of users were found to live in households without hunters, and to rely on a variety of coping mechanisms (similar to those described in the previous section) because they are not able to regularly access food (Ford et al. in review-a). It was found that households that used multiple food programs in previous years were

more likely to use multiple food programs during 2010/2011 (Fisher's Exact Test, $p < 0.01$), suggesting repeat usership.

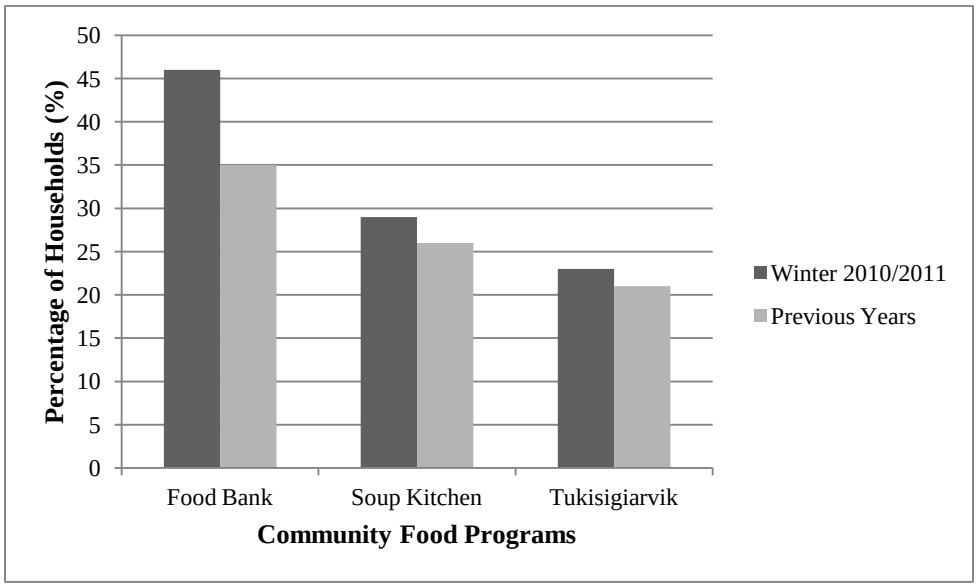

FIGURE 19. Use of community food programs amongst public housing residents during winter 2010/2011 compared to previous years.

Food Bank

"I'm sick of rice. The Food Bank is always the same taste. Ughhh. I don't like it."[P]

"Down south we get a big box of food [from the Food Bank] and up here we just get two little bags. It's not enough for our three young boys."[N]

The Food Bank opened in 2001 and offers bimonthly distributions of non-perishable food items. Depending on the number of people in the household, users can obtain "bachelor," "family," or "supplemental family" bags that contain increasing amounts of food items. In 2008-2009, the Food Bank distributed food to 365 households, representing over 18% of households in Iqaluit (Lardeau et al. 2011). The Food Bank relies solely upon donations. In 2011, Food Banks Canada donated $16,000 and Iqaluit's Rotary Club pledged $10,000 per year over three years to help fund the community food program (Ridlington 2011). However, despite these donations, funding remains

inadequate. The Food Bank's 2010-2011 sealift cost approximately $36,000, and with the rising cost of food and increasing usership the Food Bank spent more than $50,000 on its 2011-2012 sealift (Ridlington 2011).

Almost half (46%) of respondents used the Food Bank during winter 2010/2011, which shows a reported 11% increase from previous years. Households that relied on income support as their primary income source were more likely to use the Food Bank compared to other households ($\chi^2 = 12.08$, df = 1, $p < 0.01$), suggesting a particularly vulnerable subpopulation amongst public housing residents. Although the frequency of usership was not included in the survey, respondents indicated varying degrees of dependence. Some respondents described only going once in order to see what was offered, while others expressed increased reliance. While most residents were content with the Food Bank, other residents raised issue with certain aspects of the program. For example, the types of groceries provided by the Food Bank were not considered as desirable since non-perishable store food such as rice, pasta, and canned vegetables are less appealing than country food. Another concern was the lack of variety compared to the store, leading to boredom of limited food choices. A common discussion point amongst residents was that the bimonthly distribution is insufficient, and that the amount of food distributed is inadequate. These particular households reported running out of food after only one or a few days. With increasing usership (Lardeau et al. 2011), this is likely to remain a problem unless the Food Bank is provided with more funding or food donations.

Soup Kitchen

"There's a soup kitchen in town that's keeping me alive."[T]

The Soup Kitchen is operated by the Qayuqtuvik Society with the help of volunteers, and serves lunches consisting of soup and sandwiches. Throughout the week, convicts from Baffin Correctional Centre, Women's Shelter, and Youth Offenders offer extra help by serving meals. Most of the Soup Kitchen's funding is provided by the federal government, supplemented by corporate and individual donations. During

weekdays, Iqalummiut can visit the Soup Kitchen's permanent facility that opened in February 2010.

Almost one third (29%) of respondents visited the Soup Kitchen during winter 2010/2011, representing a 3% reported increase compared to previous years. Similar to the Food Bank, households that relied on income support as their primary income source were more likely to use the Soup Kitchen compared to other households ($\chi^2 = 5.84$, df = 1, $p = 0.02$), suggesting a particularly vulnerable subpopulation amongst public housing residents. Residents were very grateful for this resource, with one respondent emphasizing that the meals provided were his only sustenance. Despite their gratitude, some residents noted the banality of eating the same foods repeatedly while others expressed their desire for the provision of country food rather than store food. Some residents wanted to visit the Soup Kitchen but were reluctant to follow through with their intentions for various reasons. Personal factors were an issue, as some residents explained that they were too shy to take advantage of the service. Social factors come into play as well, as one resident had recently been threatened with violence by another user of the Soup Kitchen and had decidedly ceased visiting. Another respondent stopped going to the Soup Kitchen and Food Bank after being patronized for using the services; his girlfriend had recently started working and he was therefore deemed undeserving of the provisions. These are just a few issues associated with the non-faceless nature of food programs located within a tight-knit community such as Iqaluit.

Tukisigiarvik

"I'd rather save [Tukisigiarvik] for people who really need it."[H]

"I've been talking to elders and they know what I'm going through. They help a lot."[Y]

Tukisigiarvik, meaning "place to find understanding" in Inuktitut, is a drop-in centre that is open daily. It was established in 2003 as a result of community consultations that identified the need for a wellness, counselling, and advice centre to help Inuit cope with health and social issues in Iqaluit (Lardeau et al. 2011). Traditional foods are harvested through the centre's land skills program, and it is one of the only

places where Iqalummiut, who perhaps lack hunters in their households or have insufficient sharing networks, can obtain country food at no cost. However, Tukisigiarvik is much more than a source of food. The centre teaches cultural skills such as how to sew Inuit clothing, how to prepare country food, and how to build a traditional sled. Elders are often available to offer counselling to those in need.

Almost one quarter (23%) of respondents reported visiting Tukisigiarvik this year, which shows a 2% reported increase compared to previous years. Survey respondents were asked to affirm visiting Tukisigiarvik specifically for the purpose of obtaining traditional food, rather than for other services such as counselling or training. If other purposes were included in the analysis, the proportion of visitors would be assuredly higher. Unlike the Food Bank and Soup Kitchen, households that relied on income support as their primary income source were not more likely to use Tukisigiarvik compared to other households. This may suggest that this more "northern" approach to food programs is less stigmatized than the Food Bank and Soup Kitchen, in that it is also used by those who are more financially secure. Tukisigiarvik isn't just a place to get food – it is also place to share cultural and social experiences. This is perhaps why it is not statistically most used by those who *are* on income support, but also by those who *aren't* on income support. Those who obtain country food from Tukisigiarvik are extremely thankful for the source of both nourishment and companionship. Respondents proposed that the resources provided by Tukisigiarvik were believed to positively contribute to both their physical and mental health. The centre was well-received by residents who were happy for a community food programs that has a more northern approach.

Canada Prenatal Nutrition Program (CPNP)

"I'm grateful for the [Canada Prenatal] nutrition program."[AC]

The Canada Prenatal Nutrition Program (CPNP) is another program that offers food but is not as widespread as the aforementioned community food programs. CPNP is a federal wellness program for Inuit that is funded by Health Canada and managed by the Government of Nunavut. The objectives of CPNP are to improve the health of pregnant

women, mothers of infants, and infants through improved nutrition and breastfeeding practices, and to improve access to nutrition information and nutritious foods. CPNP encourages women to gather in a supportive environment to learn about healthy lifestyles during and after pregnancy. The program offers support and training to CPNP workers and health care professionals to ensure that they give culturally appropriate advice to mothers. Qualifying Iqalummiut can access daily programming from the Tasiquitigiit Society every afternoon. When asked about the benefits of CPNP, the women who used the program responded positively with praise. Each week they are provided with a bag of groceries, which is still extremely appreciated even though they contain store-bought food and not country food. The mothers were grateful to learn how to purchase and prepare healthy meals for themselves and their children. They were also thankful for a supportive environment that allows them to interact with other mothers and infants. The mothers were confident that their newfound nutrition habits would benefit the health of their children, and they intend to pass this knowledge to their children once they get older.

COMMERCIAL SOURCES OF COUNTRY FOOD

"Inuit who buy country food are white people wannabes. Goody-two-shoes."[P]

"If I were to buy country food, I'd [have to] be suffering for one month. My father taught me not to buy country food."[P]

"The Country Food Market is the last option if country food is nowhere else."[U]

While country food is traditionally shared, the transition toward a dual economy has facilitated a shift toward selling and purchasing country food. In Iqaluit, there are two major outlets for buying traditional food: Iqaluit Enterprises and the Country Food Market. Iqaluit Enterprises is a retail outlet that opened in the late 1980s and exclusively sells country food. The local business primarily sells Arctic char and northern seafood obtained from various community fisheries in Nunavut. Iqaluit Enterprises also provides items such as caribou, seal, and *maktaaq* [whale skin and blubber] when they are available. Owner Jim Currie buys his products either directly from hunters or through Hunters and Trappers Associations, then processes and packages them himself in

accordance with federal safety standards While some country food comes from Iqaluit, the retail supply is predominantly obtained from Pangnirtung, the closest and among the largest commercial fisheries, Qikitarjuak, Clyde River, and Pond Inlet. According to Currie, Iqaluit Enterprises' country food supply varies depending on the season, weather, gas prices, and number of people hunting. While the introduction of the business was controversial and deemed unethical by some Inuit, customers are thankful for the retail outlet. Some residents still dispute the morality of the enterprise to date. Currie describes the majority his customers as being Inuit, a high proportion of which being single women. He suggests that the people who need his business most are those who are not from Iqaluit and cannot rely on family and friends back home to send them country food. There has been an increase in customers over the year, but Currie is unsure if this is because more people are finding it difficult to find country food or if there are simply more people living in Iqaluit. This has placed increase pressure on his supply. Currie used to ship his country food worldwide, but cannot do this anymore due to limited supplies and high demand in Iqaluit.

The Country Food Market is run by Project Nunavut, a social enterprise that focuses on implementing projects to improve the viability of the traditional economy. The premise of the Country Food Market is to provide local hunters with the opportunity to sell their surplus harvest as a means of recouping the costs of hunting. Greenlandic communities have successfully organized such Inuit food markets, so the idea was brought to Iqaluit to be piloted. Under the Land Claims Agreement any Inuk can sell their country food that is lawfully harvested within the territory. Local hunters bring their country food to the market, set their own prices, and keep all the profits. The first market was held in November 2010, with over 200 attendees buying items such as caribou, seal, fish, clams, *maktaaq*, berries, and bannock. Project Nunavut hopes to hold the market on a monthly and ongoing basis, but events have been intermittent to date. William Hyndman, founder of Project Nunavut, was awarded Nunavut Businessperson of the Year in 2011 by the Baffin Regional Chamber of Commerce in recognition of his initiatives. According to Hyndman, the community has responded positively and he has almost exclusively seen support for the market. However, he does not neglect the possibility that some people oppose the market. He states that "there are probably people

who are apprehensive about it... because theirs is such a sharing culture; if the commercialization of [country food] destroys [sharing] that would be bad. It's kind of a balance." He hopes that hunters are aware of the balance between tradition and modernity and that they try to maintain it. Hyndman stated that customers are "overwhelmingly Inuit" and hypothesizes that most users are from different communities and either do not own hunting gear locally or do not belong to a hunting network. He also suggested that customers cannot afford to go hunting themselves because they either don't have the time or money. When asked what role he thinks the Country Food Market plays in Iqaluit's traditional food system, Hyndman responded that "if it works the way I hope it does, it completes the cycle that allows hunters to keep hunting. It bridges the [financial] gap to allow [Inuit] to keep practicing their traditional lifestyle and to maintain access to country food if they don't find themselves within a traditional sharing network." He believes that "for some [customers], [the Country Food Market] is their only way to get country food." Indeed, many residents confirmed this during the surveys.

Almost half (43%) of respondents reported using Iqaluit Enterprises as a source of country food. One quarter (25%) of respondents reported utilizing the Country Food Market, but with only three markets having been held by the time of the survey it was not surprising that some respondents had not yet heard of the initiative. It could be expected that number of people using this resource will become increase as awareness of this project increases. Attitudes toward the cash transaction for country food are mixed. Some Iqalummiut refuse to pay for country food because it goes against their traditional values. Evidently, there is still a strongly held notion that traditional food should be shared. This is consistent with previous research that has documented a reluctance to exchange traditional foods directly for money in other Inuit communities (Ford and Berrang-Ford 2009, Ford et al. 2006c, Gombay 2007). On the other hand, many residents are thankful that Iqaluit Enterprises and the Country Food Market provide increased access to country food, even if they must pay for it. Respondents expressed that they prefer to share country food free, but are willing to buy it when they cannot obtain it through traditional sharing networks. However, some residents who lacked access to financial resources could not afford to buy country food at all. Common complaints were that the prices are too high and the stocks are too low. Indeed, Iqaluit Enterprises had a difficult time

keeping the freezer full during winter 2010/2011, and the Country Food Market often sold out of country food within minutes of it opening. With decreased availability and accessibility of wildlife, declining numbers of hunters, increased stress on sharing networks, etc. it can be assumed that these commercial sources of country food will play a large role in Iqaluit's traditional food system in the future.

5.6.3 Regional/National-level

Inter-Community Sharing Networks

"We give out a lot of country food to people who want it. We send caribou now to Pangnirtung and Cape Dorset."[V]

"That's the way I was raised. That's the way we are. When we get country food, we hand it out."[S]

While the sharing of country food traditionally occurs within and between households, the advent of snowmobiles and airplanes has caused increasing commonality of sharing between communities, and even provinces and territories. Almost half (48%) of residents were not originally from Iqaluit, but 42% were nevertheless from Nunavut. As such, many respondents have family and friends living in the communities from which they came, thus geographically expanding their sharing networks.

The flow map (Figure 20) indicates the presence of inter-community sharing networks, with Iqalummiut both sending country food to and receiving country food from other Nunavut communities. The most common communities to which public housing residents reported sending country food were Cape Dorset (12%) and Pangnirtung (9%). In terms of receiving country food from other communities, Pangnirtung (19%) and Cape Dorset (18%) were most prevalent, followed by Qikiqtarjuak (8%), Kimmirut (7%), and Rankin Inlet (7%). Public housing residents receive country food from more communities than to which they send it, perhaps indicating greater need than abundance. This is not surprising considering the financial limitations of this demographic. It should be noted that inter-community sharing networks were not limited to Nunavut, as some residents described sending food to family who had moved to Montreal, Ottawa, and Edmonton.

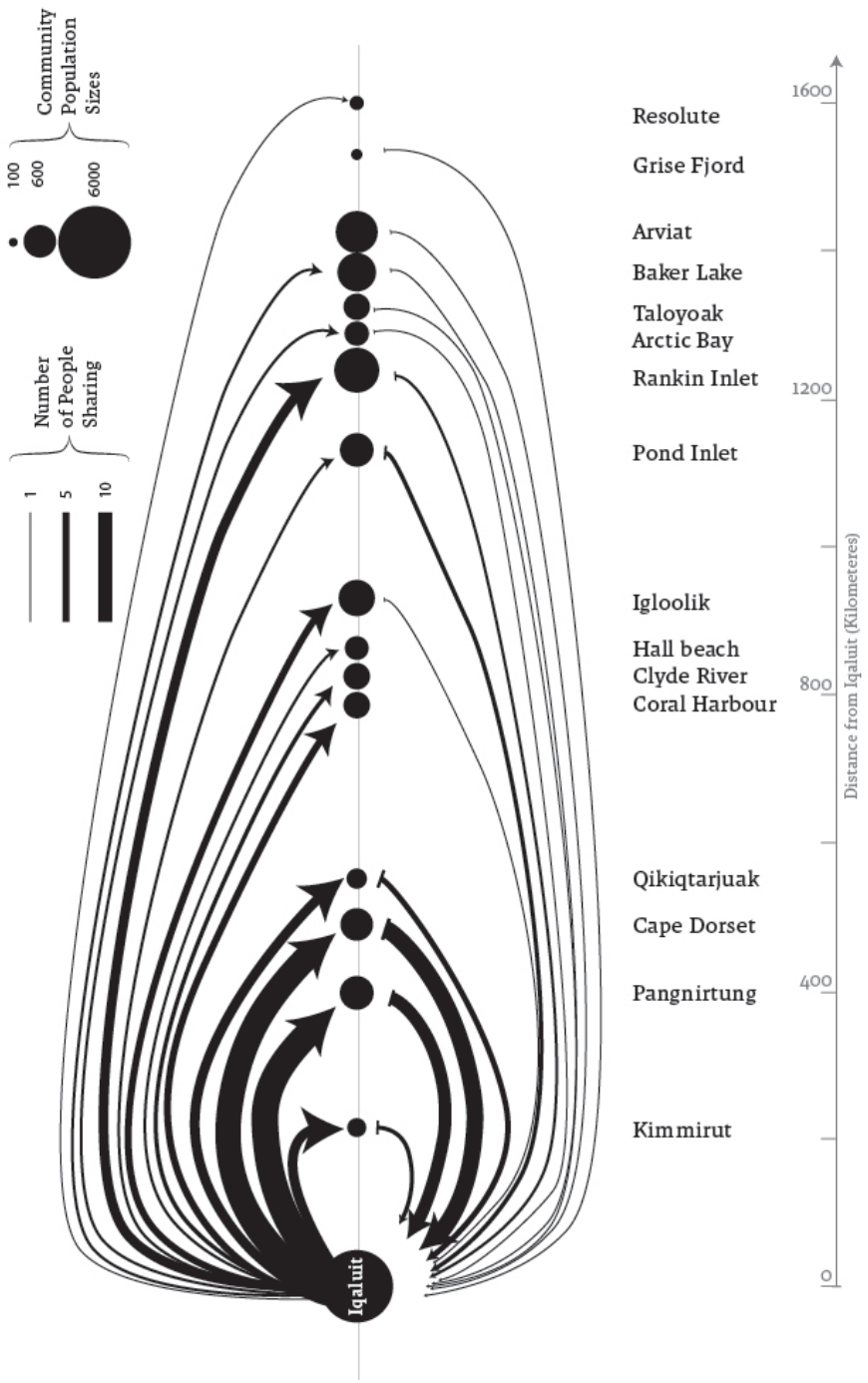

FIGURE 20. Flow map of sharing networks to and from Iqaluit as reported by public housing residents. Arrow widths are proportional to the number of public housing residents sending and receiving country food. Radii are proportional to the community population sizes. Distance to and from Iqaluit is shown along the bottom (designed by William Vanderbilt).

Having sharing networks *within* Iqaluit has proven to be helpful for many public housing residents, especially when family members and/or friends are active local hunters who share their harvests. However, having sharing networks *beyond* Iqaluit is also useful. Sharing networks that extend beyond a given community may provide with residents with a buffer in terms of availability and accessibility of country food. Environmental stresses may hinder the procurement of country food in some areas but not others. In these instances, those who have relations elsewhere may be at an advantage because perhaps their traditional food system is less stressed. Over half (55%) of residents engage in inter-community sharing networks, with 50% sharing with only one or two other communities and 5% sharing with three or four other communities. No statistically significant relationship was found between the number of communities from which respondents received country food and their access to and consumption of seal, caribou, or Arctic char. In fact, no statistically significant relationship was found between those with inter-community sharing networks and their access to and consumption of seal, caribou, or Arctic char. Therefore, engagement in inter-community sharing networks may only anecdotally buffer against traditional food insecurity.

Respondents explained the challenges of sharing between communities, provinces, and territories. While snowmobiles or boats can be used for transportation across small distances (i.e. within southern Baffin Island), they are inadequate for longer distances. In these instances, transportation via flight cargo is required. The high cost of shipping country food was a common point of discussion amongst public housing residents. Although the Nutrition North program offers a subsidy for the transportation of country food that is processed in federally-regulated commercial plants, it has yet to offer a subsidy on country food being sent privately. In addition to high costs, some residents expressed their concern over people stealing their country food while it is in transit, as this has occurred in the past.

Social Media as a Source of Country Food

An unconventional source of country food emerged from the open-ended aspect of the survey process: social media. More specifically, residents noted using Facebook's

"Iqaluit Sell/Swap" group to obtain a variety of country food such as caribou, seal, Arctic char (fresh, frozen, or dried), walrus, narwhal, and beluga whale. Users of the website post a description of what items they are offering and usually request a price. Interested consumers then contact the individual in order to complete the transaction. Some group members advertise that they have country food available for free, but this is not often the case. Popular items on the website appear to be caribou and Arctic char, which can range from $150 to $300 and $10 to $50, respectively, plus the cost of freight when necessary. While some country food is harvested and sold within Iqaluit, it is not uncommon for it to be provided from elsewhere. For example, caribou harvested and sold from Coral Harbour were prevalent. It appears that a few users of the website are repeat sellers, perhaps using the popular social media site as a platform for their entrepreneurial ambitions.

5.7 Barriers to Adaptation

This section evaluates barriers to adaptation as identified by hunters, residents, participant observation, and the literature. Barriers to adaptation vary spatially, and are similarly organized similarly to the previously mentioned adaptive strategies. Categories include individual/household-level, community-level, and regional/national-level barriers to adaptation. While many of these barriers are not necessarily unique to winter 2010/2011, the added environmental stress to the traditional food system exacerbated these already prevalent food security impediments.

5.7.1 Individual/Household-level

Limited Access to Financial Resources

"Income support comes only once a month. It's never enough."[P]

"When you don't work and you're on income support, it is never enough."[W]

"It's pretty hard for me. Social assistance is rarely enough for the whole month."[X]

"Buying food up here is expensive. There's not enough money to go around."[Y]

Residents of public housing often expressed concern regarding their limited access to financial resources. Public housing residents that relied on income support commonly expressed that the amount of money they receive each month is insufficient in terms of meeting their expense requirements. During the surveys, some residents explained that their monthly cheque would barely last one or two weeks for groceries. Even households that earned their income through employment stated that their earnings were often insufficient due to high costs of living in the north. Nearly all of the public housing residents expressed their grievance toward unaffordable prices of food, clothing, and other amenities.

One quarter (25%) of residents stated that income support was the primary source of income for their household and over half (54%) of households relied on some sort of government assistance (i.e. income support, Old Age Pension) to some extent. Only 38% of households earned their income primarily from working alone. In terms of having enough money to meet household needs, 39% of households reported that this happened "rarely or never" and 27% stated that this occurred "sometimes." The remaining 34% of households "often or always" had enough money to meet their basic needs. Household income status was significantly related to household income source. Households that rely on government assistance as an income source were more likely to report that they did not have enough money to meet household needs ($\chi^2 = 32.08$, df = 2, $p < 0.01$) while households that earn their income through working were more likely to report that they did have enough money to meet household needs ($\chi^2 = 22.77$, df = 6, $p < 0.01$). The presence of a worker in the household led higher income satisfaction ($\chi^2 = 9.06$, df = 2, $p = 0.01$), while no relationship was found in terms of the presence of a hunter in the household and household income satisfaction. This suggests that the presence of a worker in the household is more financially beneficial than the presence of a hunter.

It was thought that the household's income source would affect the number of food-related coping mechanisms used by the household. If income support was the primary household income source, there was no significant relationship regarding the use of multiple coping mechanisms. However, households that considered employment to be

the primary household income source were less likely to use multiple food-related coping mechanisms ($\chi^2 = 9.14$, df = 2, $p = 0.01$).

It was thought that the household's income source would affect the number of community food programs used by the household. If income support was the primary household income source, respondents were more likely to use multiple food programs ($\chi^2 = 8.35$, df = 2, $p = 0.02$). In contrast, households that primarily earned their income through working were less likely to use multiple food programs ($\chi^2 = 12.55$, df = 2, $p < 0.01$). These findings may suggest that households dependent on income support may rely more heavily on community based food programs as their limited access to financial resources likely prevents them from being able to afford their own groceries. While sole reliance income support predicts the use of both the Food Bank ($\chi^2 = 12.08$, df = 1, $p < 0.01$) and the Soup Kitchen ($\chi^2 = 5.84$, df = 1, $p = 0.02$), it does not predict the use of Tukisigiarvik, perhaps indicating that this culturally valued drop-in centre is not only used by those who are financially marginalized.

Finally, households with income support as the primary household income source were less likely to have a secure country food status (i.e. "enough or more than enough country food to meet household needs") during both the fall ($p = 0.008$) and winter ($p = 0.020$), suggesting increased vulnerability compared to those who do not rely on this form of government assistance.

LIMITED BUDGETING SKILLS

"Sometimes in the second week [after payday] I would have to call my sister and tell her we have no food for the kids. She would come over with some groceries for us."[N]

"It's getting harder, especially for people who don't know how to budget for themselves."[H]

Limited budgeting skills have posed a challenge for some public housing residents in terms of their ability to cope with food-related stresses. When a lack of budgeting skills is compounded with the aforementioned barrier of limited access to financial resources, adaptive capacity is further reduced. One woman described the transition to the cash economy that residents had to cope with when stores began arriving

in Iqaluit. She personally struggled with managing her money in the past, but now knows that she has to make sacrifices in order to make her funds last longer. One man expressed his inability to attend the Country Food Market because its occurrence is not aligned with his income support cheques. He explained that by the time the Country Food Market occurs, he has spent his money and cannot afford to buy the country food that he desires. He recognized that improving his budgeting skills might be able to prevent this from happening in the future. Other public housing residents discussed their experiences of learning how to manage their debt so that they could gain access to a credit card. This is challenging for some people and limits their ability to take advantage of money-saving methods such as placing personal orders for groceries to arrive by Sealift. Sealift involves ocean ships that travel from southern Canada to various Nunavut communities to provide their annual re-supply of goods and materials needed throughout the year. It remains the most economical way to transport bulk goods to the Arctic, and payment must be made with cash, cheque, or credit card. While ordering groceries in bulk is cost-effective, the high upfront costs are often prohibitive for those who have limited financial resources and lack budgeting skills.

HOUSEHOLD ECONOMIC STRUCTURE

The economic structure of households in public housing varied greatly with regards to the economic roles played by household members. Both the necessity of maintaining a high income through waged labour and the constraints related to participation in the labour market have resulted in a division of labour inside Inuit households (Chabot 2003). The majority (62%) of households had a worker in the household, with only 48% having at least one full-time worker. However, only 38% of households had a hunter in the household, and only 11% had at least one full-time hunter. Households that had the presence of both a worker and a hunter (27%), perhaps offer the best complement as both of these roles contribute to the stability of the traditional food system of the household. Workers earn financial resources that help pay for hunting equipment and food, while hunters engage in harvest activities in order to obtain country

food. As such, the potential impacts that these economic roles may have on the food security status of public housing residents were explored.

It was thought that the presence of a worker, hunter, or a combination of both in the household would influence the food security status of public housing residents during winter 2010/2011. Workers were thought to be beneficial because decreased country food availability/accessibility during winter 2010/2011 caused residents to rely more heavily on store food or commercial sources of country food. As such, earning an income was anticipated to aid this expensive coping mechanism. Hunters were thought to be beneficial because extreme climatic conditions during winter 2010/2011 resulted in decreased country food availability/accessibility. Therefore, it was expected that households with hunters would be able to provide for themselves rather than relying on sharing networks or commercial sources of country food. A combination a worker and a hunter would presumably offer the benefits of both occupations. In addition to the previously mentioned benefits, money earned by working was expected to compensate for increased hunting costs incurred during winter 2010/2011.

Surprisingly, the presence of a worker, hunter, or combination of both in the household did not lead to a more secure country food status during fall or winter (i.e. having “enough” or “more than enough” to meet household needs). The presence of a worker, hunter, or a combination of both in the household did not reduce the likelihood that the household lacked access to seal, caribou, or Arctic char during winter 2010/2011. Similarly, the presence of a worker, hunter, or a combination of both did not reduce the likelihood that the household consumed less seal or Arctic char during winter 2010/2011 compared to previous years. However, the presence of a worker hunter, or a combination of both a worker and a hunter did reduce the likelihood that the household consumed less caribou, suggesting that the presence of these roles in the household may have provided households with a buffer in terms of caribou consumption. The presence of a hunter, worker, or combination of both in the household did not reduce the number of food programs used by the household or the number of food-related coping mechanisms used by the household. As such, the household structure is not a determinant of community food program usership. While the presence of a worker, hunter, or combination of the

two was expected to affect aspects of public housing residents' food security statuses, it does not appear as though these household roles are a significant food security determinant (except for caribou consumption). As such, other determinants must be influencing food security during winter 2010/2011.

5.7.2 COMMUNITY-LEVEL

INCREASED HUNTING COSTS

"I've got to go junkyard to junkyard to fix my skidoo. It's harder to maintain your equipment. Everybody hits a rock now and then."[B]

Some hunters described increased hunting costs as becoming unaffordable. Of the 25 hunters interviewed, 56% stated that their hunting costs increased during winter 2010/2011 compared to previous years, while 32% believed that their expenditure stayed the same. Only 12% of hunters said their hunting costs decreased, but this was mostly because they simply did not hunt as often as they had during previous years due to various constraints including school, work, family commitments, and most notably the environment. Extreme environmental conditions during winter 2010/2011 were reported to require hunters to spend more money than what they would under normal conditions. Greater amounts of gasoline and oil were required due to longer land-based routes, further caribou herds, and softer snow texture. Due to the dangerous sea ice conditions, hunters adapted by bringing more emergency supplies such as extra food and warmer clothes which increased costs. Also, whereas hunters could usually rely on their traditional knowledge for navigating the surrounding tundra, unstable sea ice conditions have forced them to learn new land routes that are less familiar. As such, navigational aids such as GPS units and SPOT devices are becoming increasingly common at a high price. While the need for these electronics is not unique to winter 2010/2011, hunters described a greater need for them this year.

Anomalous climatic conditions during winter 2010/2011 impacted the hunters in terms of their hunting equipment. Thin snow on the land led to more exposed rocks that damaged snowmobiles. Icy snow also caused damage to liquid-cooled snowmobiles that

whose temperatures could not be regulated properly, causing them to overheat. Hunters explained that the repairs required to fix their equipment were costly and sometimes unaffordable. Some hunters lost their hunting equipment altogether, as was the case with at least two hunters whose snowmobiles fell through the unstable sea ice.

DETERIORATING TRADITIONAL KNOWLEDGE BASE

"A lot of hunters are seasonal workers, at the mines or DEW line, which makes [hunting] harder."[B]

"It's a sacrifice I had to make. I had to get my education. It's not a negative impact, but I'd rather be out there."[F]

"It's fun to go hunting, I like to do it. But I can't do it with my job."[S]

A deteriorating traditional knowledge base was identified a barrier to adaptation as the loss of Inuit knowledge prevented some hunters from procuring country food during winter 2010/2011. This deteriorating knowledge base partially results in a shift toward engagement in the modern (rather than the traditional) economy. This phenomenon is not unique to winter 2010/2011, but had a severe impact last year due to the anomalous sea ice conditions that posed a hazard to the hunters. Those hunters lacking experience on the land were increasingly vulnerable to these exceptionally dangerous conditions. Amongst the local hunters interviewed, concerns were raised regarding the continuation of their traditional subsistence-based lifestyles as many were involved with school or work. Indeed, only 20% of those interviewed were full-time hunters, with 68% hunting part-time and 12% hunting only on weekends.

The hunters discussed various factors that inhibit their ability to hunt and contribute to an overall decline in hunting. Employment was a common topic of discussion. While hunters noted the value in having a steady income, they explained the challenge of balancing employment and hunting commitments. Even if the hunters did not work, their companions with whom they hunted had jobs. This led to scheduling difficulties when trying to organize hunting trips. If trips were too difficult to coordinate, this prevented hunting altogether due to reluctance to going on the land alone due to unsafe conditions during winter 2010/2011. Another factor affecting the ability to hunt

was schooling. Some interviewees were students at the Nunavut Arctic College, and explained having to spend their time attending class and doing homework. Also, these time commitments prevent those in school from being able to work, thus reducing the potential of working to pay for hunting expenses. The hunters recognized the benefit of having an education in a rapidly changing economy, but expressed preference to be hunting. Health problems were another factor preventing some hunters from going on the land. These health problems were often related to old age; hunters described being too fatigued or having too much chronic pain to go on long hunting trips such as hunting caribou near Amadjuak Lake.

When surveying public housing residents, various factors affecting the availability and accessibility of their country food were discussed. While one woman acknowledged the fact that changing environmental conditions, financial constraints, strained sharing networks, and other factors were of course important, she rendered them less directly significant when compared to the recent deaths of three very prevalent hunters in Iqaluit. A discussions with a key informant indicated that while there are many hunters who share within families, there is a core group of very skilled, productive, and generous hunters viewed as the traditional "providers." The loss of even one such individual would certainly reduce the amount of food made available to certain families. Quantifying the extent of this loss impossible without detailed information regarding the hunter's harvest levels and sharing patterns, but it should be noted that the loss of pivotal hunters contributes to the vulnerability of the traditional food system. While the loss of hunters is not unique to winter 2010/2011, the loss of three such individuals over such a short period of time undeniably influenced the amount of country food being made available in Iqaluit.

STRAINED SHARING NETWORKS

"People rarely bring me any caribou meat, so I ain't gonna share now."[Z]

"When they catch a caribou, they hide it now. Even relatives. People are greedy now because there is less. Some people keep their freezers in their bedroom."[N]

"Sharing was pretty bad. You tend to keep what you have for yourself."[H]

"Other people have started selling country food recently for gas or ammunition instead of sharing."[K]

"I heard some people are catching seal meat, but they are getting less and don't want to share."[AA]

When the hunters were asked to discuss the general trend in number of people they support with their country food, 48% stated that the number was increasing. Reasons for the increase include greater demand for country food, growth of social networks, reduction of hunters in the community, and becoming a more prolific hunter. Only 12% of the hunters noted that the number of people they support was decreasing. However, the reason for this decline was not due to reduced demand but instead due to reduced amount of country food procured. As such, there appears to be increased pressure on hunters interviewed, potentially causing a strain on local sharing networks.

While some public housing residents indicated that their sharing networks were similar to previous years, others were quite concerned about the status of the sharing economy during winter 2010/2011. One resident suggested that less country food was shared for two reasons: 1) the hunters did not harvest as much this year compared to previous years, and 2) more people were requesting country food due to the decreased availability of country food in Iqaluit. Both of these stresses are related to the extreme environmental conditions experienced during winter 2010/2011. Another resident believes that hunters are increasingly selling their country food rather than sharing it so that they can afford gasoline and ammunition. This stress is partially related to anomalous conditions during winter 2010/2011 as they caused hunters to travel further and require more hunting resources, but this stress is also a function of the economic transition toward a cash economy. One resident described that some people are so reluctant to share that they hide their freezers in their bedroom to decrease access to their country food. This action seems drastic but may be necessary in order to maintain what little country food they have; sharing is often expected and friends or family do not often ask permission to take food items.

5.7.3 Regional/National-level

Wildlife Sustainability

"We are running out of animals."[H]

"Some of the animals are getting pretty scarce."[Y]

Obtaining country food from other communities (i.e. through sharing networks, commercial sources, or Facebook) has implications in terms of wildlife sustainability and may pose as a barrier to adaptation if this is not done vigilantly. In particular, concern has been raised over the viability of the caribou herd on Southampton Island. This herd, which was hunted to extinction in the 1950s and re-established in 1968 when 50 animals were transplanted there in, may face eradication once again as a result of disease and overhunting. In terms of overhunting, it is believed that social media and cheaper airline shipping rates are helping people in caribou-scarce communities like Iqaluit order meat from communities like Coral Harbour. This places increased stress on the already vulnerable herd. Indeed, consultation of Facebook's "Iqaluit Sell/Swap" group confirms that regular sellers of caribou meat are based out of Coral Harbour. Since the caribou were neither readily neither available nor accessible near Iqaluit during winter 2010/2011, residents relied more heavily upon this alternative means of procuring caribou meat. Regional Biologist, Mitch Campbell, explained that more than 1,500 caribou have been exported this winter – a number higher than the birth rate – and that was only halfway through the season. Campbell believes that if the unsustainable harvest does not cease, the caribou population could be devastated within the next three years or so.

Climate Change

"I don't trust the ice anymore. A lot of the guys don't trust it anymore. People are scared to go."[B]

"People don't go out because they can't predict the outcome of the trip."[E]

Of the 25 hunters interviewed, 33% believed that environmental conditions had the greatest impact on their ability to hunt during winter 2010/2011. The same proportion of hunters believed that other factors (i.e. employment, education, health reasons) most

greatly influenced their ability to hunt. However, 33% deemed it was a combination of environmental conditions and other factors that determined their ability to hunt during winter 2010/2011. Of the 38 hunting households surveyed, 68% stated that the hunter(s) hunted less during winter 2010/2011 compared to previous years. When asked if certain factors could have caused this reduction in hunting activity, 65% affirmed environmental conditions, 46% stated access to resources, and 35% suggested personal reasons. What these figures indicate is that changing environmental conditions, likely attributed to climate change, are having an impact on the procurement of country food in Iqaluit. Unpredictable weather patterns and unstable sea ice conditions during winter 2010/2011 are manifestations of region-wide climate trends, and these anomalous conditions have contributed to a decrease in hunting productivity and therefore an increase in vulnerability of the traditional food system.

POVERTY & SOCIAL ISSUES

"Depression is hard."[Z]

"It's scary when people are drunk. They can do anything when drunk."[K]

"My family and I were homeless, but my friend took us in and paid for us when our income support ran out. She went into debt to help me and my family."[P]

"I went on a week-long [alcohol] bender. I spent all my money so I didn't buy food."[AB]

In terms of measuring poverty in Nunavut, the most commonly-used measure is the level of participation by Nunavummiut in the Government of Nunavut's income support program (Nunavut Roundtable for Poverty Reduction 2011). As such, some public housing residents are considered impoverished as 35% of those surveyed collect income support. The income support program is described as being a last resort to assist individuals and families meet the basic food and housing needs (Nunavut Roundtable for Poverty Reduction 2011). In general, assistance may be granted to any individual who has been determined, on the basis of need, to be unable to provide adequately for themselves and any dependants. According to the National Council of Welfare, the participation of Nunavummiut in this type of social assistance program, which exists in

every province and territory, is the highest in Canada (Nunavut Roundtable for Poverty Reduction 2011).

In Iqaluit, the territorial-wide issue of poverty manifests at the local level. Although Iqaluit is increasingly prosperous as the capital of one of Canada's fastest expanding regions, there is pronounced inequality in income, employment opportunities, and health outcomes (Ford et al. in review-a, Searles 2010, Canada. 2011). Finding stable employment is difficult for some, especially those who have a criminal record or those who suffer from mental health or problems (Ford et al. in review-a). As the territorial capital, Iqaluit offers various services such as a correctional facility and mental health facility that draw these demographics to this community. The history of cultural oppression and marginalization has contributed to the high levels of mental health problems found in many Inuit communities. A few public housing residents mentioned the challenges of dealing with depression, trauma from settlement, suicide, and physical abuse. Alcohol and substance abuse affect health and wellness in Iqaluit, and one survey respondent described spending all of his money on a "week-long bender" so he could not buy food. In this instance, addiction to narcotics outweighed basic nutrition. Hidden homelessness or house insecurity is an increasingly common issue characterized by an inability of individuals or families to find stable housing (Knotsch and Kinnon 2011, Lardeau et al. 2011, Minich et al. 2011). This was evident amongst those living in public housing; survey respondents had difficulties answering how many people lived in the household due to the commonality of "couch surfing" and inconsistent residence. This suite of social problems, including unemployment, mental health issues, addiction, and homelessness, interact to influence food security as they make it difficult to prioritize food. These deleterious social issues are not unique to winter 2010/2011, however it is imperative that they are noted as they exacerbate all other determinants of food insecurity.

6. DISCUSSION

The overarching aim of this study was to identify and characterize the vulnerability of Iqaluit's traditional food system to extreme climatic conditions during winter 2010/2011 in the context of broader socioeconomic stresses. In its most basic sense, the study sought to assess whether or not these anomalous conditions affected the ability of local hunters to procure country food and whether or not this affected food security at the community level. The intention was to explore the influence of changing environmental conditions as a potential determinant of food insecurity, with a specific focus on public housing residents. Public housing units account for 19% of the housing stock in Iqaluit. However, public housing comprises 51% of housing throughout Nunavut. So while this demographic is relatively small within Iqaluit, it is larger within the territory. If Iqaluit-specific findings for this financially marginalized demographic are transferable public housing residents Nunavut-wide, these findings may be relatively more applicable and pertinent. This mixed-methods approach provides a snapshot of Iqaluit's traditional food system during winter 2010/2011. The work is not intended to be a representative baseline of food security in general, as this year was climatically anomalous and not likely characteristic of the longer-term norms. Instead, it provides a lens for exploring food system vulnerability and its determinants in the context of an extreme year, recognizing that these environmental influences may become increasingly common with future climate change.

6.1 PROPAGATION OF CLIMATIC EXTREMES THROUGH THE TRADITIONAL FOOD SYSTEM

Environmental conditions were statistically anomalous during winter 2010/2011, including warmer than average temperatures, the latest ice freeze-up documented, and earlier ice break-up. According to local hunters, sea ice conditions were unanimously regarded as more unstable and more dangerous than ever before. If a traditional food system comprises all processes of procuring, sharing, and consuming country food, then

extreme climatic conditions experienced during winter 2010/2011 indeed affected all components of this system.

In terms of *hunting and harvesting* country food, the brief sea ice season limited the amount of time during which hunters could use the ice as a platform for hunting or for accessing hunting grounds. When the sea ice did finally freeze up, dangerous conditions constrained the ability of hunters to navigate Frobisher Bay. While the shorter sea ice season meant that there was a longer open water season, not many hunters were able to capitalize on this opportunity due to financial constraints. Not only did climatic extremes affect hunting conditions, they also impacted the distribution of wildlife. Icy conditions on the land impeded access to vegetation, causing caribou to seek forage further from the coast. Although conditions on the land were deemed favourable, traveling further distances was unfeasible for some who lacked the finances and time required. This is a case where adequate accessibility was outweighed by limited availability. In contrast, seal availability was high but accessibility was very restricted. While the hunters described winter 2010/2011 as a "window of opportunity" for seals, the dangerous ice conditions and lack of access to a boat prevented them from taking advantage of this prospect. These are both instances where environmental factors combine with socioeconomic factors to increase the vulnerability of the traditional food system. Arctic char did not appear to be a volatile species; the lack of discussion regarding Arctic char is perhaps indicative of the limited impact they had on the hunters.

With regards to *sharing and distributing* country food, the variable availability and accessibility of wildlife on the land was reported to negatively affect harvests. This had implications as almost half of hunters reported an increasing trend of the number of people they support with their harvests. When combined with decreased country food procurement, this impacted the ability of hunters to share. Amongst public housing residents, the sharing of caribou was drastically reduced during winter 2010/2011 compared to previous years. The sharing of seal was negatively affected as well, while Arctic char appeared stable. Residents with strong sharing networks were buffered against deterioration of sharing with regards to seal and caribou – the two species that were most affected during winter 2010/2011. Also, those who frequently share country

food with others were more likely to have others share country food with them. It is evident that strong sharing networks are important in terms of maintaining traditional food security. Unfortunately, marginalized residents (i.e. due to addiction, mental health problems, etc.) seemed to lack strong social networks and were therefore at increased risk deteriorating sharing networks and thus food insecurity.

In terms of *preparing and consuming* country food, patterns of decreased country food availability and accessibility were evident in Iqaluit, as public housing residents described extreme challenges in terms of obtaining country food during winter 2010/2011. This was especially notable for caribou and seal. Reduced consumption was described to affect both the physical and mental health of residents, as they lacked both the nutritional and cultural components of country food. It is unknown whether this increased difficulty is part of a continuing trend or if it is a one-off event. This thesis provides a baseline for winter 2010/2011, but further studies are needed to effectively compare the impact of anomalous conditions on traditional food consumption with longer-term norms.

6.2 Current Vulnerability of the Traditional Food System

Survey and interview data show that winter 2010/2011 was more difficult than previous years in terms of hunters procuring wildlife on the land and public housing residents obtaining country food in Iqaluit. While there were issues of wildlife availability (i.e. decrease in numbers of caribou), the vulnerability assessment of this thesis mostly concerns wildlife accessibility (i.e. decrease in sea ice stability). These challenges were not as pronounced as expected given the nature of the extremes. This may indicate that the traditional food system is not as vulnerable as hypothesized to climatic extremes – at least in how they were experienced in during winter 2010/2011.

When assessing vulnerability of the traditional food system, it is necessary to consider the contribution of country food to the diet. In general, public housing residents did not report procuring much of their own country food, primarily due to their limited

access to resources. As such, they rely on alternative sources such as sharing networks through friends and family as well as commercial sources such as Iqaluit Enterprises, the Country Food Market, and Facebook's "Iqaluit Sell/Swap" group. While sharing networks and commercial food sources moderated some country food limitations, these mechanisms were unable to fully cover the deficit. As such, residents compensated for this loss by substituting their traditional diets for store food. For those more dependent on country food, switching to store food was a culturally, nutritionally, and economically unacceptable trade-off. This group of public housing residents is more likely to be vulnerable to food insecurity if hunting is further constrained by future climate change. Indeed, as recent exploratory research indicates, these stresses could have mental health implications for those at high risk (Cunsolo Willox et al. in press). On the other hand, those who rely more heavily upon store-bought foods were at an advantage during winter 2010/2011 because this component of the food system was less impacted by environmental conditions. It seems as though the changing diet of Inuit toward a preference for store-bought food has increased their resilience to food insecurity by increasing diversity of food sources. With a greater fondness for store foods, variation in availability, accessibility, and quality of their food preferences will be less sensitive to climatic extremes – especially in Iqaluit where transportation networks are more developed than in smaller communities. This is especially important throughout the shoulder seasons, during which the ability to hunt is compromised and periods of starvation and acute food shortage have historically occurred (Anders 1965, Crowe 1969). However, this transition to store foods comes at the expense of both nutrition and cultural identity. Sharing networks were also important with regards to obtaining country food. While inter-community sharing networks were undoubtedly strained during winter 2010/2011, intra-community sharing offered some sort of buffer in terms of obtaining country food. The same holds true for those using Facebook since many sellers are based out of other communities such as Coral Harbour. However, long term reliance on these regional supplies may not be viable given the intense hunting pressure required to keep up with demand, as is being seen with the current overharvesting of the Southhampton Island caribou herd.

Non-climatic stresses have also increased the vulnerability of the traditional food system, arguably more so than climatic stresses. The climate change literature has highlighted that these "multiple exposures" are important in determining vulnerability to climate change (Keskitalo 2008, Liu et al. 2007, McLeman et al. 2008, O'Brien and Leichenko 2003, O'Brien and Leichenko 2000). At the local level, limited access to financial resources and a lack of budgeting skills combined to create difficulties in affording both hunting equipment and groceries. These barriers to adaptation are especially prevalent amongst public housing residents who rely on income support as their main household income source. A deteriorating *traditional* knowledge base has resulted from reduction in hunting activity, obtainment of post-secondary education, and engagement in the formal economy. While this shift has resulted in a broadened *formal* knowledge base that may be unconventionally useful in the future, it has contributed to decreased participation in subsistence activities, and hence decreased supply of country food. With such a rapidly growing population, this has led to increased pressure on remaining hunters, thus straining traditional sharing networks. Perhaps the most detrimental broader socioeconomic stresses include poverty the social issues that accompany it: unemployment, mental health issues, addiction, and homelessness. These issues interact to influence food security as they make it difficult to prioritize food security, both at the individual and governmental level.

6.3 Future Vulnerability of the Traditional Food System

The future of the traditional food system in Iqaluit remains unclear. Currently, Iqaluit's traditional food system is unique compared to that of smaller Arctic communities. With a larger proportion of non-Inuit living in the community, the proportion of people reliant on country food is arguably smaller. Additionally, if the trend of Inuit preference toward store foods continues then perhaps their reliance on country food will further decrease. However, it is necessary to consider whether this shift away from traditional foods will increase or decrease vulnerability of the traditional food system. In one sense, the decreased pressure would allow those who *do* engage in the

traditional food system to obtain more country food. On the other hand, decreased participation in the traditional food system would contribute to the deterioration of this cultural practice. It is difficult to say if one outweighs the other; there is evidently a trade-off between the two.

Iqaluit also differs from other communities in that it is more conducive to sending country food to and receiving country food from other communities due to its well-developed transportation network. As such, it is becoming rapidly integrated into a territorial-wide network of inter-community sharing via cargo shipping as well as inter-community purchasing via social network websites such as Facebook. It is also more commercialized due to the presence of Iqaluit Enterprises and the Country Food Market. This transition toward cash transactions instead of sharing is contentious. It can be argued that these initiatives are beneficial with regards to the maintaining the traditional food system as they allow many people to obtain country food who would otherwise not have access to it. However, it can also be argued that these initiatives are detrimental to Inuit culture and values. The broader implications of these commercial sources of country food are beyond the scope of this thesis. However, it would be difficult to deny the continuation of commercialization since Iqaluit's rapidly increasing population will place localized pressure on wildlife as well as the hunters harvesting it. Therefore, it is likely that country food obtained elsewhere will become increasingly incorporated into Iqaluit's traditional food system. This could occur via increased reliance on commercial fisheries at Iqaluit Enterprises, non-local hunters at the Country Food Market, or sellers from other communities on Facebook. If Iqaluit's traditional food system becomes increasingly interconnected, its vulnerability will become more complex as well. Vulnerability may be regionally reduced by dispersing the pressure on local wildlife and hunters, but it may be locally increased due to reliance on outsourced supplies.

The continuation of climatic change is predicted for the future. Indeed, associated environmental stresses will have an increasingly prevalent impact the traditional food system. Winter 2010/2011 provided insight as to how future climatic conditions might influence food security. Inuit are inherently adaptable, and this flexibility has allowed them to subsist in a harsh Arctic climate. However, without addressing the underlying

socioeconomic determinants of food security, the changing environment has the potential to exacerbate the already stressed traditional food system.

6.4 Lessons Learned & Recommendations

This study demonstrates that vulnerability to a specific climate-related event, in this case a shortened and dangerous sea ice season, can be exacerbated or moderated by broader socioeconomic conditions. The work illustrates that vulnerable groups often emerge due to the synergistic interaction between climatic and non-climatic stresses that combine to overwhelm adaptability. For instance, this thesis has shown that public housing residents who rely on income support (rather than waged employment), have weak sharing networks (rather than strong sharing networks), and depend on country food for a large portion of their diet (rather than store food) are more vulnerable to food insecurity. This study also re-affirms the adaptability of Inuit, with changing conditions stimulating learning. The insights drawn from temporal analogue-based case studies such as this have important policy relevance, particularly for reducing vulnerability to "climate crises" (Ford et al. 2009).

When alleviating food insecurity of Inuit, or Indigenous groups in general, special considerations are required through more specialized health policies. There are unique food security considerations for Indigenous peoples related to the obtainment, preparation, and use of traditional foods. However, thus far, public health has operated with conceptualizations of food security that were developed in non-indigenous contexts (Power 2008). For example, while Iqaluit's Food Bank is certainly beneficial and helps many Inuit families, this "southern" approach to community food programs is not as well-received amongst residents as Tukisigiarvik's "northern" approach. This valued drop-in centre shows that alterations to typical programs can be made in order to accommodate cultural ideals in a very successful manner. Oftentimes, traditional food practices and perceptions of food security are not fully taken into account when creating policies, and this may have implications if such interventions are not culturally sensitive or appropriate. Acknowledging the importance of an Indigenous context, there are

numerous entry points for policy with regards to increasing the resilience of Iqaluit's traditional food system and increasing food security amongst public housing residents.

During periods of climatic stress, targeting non-climatic drivers of vulnerability offers a strategic entry point for policy to reduce the risks. In terms of *hunting and harvesting* country food, many initiatives could bolster the resilience of the hunting community. Dangerous and unpredictable conditions during winter 2010/2011 were unlike anything some of the hunters had ever seen. Therefore, the Hunters and Trappers Association could host roundtable discussions to provide a platform for hunters to share their experiences, describe to their challenges, and offer their recommendations (i.e. increasing their safety). Also, the Nunavut Harvester Support Program's Capital Equipment Program could provide cooperative equipment (i.e. snowmobiles, rifles) to allow financially insecure hunters to participate in subsistence activities (i.e. improving their ability to go boating during the longer open-water season). The Capital Equipment Program could also offer gasoline subsidies to permit hunters to travel increasingly far distances without bearing the financial burden (i.e. increasing their ability to hunt distant caribou at Amadjuak Lake). Incentives for hunters to provide country foods to the community need to be created. In Greenland, for example, hunters can be given a professional hunting designation similar to that of a trade (i.e. electrician, carpenter). These hunters are given benefits such as financial compensation and priority access to hunting quotas (Hyndeman, personal communication). Initiatives such as these would enhance the feasibility of hunting, thus bolstering the procurement of traditional food.

With regards to *sharing and distributing* country food, a recurring suggestion made by public housing residents was the instalment of a community freezer. Project Nunavut is currently focusing on establishing community freezers in those communities that lack them. However, Iqaluit is excluded because success is deemed unlikely in this large territorial capital (Hyndeman, personal communication). As such, Iqaluit may require a similar yet alternative approach to a community freezer. Initiatives such as the Country Food Market have been successful and therefore create a strong argument for their continuation. However, increased public dialogue should occur with regards to their development and potential impact on country food sharing networks. Successful models

have been seen in Greenland, and it would be advantageous if Iqaluit could mimic this to achieve such success. In addition, subsidies for country food could be incorporated into the next food program to increase the viability of inter-community sharing. Expanding this freight subsidy beyond commercially-produced country food would improve the ability of Northerners to obtain traditional foods from one another.

In terms of *preparing and consuming* country food, community kitchens could be established for people to prepare food together and share cooking skills. A nutrition program, similar to the Canada Prenatal Nutrition Program, could be created to teach community members about health and wellness. This program should target a broad audience rather than requiring participants to meet specific eligibility criteria so that many residents are able to take advantage of this useful program. Community food programs, such as the Food Bank and Soup Kitchen, could incorporate country foods into their provisions. The Tukisigiarvik Centre has taken a more "northern" approach to food programs, and this has proven to be successful amongst public housing residents. The Food Bank already offers flour and other ingredients to make bannock, and these culturally initiatives should be taken further. However, in order for this to happen, increased capital – both financial and social – is imperative.

However, in order to appreciably enhance food security, broader socioeconomic determinants of food insecurity must be addressed. These determinants primarily refer to issues of poverty. Households that are reliant on income support were found to be increasingly vulnerable to certain facets of food insecurity. These households were less likely to have enough money to meet household needs, suggesting that economic stability plays a large role in maintaining adequate nutrition. Indeed, high costs associated with living in the north are a burden even amongst those households earning waged income. Whether these costs are related to the traditional food system (i.e. acquiring hunting equipment, purchasing country food) or the contemporary food system (i.e. buying groceries), they place great strain on households. As such, efforts aimed at increasing financial security should be prioritized. Revision of public housing and the income support program is required to reduce disincentives to employment. This is imperative because some Iqalummiut refrain from acquiring jobs so their housing will remain

subsidized and government assistance will continue. Financial self-sufficiency is especially important as those on income support were more likely to not have enough money to meet household needs, use multiple community food programs, and have an insecure country food status. Recently, political action has been taken to address the issue of poverty. In February 2012, the Government of Nunavut released an action plan that promises to tackle poverty across the territory. This action plan, entitled "The Makimaniq Plan: A Shared Approach to Poverty Reduction," resulted from Nunavut's first-ever poverty summit held in November 2011. It maps out goals that the government and its partners hope to achieve over the following 18 months. These goals fall into the following themes: collaboration and community participation, healing and well-being, education and skills development, food security, housing and income support, as well as community and economic development. While the outcome of this initiative remains to be seen, its creation and support is a positive indication of increased political awareness. Hopefully this action plan will allow residents to gain financial independence, thus alleviating the burden of high costs associated with Iqaluit's food system.

7. CONCLUSION

This thesis provides a snapshot of the vulnerability of the traditional food system to climatic extremes during winter 2010/2011 in Iqaluit, Nunavut. Vulnerability was not as pronounced as anticipated, although issues of food security amongst public housing residents were still significant. Resilience was displayed by hunters for dealing with environmental stresses and residents for dealing with food-related stresses. Many of the adaptive strategies used were not unique to winter 2010/2011, although the augmented stress to the traditional food system likely contributed to the increased use of such strategies. However, it is hoped that the experience of this extreme climatic event may provide some adaptive knowledge for the future. Indeed, responses that increased resilience (i.e. using more discretion when hunting, improving financial awareness) should be reinforced and those responses that were maladaptive (i.e. reducing food intake, selling belongings) should be reduced. It can be argued that broader socioeconomic conditions were more pressing than environmental conditions in terms of food security determinants amongst those living in public housing. If residents were socially and economically stable, it is likely that they would have been even more resilient to food system vulnerability and related food insecurity. Overall, extreme climatic conditions indeed exacerbated the vulnerability of the traditional food system, but this was primarily due to its coupling with broader socioeconomic conditions.

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APPENDIX A – HUNTER INTERVIEW

1. What is your age?
2. How long have you lived in Iqaluit?
3. On average, how many times do you hunt each month?
4. Would you consider yourself a full-time hunter, weekend hunter, or part-time hunter?
5. How did conditions on the land this year compare to previous years? Was this year different? If so, how?
6. According to elders, what are the traditional freeze-up and break-up dates for the bay?
7. What conditions had the most significant effect on your hunting activities this year?
8. Did you observe more, less, or the same amount of animals on the land this year compared to previous years? (especially seal, caribou, and Arctic char)
9. Did you harvest more, less, or the same amount of wildlife this year compared to previous years? (especially seal, caribou, and Arctic char)
10. How did the quality of country food you harvested this year compare to previous years? (especially seal, caribou, and Arctic char)
11. What, if any, hunting opportunities did conditions on the land present this year?
    a. How did you take advantage of these opportunities?
12. What, if any, hunting challenges did conditions on the land present this year?
    a. How did you deal with these challenges?
13. How many people do you support with the country food you harvest?
    a. Is the number of people your country food supports increasing, unchanging, or decreasing?
14. Did anything other than conditions on the land affect your ability to hunt this year?
15. Compared to conditions on the land, did these other factors have a greater or lesser impact on your ability to hunt this year?
16. Did hunting cost more, less, or the same this year compared to previous years? Why?
17. Overall, would you say that conditions on the land this year were beneficial, problematic, or had no noticeable effect on your hunting compared to previous years?
18. Is there anything else that you would like to tell me?

APPENDIX B – PUBLIC HOUSING SURVEY

1. What is your sex?
   (Not explicitly asked)
   - o Male
   - o Female

2. What is your age?
   - o 20 or younger
   - o 21-30
   - o 31-40
   - o 41-50
   - o 51-60
   - o 61-70
   - o 71 or older
   - o Refuse to answer

3. Are you originally from Iqaluit?
   - o Yes
   - o No
   - o Refuse to answer

   (If "No" to 3...)

   3.1. Which community are you originally from?

   _____

   3.2. How long have you been living in Iqaluit?
   - o Less than 5 years
   - o Between 5 and 10 years
   - o Between 10 and 20 years
   - o More than 20 years
   - o Refuse to answer

   3.3. What brought you to Iqaluit?
   - o Work
   - o School
   - o Personal reasons
   - o Family reasons
   - o Health reasons
   - o Other; Specify:
   - o Refuse to answer

4. What do you do for a living?
   - o Full-time worker
   - o Part-time worker

- Full-time hunter
- Part-time hunter
- Worker and hunter
- Stay-at-home mother/father
- Student
- Retired
- Unemployed
- Other; Specify:
- Refuse to answer

5. How does your household get most of its money?
   - Mostly from working
   - Mostly from Income Support
   - Equally from working and Income Support
   - Other; Specify:
   - Don't know
   - Refuse to answer

6. Does your household have enough money to meet its basic needs?
   Basic needs include food, housing, clothing, hunting equipment, etc.
   - Always
   - Often
   - Sometimes
   - Rarely
   - Never
   - Don't know
   - Refuse to answer

7. How many people live in your household?
   _____

8. How many children under 18 years old live in your household?
   _____

9. How many full-time workers live in your household?
   _____

10. How many part-time workers live in your household?
    _____

11. How many full-time hunters live in your household?
    _____

12. How many part-time hunters live in your household?
    _____

(If "1" or more to 11 or 12...)

12.1. Did the hunter/hunters hunt more, less, or the same amount this fall/winter compared to previous years?

- o More
- o Less
- o Same
- o Don't know
- o Refuse to answer

(If "Less to 12.1...)

12.1.1. Why do you think this is?

You can choose multiple answers.

- o Environmental conditions (ex. sea ice, weather, animals, etc.)
- o Access to resources (ex. money, equipment, etc.)
- o Hunting/fishing regulations (ex. quotas, restrictions, etc.)
- o Personal reasons (ex. illness, lack of training, etc.)
- o Other
- o Don't know
- o Refuse to answer

Please briefly explain:

_____
_____
_____

13. Where do you get your country food?

You can choose multiple answers

- o Family
- o Friends
- o Store
- o Project Nunavut's Country Food Market
- o Tukisigiarvik
- o Other; Specify:
- o Don't know
- o Refuse to answer

14. How much country food is available in your household during each season?

	Spring	Summer	Fall	Winter
More than enough to meet household needs				
Enough to meet household needs				
Not enough to meet household needs				

Don’t know				
Refuse to answer				

15. Do you share your country food with friends and family?
    - o Always
    - o Often
    - o Sometimes
    - o Rarely
    - o Never
    - o We used to share, but not anymore
    - o Don’t know
    - o Refuse to answer

(If “Always,” “Often,” “Sometimes,” or “Rarely” to 15...)

15.1. Where do these friends or family live?
This can include Iqaluit, other Arctic communities, or southern cities.
You can choose multiple answers.

_____
_____

16. Do your friends and family share their country food with you?
    - o Always
    - o Often
    - o Sometimes
    - o Rarely
    - o Never
    - o They used to share, but not anymore
    - o Don’t know
    - o Refuse to answer

(If “Always,” “Often,” “Sometimes,” or “Rarely” to 16...)

16.1. Where do these friends or family live?
This can include Iqaluit, other Arctic communities, or southern cities.
You can choose multiple answers.

_____
_____

17. During this fall/winter, did you notice any changes in the country food you eat?
Changes can include how much you eat, how often you eat, or the quality of food you eat.
    - o Yes
    - o No
    - o Don’t know
    - o Refuse to answer

Please briefly explain:
_____
_____
_____

(If "Yes" to 15...)

17.1. Did these changes have a noticeable effect on your well-being?
- o Yes
- o No
- o Don't know
- o Refuse to answer

Please briefly explain:
_____
_____
_____

17.2. Were these effects:
- o Good
- o Bad
- o Neither good nor bad
- o Both good and bad
- o Don't know
- o Refuse to answer

Please briefly explain:
_____
_____
_____

18. This fall/winter, was seal harder, easier, or the same to get (ex. from the land or from sharing) compared to previous years?
- o Harder
- o Same
- o Easier
- o Don't know
- o Refuse to answer

18.1. How did this compare to previous years?
- o Hardest ever
- o Much harder
- o A bit harder
- o Same
- o A bit easier

- Much easier
- Easiest ever
- Don’t know
- Refuse to answer

18.2. How did this affect sharing seal?
- Shared more
- Shared the same
- Shared less
- Don’t know
- Refuse to answer

18.3. This fall/winter, did you eat more, less, or the same amount of seal compared to previous years?
- More
- Neither more nor less
- Less
- Don’t know
- Refuse to answer

19. This fall/winter, was caribou harder, easier, or the same to get (ex. from the land or from sharing) compared to previous years?
- Harder
- Same
- Easier
- Don’t know
- Refuse to answer

19.1. How did this compare to previous years?
- Hardest ever
- Much harder
- A bit harder
- Same
- A bit easier
- Much easier
- Easiest ever
- Don’t know
- Refuse to answer

19.2. How did this affect sharing caribou?
- Shared more
- Shared the same
- Shared less
- Don’t know
- Refuse to answer

19.3. This fall/winter, did you eat more, less, or the same amount of caribou compared to previous years?
- More
- Neither more nor less
- Less
- Don't know
- Refuse to answer

20. This fall/winter, was Arctic char harder, easier, or the same to get (ex. from the land or from sharing) compared to previous years?
- Harder
- Same
- Easier
- Don't know
- Refuse to answer

20.1. How did this compare to previous years?
- Hardest ever
- Much harder
- A bit harder
- Same
- A bit easier
- Much easier
- Easiest ever
- Don't know
- Refuse to answer

20.2. How did this affect sharing Arctic char?
- Shared more
- Shared the same
- Shared less
- Don't know
- Refuse to answer

20.3. This fall/winter, did you eat more, less, or the same amount of Arctic char compared to previous years?
- More
- Neither more nor less
- Less
- Don't know
- Refuse to answer

21. Did you notice any changes in other types of country food this year?

_____

_____

_____

_____
_____
_____

22. Did you or anyone in your household not have enough money to buy store food and you could not get country food?

	This Fall/Winter	Previous Years
Yes		
No		
Don't know		
Refuse to answer		

23. Did you or anyone in your household eat other foods that you do not like as much but are easier or cheaper to get?

	This Fall/Winter	Previous Years
Yes		
No		
Don't know		
Refuse to answer		

24. Did you or anyone in your household eat less than normal because you did not have enough food?

	This Fall/Winter	Previous Years
Yes		
No		
Don't know		
Refuse to answer		

25. Did you or anyone in your household sell some of your things to get money to pay for food or hunting equipment?

	This Fall/Winter	Previous Years
Yes		
No		
Don't know		
Refuse to answer		

26. Did you or anyone in your household eat elsewhere (ex. family's house, friend's house) so you did not have to feed yourselves at home?

	This Fall/Winter	Previous Years
Yes		
No		
Don't know		
Refuse to answer		

27. Did you or anyone in your household use any of the following services to get more food?
You can choose multiple answers.

	This Fall/Winter	Previous Years
Food bank		
Soup Kitchen		
Tukisigiarvik		
Other; Specify:		
None		
Don’t know		
Refuse to answer		

28. Is there anything else you would like to tell me?

_____
_____
_____
_____
_____
_____
_____
_____

Thank you for completing this survey.

APPENDIX C – KEY INFORMANTS

Name	Title	Organization	Date Interviewed
William Hyndman	Founder	Project Nunavut	November 23, 2011
Rus Blanchet	Director	Qayuqtuvik Soup Kitchen	November 25, 2011
Tim Stiles	Policy Analyst	Nunavut Anti-Poverty Secretariat	November 25, 2011
Jim Currie	Owner	Iqaluit Enterprises	November 26, 2011
Mitch Campbell	Regional Biologist	Department of Environment	September 28, 2011 January 17, 2012

APPENDIX D – INTERVIEW RESULTS

		n (%)
Sex	Male	23 (92)
	Female	2 (8)
Inuit	Yes	21 (84)
	No	4 (16)
Age	20-29	4 (16)
	30-39	7 (28)
	40-49	6 (24)
	50-59	6 (24)
	60-69	2 (8)
Originally from Iqaluit	Yes	9 (36)
	No	16 (64)
Years living in Iqaluit (if not originally from Iqaluit)	Between 5 and 10	3 (12)
	Between 10 and 20	9 (36)
	More than 20	4 (16)
	Not applicable	9 (36)
Self-identified type of hunter	Part-time	17 (68)
	Weekend	5 (20)
	Full-time	3 (12)
Recruitment method	Actively sought	10 (40)
	Word of mouth	10 (40)
	Previous acquaintance	3 (12)
	Radio advertisement	2 (8)
	Poster advertisement	0 (0)
Trend in number of people they support with their country food	Increasing	12 (48)
	Decreasing	3 (12)
	Staying the same	5 (24)
	No answer	4 (16)
Opportunities presented by environmental conditions during winter 2010/2011	Yes, I recognized that opportunities existed but I did not experience them	6 (24)
	Yes, there were opportunities and I experienced them	8 (32)
	No, there were no opportunities	11 (44)
Challenges presented by environmental conditions during winter 2010/2011	Yes, I recognized that there challenges existed but I did not experience them	0 (0)
	Yes, there were challenges and I experienced them	25 (100)
	No, there were no challenges	0 (0)
Cost of hunting during 2010/2011 compared to previous years	Increased	14 (56)
	Decreased	3 (12)
	Stayed the same	8 (32)
Factor that had the greatest impact on the ability to hunt during winter 2010/2011	Environmental conditions	4 (16)
	Other factors	4 (16)
	Both environmental conditions and other factors	4 (16)
	No answer	13 (52)
Overall opinion regarding the environmental conditions and the ability to hunt during winter 2010/2011	Problematic	14 (56)
	Beneficial	0 (0)
	Problematic and beneficial	6 (24)
	No noticeable effect	5 (20)

APPENDIX E – SURVEY RESULTS

Individual Characteristics		
Sex	Male	36
	Female	64
Age	19 or younger	2
	20-29	25
	30-39	14
	40-49	25
	50-59	8
	60-69	12
	70 or older	14
Originally from Iqaluit	Yes	52
	No	48
Province of origin	Nunavut	94
	Quebec	4
	Ontario	1
	Other	1
Years living in Iqaluit (if not originally from Iqaluit)	Less than 5	5
	Between 5 and 10	10
	Between 10 and 20	13
	More than 20	20
	Not applicable	52
Reason for moving to Iqaluit (if not originally from Iqaluit)	Family	25
	Work	9
	School	6
	Personal	5
	Health	2
	Refused to answer	1
	Not applicable	52
Occupation	Worker	28
	Retired	20
	Unemployed	20
	Stay-at-home mother/father	19
	Other	7
	Worker and hunter	3
	Hunter	3
Household Characteristics		
Primary household income source	Working	38
	Income support	25
	Old Age Pension	14
	Working and income support	10
	Other	8
	Working and Old Age Pension	5
Household income status	Always enough to meet basic needs	15
	Often enough to meet basic needs	19
	Sometimes enough to meet basic needs	27
	Rarely enough to meet basic needs	24
	Never enough to meet basic needs	15
Number of people living in the	1	19

household	2	21
	3	17
	4	14
	5	20
	6	3
	7	5
	8	1
Number of children under the age of 18 living in the household	0	45
	1	25
	2	15
	3	9
	4	4
	5	1
	6	1
Number of full-time workers living in the household	0	52
	1	36
	2	9
	3	3
Number of part-time workers living in the household	0	74
	1	25
	2	1
	3	0
Number of full-time hunters living in the household	0	89
	1	10
	2	1
	3	0
Number of part-time hunters living in the household	0	70
	1	25
	2	5
	3	0
Hunting Activity		
Hunting activity this year compared to previous years	More	7
	Less	26
	Same	5
	Don't know	6
	Not applicable	56
Reasons for change in hunting activity	Environmental conditions	20
	Access to resources	13
	Personal reasons	12
	Hunting/fishing regulations	0
	Other	0
Country Food		
Sources of country food	Family	81
	Friends	78
	Store	43
	Tukisigiarvik	26
	Country Food Market	25
	Elder's Centre	4
Household country food status – Spring	More than enough to meet household needs	8
	Enough to meet household needs	49

	Not enough to meet household needs	40
	Don't know	3
Household country food status – Summer	More than enough to meet household needs	18
	Enough to meet household needs	50
	Not enough to meet household needs	31
	Don't know	1
Household country food status – Fall	More than enough to meet household needs	9
	Enough to meet household needs	41
	Not enough to meet household needs	48
	Don't know	2
Household country food status – Winter	More than enough to meet household needs	9
	Enough to meet household needs	42
	Not enough to meet household needs	47
	Don't know	2
Respondent shares their country food with friends and/or family	Always	62
	Often	19
	Sometimes	16
	Rarely	1
	Never	2
Friends and/or family share their country food with respondent	Always	60
	Often	18
	Sometimes	16
	Rarely	3
	Never	3
Animal Accessibility/Availability		
Seal availability/accessibility this year compared to previous years	Increased	9
	Stayed the same	27
	Decreased	49
	Don't know	15
Seal sharing this year compared to previous years	Increased	7
	Stayed the same	52
	Decreased	32
	Don't know	9
Seal consumption this year compared to previous years	Increased	2
	Stayed the same	40
	Decreased	51
	Don't know	7
Caribou availability/accessibility this year compared to previous years	Increased	7
	Stayed the same	10
	Decreased	81
	Don't know	2
Caribou sharing this year compared to previous years	Increased	11
	Stayed the same	40
	Decreased	47
	Don't know	2

Caribou consumption this year compared to previous years	Increased	9
	Stayed the same	34
	Decreased	56
	Don't know	1
Arctic char availability/accessibility this year compared to previous years	Increased	28
	Stayed the same	47
	Decreased	18
	Don't know	7
Arctic char sharing this year compared to previous years	Increased	15
	Stayed the same	63
	Decreased	15
	Don't know	7
Arctic char consumption this year compared to previous years	Increased	16
	Stayed the same	59
	Decreased	19
	Don't know	6
Adaptive Mechanisms		
Community food programs used – This year	Food Bank	46
	Soup Kitchen	29
	Tukisigiarvik	23
	Other	5
	None	47
	Don't know	2
Community food programs used – Previous years	Food Bank	35
	Soup Kitchen	26
	Tukisigiarvik	21
	Other	5
	None	49
	Don't know	2
Food-related coping mechanisms used – This year	Substituted food	63
	Ate less	46
	Ate elsewhere	38
	Sold belongings	17
Food-related coping mechanisms used – Previous years	Substituted food	54
	Ate less	37
	Ate elsewhere	36
	Sold belongings	20
Household could not obtain country food and/or could not afford store food – This Year	Yes	54
	No	44
	Don't know	2
Household could not obtain country food and/or could not afford store food – Previous Years	Yes	46
	No	52
	Don't know	2

APPENDIX F – CHARACTERISTICS OF INDIVIDUALS QUOTED

Quote	Characteristics
A	Male, weekend hunter, non-Inuit, 51 years old, has lived in Iqaluit 14 years
B	Male, part-time hunter, Inuit, 29 years old, has lived in Iqaluit his whole life
C	Male, part-time hunter, Inuit, 48 years old, has lived in Iqaluit his whole life
D	Female, part-time hunter, Inuit, 56 years old, has lived in Iqaluit 27 years
E	Male, part-time hunter, Inuit, 24 years old, has lived in Iqaluit 7 years
F	Male, part-time hunter, Inuit, 30 years old, has lived in Iqaluit his whole life
G	Male, public housing resident, part-time worker, 40-49 years old, from Qikiqtarjuak, has lived in Iqaluit more than 20 years
H	Female, public housing resident, unemployed, 50-59 years old, from Iqaluit, has lived in Iqaluit her whole life
I	Female, public housing resident, stay-at-home mother, 30-39 years old, from Iqaluit, has lived in Iqaluit her whole life
J	Female, public housing resident, stay-at-home mother, 20-29 years old, from Iqaluit, has lived in Iqaluit her whole life
K	Female, public housing resident, unemployed, 50-59 years old, from Iqaluit, has lived in Iqaluit her whole life
L	Male, part-time hunter, Inuit, 65 years old, has lived in Iqaluit 7 years
M	Male, full-time hunter, non-Inuit, 48 years old, has lived in Iqaluit 8 years
N	Female, public housing resident, stay-at-home mother, 30-39 years old, from Iqaluit, has lived in Iqaluit her whole life
O	Female, public housing resident, full-time worker, 40-49 years old, from Iqaluit, has lived in Iqaluit her whole life
P	Male, public housing resident, stay-at-home father, 20-29 years old, from Igloolik, has lived in Iqaluit less than 5 years
Q	Female, public housing resident, unemployed, 40-49 years old, from Cape Dorset, has lived in Iqaluit more than 20 years
R	Male, public housing resident, part-time worker, 40-49 years old, from Qikiqtarjuak, has lived in Iqaluit more than 20 years
S	Male, public housing resident, full-time worker, 20-29 years old, from Baker Lake, has lived in Iqaluit between 5 and 10 years
T	Male, public housing resident, unemployed, 30-39, from Iqaluit, has lived in Iqaluit his whole life
U	Female, public housing resident, unemployed, 20-29, from Iqaluit, has lived in Iqaluit her whole life
V	Female, public housing resident, full-time worker, 40-49 years old, from Cape Dorset, has lived in Iqaluit between 10 and 20 years
W	Female, public housing resident, part-time worker, 50-59 years old, from Ottawa, has lived in Iqaluit between 5 and 10 years
X	Male, public housing resident, unemployed, 40-49 years old, from Iqaluit, has lived in Iqaluit his whole life
Y	Male, public housing resident, unemployed, 40-49 years old, from Pangnirtung, has lived in Iqaluit more than 20 years
Z	Female, public housing resident, stay-at-home mother, 40-49 years old, from Iqaluit, has lived in Iqaluit her whole life
AA	Female, public housing resident, stay-at-home mother, 40-49 years old, from Iqaluit, has lived in Iqaluit her whole life
AB	Male, public housing resident, unemployed, 40-49 years old, from Iqaluit, has lived in Iqaluit his whole life
AC	Female, public housing resident, stay-at-home mother, 30-39 years old, from Iqaluit, has lived in Iqaluit her whole life

AD	Female, public housing resident, part-time worker, 30-39 years old, from Arctic Bay, has lived in Iqaluit more than 20 years