Vulnerability of Inuit women's food system to climate change in the context of multiple socio-economic stresses – A case study from Arviat, Nunavut

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ABSTRACT

Nunavut has the highest incidence of food insecurity in Canada, where 56% of Inuit households are believed to experience difficulties in obtaining sufficient food. Food insecurity occurs when food systems are stressed such that adequate nutrition is not accessible, available, and/or of insufficient quality. Inuit food systems comprising traditional and store food components are affected by economic, social and cultural transformations, and ecological changes, most notably associated with climate change. Inuit women have been identified to be particularly vulnerable to food insecurity, a condition that can be exacerbated by climate change stresses on their food system.

This research identifies and characterizes the key factors determining Inuit women's food system vulnerability and adaptability to climate change and human stressors, and the factors contributing to food insecurity. This research was conducted in collaboration with the community of Arviat, Nunavut, using a community-based participatory research approach. Arviat is experiencing a high level of food insecurity, particularly among women. Photovoice, semi-structured interviews with Inuit women (n=42) and key informants (n=8), focus groups with women (n=7), elders (n=3) and hunters (n=2), and participant observations were used to collect in-depth qualitative data.

Findings show that Inuit's food system in Arviat is sensitive to climate-related risks and changes, but climate change was not identified as affecting women's food security. Human factors such as financial resources and budgeting skills, store food knowledge, decrease in the transmission of country food knowledge, decrease in traditional training, substance use and gambling and high cost of living, negatively impact Inuit women's food security. On the other hand, a strong sharing network, governmental financial support and local educational initiatives help strengthen the food system and improve food security.

RESUMÉ

Le Nunavut connait la plus haute incidence d'insécurité alimentaire au Canada, où 56% des foyers ont de la difficulté à obtenir une quantité suffisante de nourriture. Ce pourcentage dépasse largement la moyenne canadienne. L'insécurité alimentaire se manifeste lorsque le système alimentaire est stressé, provoquant ainsi un accès et une disponibilité inadéquate à de la nourriture de qualité. Le système alimentaire des Inuit, qui se compose de nourriture traditionnelle et d'aliments importés, est affecté par des changements d'ordre économique, social, culturel, et environnemental notamment associé aux changements climatiques. Les femmes Inuit ont été identifiées comme étant particulièrement vulnérables à l'insécurité alimentaire, et donc plus sensibles aux changements climatiques. L'insécurité alimentaire, particulièrement lorsqu'elle est chronique, a des répercussions au niveau de la santé physique, mentale et sociale des femmes Inuit, et ainsi accroît leur susceptibilité aux infections et aux maladies chroniques.

Cette recherche améliore la compréhension de la vulnérabilité et la capacité d'adaptation du système alimentaire des femmes Inuit au changement climatique, et ce dans le contexte de stresses socio-économiques. Ce travail identifie et caractérise les facteurs clés qui déterminent la sécurité ou l'insécurité alimentaire chez les femmes Inuit à l'aide d'une méthodologie basée sur l'étude de cas, qui s'inspire d'une approche de recherche participative communautaire (*CBRP*), et ce en collaboration avec la communauté d'Arviat, Nunavut. Le niveau d'insécurité alimentaire est élevé à Arviat, particulièrement chez les femmes. Diverses méthodes ont été utilisée afin d'obtenir des données qualitatives approfondies, telles que *photovoice*, entrevues semi-structurées avec des femmes Inuit (n=42) et des informateurs clefs (n=8), groupes de discussions avec des femmes (n=7), des personnes âgées (n=3) et des chasseurs (n=2), ainsi que l'observation participative. Les résultats démontrent que le système alimentaire des femmes Inuit est sensible aux risques et aux changements reliés au climat. Par contre, le

changement climatique n’a pas été identifié comme un facteur affectant la sécurité alimentaire des femmes actuellement. Les facteurs humains tels que les ressources financières, la capacité à faire un budget, les connaissances au sujet de la nourriture d’épicerie, la diminution de la transmission des savoirs reliés à la nourriture traditionnelle, la réduction de l’éducation traditionnelle, la consommation de tabac et de drogues, les jeux de hasard et le coût de la vie élevé impactent négativement le système alimentaire des femmes Inuit. Malgré tout, un important réseau de partage et le support gouvernemental et local contribuent à renforcir le système alimentaire et la sécurité alimentaire. Les programmes communautaires à vocation éducative sont important afin d’assurer la sécurité alimentaire à long terme.

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1.1 Introduction

Food systems globally are sensitive to climate change. According to Brown and Funk (2008: 580) "some of the most profound and direct impacts of climate change over the next few decades will be on agricultural and food systems". Recent trends in changing climate conditions are already having negative impacts on crop yields (Lobell and Field 2007) with more impacts on global food security projected in the future (FAO 2008; Lobell, Burke et al. 2008). While the vulnerability of agricultural-based food systems to climate change has been widely studied, this is less true of subsistence-based food systems such as that of Inuit in Arctic regions. In such locations, opportunities for agriculture are limited, with the availability of and access to wild animals of key importance.

The Arctic climate is rapidly changing: temperatures are increasing at twice the global average, precipitation regimes are shifting, sea ice extent and ice thickness are decreasing, permafrost is degrading and extreme weather events are more frequent and intense (ACIA 2005; Smith, Burgess et al. 2005; IPCC 2007; Stroeve, Holland et al. 2007; Furgal and Prowse 2008; Roberts and Stewart 2008; Hanesiak, Stewart et al. 2010; Richter-Menge and Overland 2010). These changes have been shown to affect several aspects of Inuit food systems, particularly hunting and fishing (Berkes and Jolly 2001; Ford, MacDonald et al. 2006; Ford, Pearce et al. 2007; Ford, Pearce et al. 2008; Ford, Smit et al. 2008; Ford, Gough et al. 2009; Pearce, Smit et al. 2010). These activities provide a variety of land and sea animals to Inuit and represent an essential nutritional intake in their diet alongside their socio-cultural importance (Bersamin, Zidenberg-Cherr et al. 2007; Kuhnlein and Receveur 2007; Kuhnlein, Receveur et al. 2008; Sharma, Cao et al. 2010).

Inuit in Nunavut (NU) already disproportionally suffer from food insecurity. Recent studies have shown that 56% of Inuit households in NU

experience difficulties in obtaining sufficient food, which significantly exceeds the Canadian average of 15%, with community specific studies indicating prevalence of food insecurity in excess of 80% in some locations (Ledrou and Gervais 2005; Egeland, Pacey et al. 2010). Existing challenges to food access, availability, and quality, are likely to predispose Inuit food systems to emerging stresses such as climate change (Ford 2009; Beaumier and Ford 2010). While the potential risks of climate change to food insecurity are increasingly acknowledged (Furgal and Seguin 2006; Beaumier and Ford 2010; Nancarrow and Chan 2010; Wesche and Chan 2010), there are currently few studies assessing the vulnerability of and the adaptability of Inuit food systems to climate change (Ford 2009; Goldhar and Ford 2010), particularly among vulnerable subpopulations including Inuit women (Beaumier and Ford 2010). Considering that Arctic climate is predicted to change significantly over the next 50 years (ACIA 2005; Serreze, Holland et al. 2007; Stroeve, Holland et al. 2007; Sharma, Cao et al. 2010), it is imperative to understand the pathways through which climatic factors and change might affect food systems and how these changes are experienced and responded to. This thesis is situated within this context, focusing specifically on Inuit women. The vulnerability of women's food system assessment is composed of a description of women's food system and food security status; a description of climate change manifestation in the Kivalliq regions, an assessment of human factors affecting the food system and ultimately an assessment of the climatic vulnerability of the food system by integrating and evaluating climatic, biophysical and human factors affecting the food system and creating condition of food security or insecurity.

1.2 Rationale

Identifying and characterizing the multiple factors affecting the food system for Inuit women is essential in order to better understand the conditions under which food insecurity occurs, and examine the implications of emerging stresses such as climate change. There is an emerging body of scholarship characterizing the magnitude of food insecurity among Inuit communities and

identifying determinants (e.g. Willows 2005; Lambden, Receveur et al. 2007; Power 2008; Ford 2009). This literature largely focuses on large scale quantitative nutritional assessments using close-ended surveys (e.g. Lambden, Receveur et al. 2006; Kuhnlein and Receveur 2007; Lambden, Receveur et al. 2007; Kuhnlein, Receveur et al. 2008; Sharma, Cao et al. 2010). There is limited research however, examining contextual information in order to understand and explain the complex interactions of socio-economic-biophysical factors affecting food systems, especially among women (Arviat Health Committee 2009; Ford 2009; Beaumier and Ford 2010). Women, especially Aboriginal and/or single-parent women, have been identified as being particularly vulnerable to food insecurity and tend to compromise their nutritional intake to feed their children when food is scarce (McIntyre, Glanville et al. 2003; Ledrou and Gervais 2005; Power 2006; Health Canada. 2007; FAO 2008; United Nations 2009). In the Canadian Arctic, Ford and Berrang-Ford (2009) as well as Lambden et al. (2006) report a higher prevalence of food insecurity among female community members. Food insecurity in the north is characterized by a switch in traditional diet to over consumption of nutrient-poor processed foods high in sugar, salt and saturated fat which is associated with increased susceptibility to chronic health afflictions, such as obesity, Type 2 diabetes, and cardiovascular disease (Bjerregaard, Young et al. 2004; Health Canada 2005; Chateau-Degat, Dewailly et al. 2011; Egeland, Johnson-Down et al. 2011). Pregnant women are especially sensitive to food insecurity as nutritional deficiency is one of the most common health problems reported in pregnant Inuit women (Berti, Soueida et al. 2008; NTI 2008). Increasing women's access to both traditional and healthy store foods is one of the main nutritional goals of Nunavut's Department of Health and Social Services (Government of Nunavut 2007).

There is limited research exploring the gender dimension of food system vulnerability to climate change in the Arctic. While women in developing rural world have been identified as most vulnerable to climate change due to lower socio-economic status and increased exposure to environmental hazards (Lambrou and Piana 2006; Costello, Abbas et al. 2009; WomenWatch 2011), in the Arctic,

male hunters are generally associated with a higher vulnerability to climate change due to their higher exposures to climate risks (Ford 2006; Ford, MacDonald et al. 2006; Ford, Smit et al. 2006; Furgal and Seguin 2006; Ford, Laidler et al. 2007; Ford, Smit et al. 2008; Ford, Gough et al. 2009; Dowsley, Gearheard et al. 2010). This place-based analysis builds upon the work of Beaumier and Ford (2010) who identifies the determinants of Inuit women's food insecurity in Igloolik, NU.

The thesis integrates concepts and terminology from 'vulnerability science' (Cutter 2003) with principles of community-based participatory research (CBPR) (O'Fallon and Dearry 2002; Castleden, Garvin et al. 2008) to investigate the vulnerability and adaptability of Inuit women's food system to climate change. The approach focuses on examining how a complex interplay of human and non-human factors operating over multiple spatial and temporal scales affects how people experience and respond to changing conditions. Similar approaches have been used to examine the human dimensions of climate change in Arctic regions (e.g. Berkes and Jolly 2001; Ford 2006; Ford, MacDonald et al. 2006; Ford, Smit et al. 2006; Furgal and Seguin 2006; Ford, Laidler et al. 2007; Ford, Smit et al. 2008; Ford, Gough et al. 2009), and is advanced here in an Inuit females food security context. The community of Arviat was selected as the site for the conduct of this research as it is experiencing rapid change in the physical environment (eg. Gough, Cornwell et al. 2004; Stirling, Lunn et al. 2004; Gagnon and Gough 2005) and the Arviat Health Committee has expressed concerns over high levels of food insecurity among women, especially single parents (Tagalik 2009, personal communication, Arviat). In addition, limited research on climate change and food security have taken place in the Kivalliq region of Nunavut where Arviat is located (Stirling and Smith 2004). This work advances our general knowledge on Arctic food systems in a changing climate, providing insights for adaptation planning processes underway at local and territorial levels. Beyond its climate change contribution, the work also provides broader understanding of the determinants of food (in)security among Inuit females.

1.3 Research aim and objectives

The aim of this thesis is to identify and characterize the vulnerability and adaptability of the Inuit women's food system to climate change in the context of multiple stresses, using a case study from Arviat, Nunavut. Specific objectives for this study are:

1. **Document and characterize climate-related *exposures* to which Inuit women's food system is *sensitive* in Arviat (NU) and factors creating *sensitivity*.** This objective aims to (i) identify and characterize how climate-related conditions and change directly or indirectly affect female food security; and (ii) identify the multiple factors which affect the sensitivity of women to these climatic exposures.

2. **Document and characterize the *adaptive capacity* of Inuit women to manage climate-related exposure-sensitivities in the context of multiple stresses in Arviat (NU).** This objective aims to (i) identify strategies used by women to deal or cope with multiple stresses affecting their ability to acquire food of acceptable quality, specifically climate-related stresses; and (ii) determine the factors (climatic and non-climatic) that determine their ability to cope.

3. **In partnership with the Arviat Health Committee, develop recommendations to alleviate Inuit women's food insecurity in Arviat (NU), in the face of a changing climate.** This final objective aims to develop recommendations targeting community-run programs as well as territorial and local policies to enhance Inuit women's food security and adaptive capacity in a time of rapid change.

1.4 Thesis outline

This thesis will begin with a review of relevant literature, describing important concepts and terminology that will be used throughout and will provide

an overview of Indigenous food security status in developed countries and the factors affecting the Inuit food system. Chapter 3 describes the research approach used in this study, including the vulnerability-based conceptual framework, the analytical research approach, and methodology and methods. The gendered dimensions of the food system in Arviat are illustrated in Chapter 4. Chapter 5 presents an evaluation of the status of Inuit women's food security in Arviat and the health consequences associated with food insecurity. Chapter 6 outlines the manifestation of climate change and observations from local people alongside scientific data to understand better how the food system is affected by climate change. Chapter 7 identifies the human factors driving food insecurity in Arviat within a historical context. Chapter 8 assesses the vulnerability of Inuit women's food system to climate change in the context of socio-economic stressors. Chapter 9 looks at the contribution of this research to the arctic food system vulnerability literature and concludes this thesis.

CHAPTER 2. RESEARCH BACKGROUND

This chapter provides description of concepts, such as 'food system' and 'food security', which are used throughout this thesis. This chapter also provides an overview of Indigenous peoples' food security status in Canada and other developed countries. Finally, this section presents the multiple factors affecting Inuit food security that are identified in the literature.

2.1 Food systems

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, Ingram et al. 2005: 2141; Ericksen 2008). Food systems of Indigenous peoples living in developed nations are often characterized by a duality of food sources, including both traditional and store bought foods (Kuhnlein, Erasmus et al. 2009). Food systems underpin food security (section 2.3), and thus the characteristics and nature of the food system are important in determining the accessibility, availability, and quality of food, and affect how individuals and households interact and respond to stress (Ford 2009).

2.2 Inuit "dual" food system

Inuit food systems are composed of traditional foods (commonly called 'country foods') and store-bought foods. The emergence of this 'dual food system' is the result of rapid changes that have occurred over the last 60 years in Arctic Canada (Damas 2002), including the transformation of Inuit livelihoods and socio-cultural structures beginning in the 1950s and 60s with the development of the waged economy; the imposition of western governance and legal systems, the development of hunting regulations, compulsory schooling, community resettlement, and rapid population growth (Usher 2002; Kishigami 2004; Ford

2006; Damman, Eide et al. 2008). A consequence of this transition has been a decrease in the consumption of traditional foods and an increase in store foods; what has been termed the *nutrition transition* (Wenzel 1991; Kuhnlein, Soueida et al. 1996; Kuhnlein, Receveur et al. 2004; Chan 2006; Kuhnlein and Receveur 2007; Kuhnlein, Receveur et al. 2008). This transition is particularly pronounced among younger generations and women (Kuhnlein, Receveur et al. 2004; Chan 2006; Kuhnlein, Erasmus et al. 2009). Despite these changes, traditional foods remain an important component of the contemporary Inuit food system and have significant social, cultural, and economic importance (Wenzel 1995; Furgal and Seguin 2006; Nickels, Furgal et al. 2006). In Nunavut, 41 % of peoples diets, according to Poppel et al. (2007), are more then half composed of country food.

The production, processing, distribution, and consumption of traditional foods in Nunavut are generally structured around the extended family unit and differ significantly from store-bought food (Wenzel 1995; Usher, Duhaime et al. 2003; Kishigami 2004; Poppel, Kruse et al. 2007). Country food consumption varies with season and by community, household, and individual. Caribou, seal; geese, berries walrus, arctic char, maqtaaq (beluga or narwhal blubber), to name only a few of the stables making up country food, are obtained locally through picking, hunting and fishing activities undertaken by community members and distributed through sharing networks. In some instances, they can also be bought from local stores. Food-sharing practices differ across Inuit regions in Canada and between communities due to different societal directives, socio-economic and cultural context and sensitivities to environmental conditions (Wenzel 1995; Damas 2002; Usher, Duhaime et al. 2003; Duhaime, Searles et al. 2004; Kishigami 2004). However, there is a widespread reluctance to exchange traditional foods directly for money (Gombay 2007), although there is evidence that this is becoming more common (Beaumier and Ford 2010).

Store-bought or ‘southern foods’ are also important in Inuit food systems (Kuhnlein and Receveur 2007; Kuhnlein, Receveur et al. 2008). Communities usually have a number of small stores, which stock a limited variety of fresh and processed foods that can be found in southern Canada. Perishable store foods are

brought in by scheduled air service and non-perishables, on the sea-lift once a year during the summer ice-free period. The food system surrounding store food reflects industrial / agriculture based food systems in southern Canada.

2.3 Food security and insecurity

Food security occurs when "people at all times can acquire safe, nutritionally adequate, and culturally acceptable foods in a manner that maintains human dignity" (VanEsterik 1999: 227). In contrast, food insecurity manifests when food systems are stressed such that adequate nutrition is not accessible, available, and/or of sufficient quality (FAO 1999). *Accessibility* is the ability of an individual or household to acquire enough store or traditional foods; it reflects the affordability of store foods and harvesting, food allocation, and preferences and knowledge about foods. *Availability* is the "ability of the store and traditional food components of the food system to meet the demand" (Ford 2009: 86); it refers to the presence or absence of nutritious and culturally appropriate foods at the local store, and of traditional foods in the community (i.e. through hunting success). *Quality* is the ability to obtain foods that are safe and of adequate nutritional and cultural value. Figure 1 below illustrates the multiple dimensions of food system and food security and how they intersect. For example, when the *production* dimension is impacted within the food system, the *availability* of food, and concurrently food security, is affected. In general, when the food system is stressed, food security will diminish. At the same time, inadequate food security may negatively impact the food system. For example, a hunter who does not obtain proper nutrition (*food quality*) may not have the health condition needed to hunt and provide country food for the community, thus, reducing *production*.

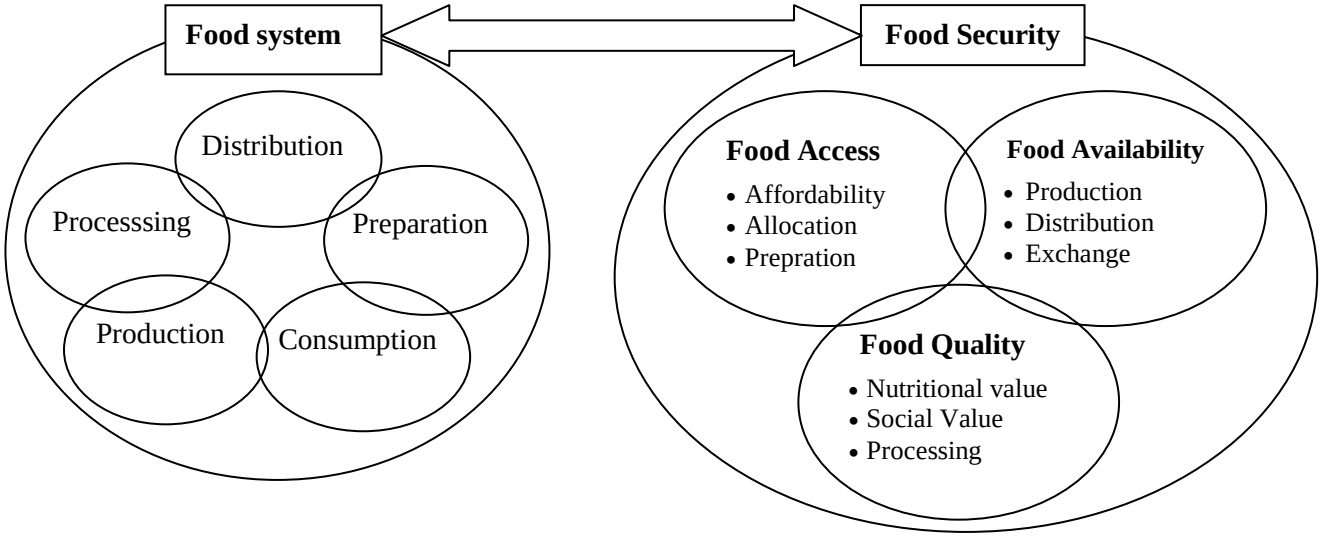

Figure 1. Dimensions of food system and food security (after Ford (2009))

2.4 Food insecurity and Indigenous populations

Worldwide, poor nutrition is one of the main problems affecting Indigenous populations (United Nations 2009). In the United States, Native American and Alaska Natives have undergone changes in lifestyle and diet which have lead to high levels of obesity and diabetes (Broussard, Johnson et al. 1991; Welty 1991; Rhoades 1996; Teufel 1996; Government of Nunavut 2008). Aboriginal peoples in Australia in both urban centers and rural areas are more likely to experience food insecurity than non-indigenous Australians. Poverty, low income, high food costs, limited availability of nutritious products and poor housing condition have been identified as contributing factors to this situation (Harrison, Coyne et al. 2007; Main, Earner et al. 2008; Torzillo, Pholeros et al. 2008; Holm, Vogeltanz-Holm et al. 2010). In Canada, populations residing in the Territories (predominantly Inuit, First Nation and Métis peoples) (Statistics Canada 2006), are particularly vulnerable to food insecurity, as are off-reserve Aboriginal families (Willows, Veugelers et al. 2008). Generally, Indigenous peoples' health and well-being are directly linked to their ability to consume traditional food sources. Thus, combined with genetic, environmental and socio-economic factors, the decrease in the consumption of country foods in favor of imported products high in fat, sugar and sodium has resulted in an increase in

chronic health afflictions, particularly Type 2 diabetes and obesity (Kuhnlein and Receveur 1996; United Nations 2009).

2.5 Prevalence of food insecurity among Canada's Inuit population

Food (in)security among Canadian Inuit populations emerged as a focus in the academic literature in the 1990's as a result of increasing concern about contaminants in traditional food sources (Kuhnlein and Chan 2000; Van Oostdam, Donaldson et al. 2005); the implications of the nutrition transition (Kuhnlein, Soueida et al. 1996; Kuhnlein, Receveur et al. 2004; Kuhnlein and Receveur 2007; Kuhnlein, Receveur et al. 2008), and the negative impacts of international policy on the Inuit population (Wenzel 1991). The 2007-2008 Inuit Health Survey of adults, conducted in 36 Arctic communities, report a prevalence 62.6% of adults living in food insecure household (Egeland, Johnson-Down et al. 2011). In Nunavut, Ledrou and Gervais (2005) reported the highest prevalence of food insecurity in Canada to be in Nunavut, where over 50% of Inuit households experience some degree of food insecurity. Egeland et al. (2010) document the prevalence of Inuit pre-schoolers (three to five years olds) living in moderately food insecure households to be 35% and those living in households that are classified as severely food insecure to be 34% in Nunavut. At a community level, Ford and Berrang-Ford (2009) estimated that 64% of Inuit residents of Igloolik, Nunavut, experienced some degree of food insecurity in 2006/07. Lawn and Harvey (2003) documented 83% of Inuit to be food insecure in Kugaaruk, Nunavut. In Pangnirtung, 80% of adults surveyed by Egeland et al. (2009) reported they often or are sometimes worried that food would run out before they had enough money to buy more, and 48% reported that they sometimes or often eat less or skip a meal because there isn't enough money to buy food.

2.8 Factors affecting Inuit food security

Existing scholarship identifies a number of factors contributing towards high rates of food insecurity among Inuit. The environmental and socio-economic

factors documented in this work are briefly reviewed here. While these factors are reported here separately, it is important to note that they are not mutually exclusive. Changes in social determinants can change the ability of the food system to deal with biophysical stresses and consequently reduce / increase the likelihood of becoming food insecure.

Socio-economic factors: Inuit food insecurity has been linked to rapid changes in livelihoods which have occurred over the course of the last half of the 20th century. Recent economic transformations, and social and cultural stresses have been reported to negatively affect health, food security and nutritional status in Nunavut (Chan, Fediuk et al. 2006; Furgal and Seguin 2006; Health Canada 2008; Young and Bjerregaard 2008; Ford 2009; Egeland, Johnson-Down et al. 2011). More specifically, inadequate housing, poverty, unemployment, a large youth population, high cost of living in the North, alongside changing social relations, the rising costs of hunting and store food, are among multiple stressors identified as affecting food security (Chan, Fediuk et al. 2006; Power 2007; Ford 2009; Beaumier and Ford 2010). The decrease in consumption of country foods of high nutritional value, in favor of foods high in trans-fat, sugar and salt has been linked to negative implications for food security and Inuit health (Kuhnlein, Receveur et al. 2004; Chan, Fediuk et al. 2006; Kuhnlein, Receveur et al. 2008; Sharma, Cao et al. 2010). Finally, other chronic problems affecting many Inuit settlements, including substance abuse, and addiction, can have implications on food security (Kirmayer, Boothroyd et al. 1998; Curtis, Kvemmo et al. 2005; Healey and Meadows 2007) with implications for vulnerability and adaptability to climate change (Beaumier and Ford 2010).

Environmental factors: Inuit food systems are highly sensitive to environmental variation such as the timing and duration of ice freeze up and break up, weather conditions, and the health, abundance and location of wildlife. Accumulation of contaminants in wildlife consumed by Inuit has also emerged as a major concern for Inuit food security and general health in the 1990's (Kuhnlein and Chan 2000; Van Oostdam, Donaldson et al. 2005). Several studies have assessed climate change vulnerabilities associated with harvesting activities.

Changing frequency and intensity of storms, unpredictability of weather, later and longer ice-freeze ups, change in wind direction and speed, and change in snow conditions have been have been reported as limiting the opportunities to hunt, increasing the risk of travelling on ice, decreasing access to hunting grounds, and limiting inter-community trade of animals, with negative implication on country food supply (e.g. Berkes and Jolly 2001; Ford, Smit et al. 2005; Ford, MacDonald et al. 2006; Gearheard, Matumeak et al. 2006; Ford, Pearce et al. 2007; Ford, Pearce et al. 2008; Ford, Smit et al. 2008; Ford, Gough et al. 2009; Nancarrow and Chan 2010; Pearce, Smit et al. 2010).

Store food is also susceptible to climatic conditions. The majority of store food items are imported to communities over long distances via air transportation. Thus, extreme weather hazards, including high winds and blizzard, can delay air access to the community and limit the availability of fresh food stocks in local stores (Ford 2009; Beaumier and Ford 2010; Ford and Beaumier 2010).

This chapter describes the research approach that guided data collection for the thesis. It introduces the conceptual framework and explains the analytical framework that guided the project's focus, describes key feature of how the community was engaged in the research, and the methods used.

3.1 Theoretical conceptuel framework

Food security is determined by complex interactions between social and biophysical processes occurring at different scales (local, regional, global), such that in addition to climate change, institutional, political, socio-economical and cultural changes all together impact directly or indirectly Inuit food systems. Thus, in order to conceptualize how climate change interacts with Inuit food systems to create conditions of food security or insecurity, I developed a vulnerability-based approach which is rooted in a human-environment discourse and focuses on the interaction between natural and social systems (Figure 2) (Adger 2006; Fussel and Klein 2006; O'Brien, Eriksen et al. 2007; Ericksen 2008). Specifically, I adapted the conceptual model of Ford (2009) which builds upon a climate change vulnerability-based model initially proposed by Ford and Smit (2004).

A vulnerability approach offers an appropriate framework to conceptualize the complexity and multi-scale nature of food security, notably by focusing on the key processes, system characteristics and contextual elements (O'Brien, Eriksen et al. 2007; Ericksen 2008). This approach is widely used in scholarship that focuses on the human dimensions of climate change to investigate the implications of changing climate on human systems and to evaluate its capacity to adapt to those changes (Adger 2006; IPCC 2007; Ford, Smit et al. 2008; Heltberg, Siegel et al. 2009; Ionescu, Klein et al. 2009). Vulnerability science seeks to identify who and what are vulnerable to what stress and where (Turner, Kasperson et al. 2003). In this literature, vulnerability has typically been defined as the "capacity to be

wounded" (IPCC 2007), in other words, the degree to which a system is likely to experience harm due to exposure to a hazard (stress) (McCarthy, Canziani et al. 2001; Turner, Kasperson et al. 2003; Ford and Smit 2004; Smit and Wandel 2006; IPCC 2007). Some scholars have argued that vulnerability terminology gives a negative connotation to climate change while underestimating the opportunities that climate change might afford; Ford et al. (2010) and Ribot (2011) have responded to this critique by emphasizing that 'vulnerability' refers to the approach and concepts used, not the outcome, and as such has antecedents in political ecology and political economy work in a natural hazards context beginning in the 1970s, leading us to ask "why are some people vulnerable and others not." Moreover, research using vulnerability approaches frequently outline the significant adaptive capacity of systems being studied.

In this research, vulnerability refers to the susceptibility of Inuit women's food systems to food insecurity as a consequence of climate-related risks and change. Vulnerability is conceptualized as a function of (1) exposure and sensitivity (or exposure-sensitivity) to climate-related risks and (2) adaptive capacity to manage or cope with these risks (IPCC 2007; Ford, Keskitalo et al. 2010). First, *exposure-sensitivity* refers to those climate-related risks that affect food systems (exposure) and nature of the food system which make people sensitive. Here the compound term 'exposure-sensitivity' is used because exposure and sensitivity are almost inseparable properties of a system (or community) and are dependent on the interaction between the characteristics of the system and on the attributes of the climate stimulus (Smit and Wandel 2006). The characteristics of climatic risks include the frequency, magnitude, spatial distribution, duration, timing and temporal spacing of climatic conditions (Ford 2009). The nature of the food system concerns how food production, processing, distribution, preparation and consumption take place. The elements of the food system differ according to the level of reliance of an individual, household or a community on traditional or store components of a food system. For example, Inuit have identified warming temperatures (i.e. exposure) as negatively impacting the quality of country food which gets spoiled in the course of

travelling back to the community. Warmer temperature thus affects traditional food consumption for those who depend on traditional foods (i.e. sensitivity) (Furgal and Seguin 2006). Secondly, *adaptive-capacity* reflects the ability of individuals and households to deal or cope with exposure-sensitivities. Using the same example, people are developing strategies to adapt to warmer temperatures (i.e. climate condition) by returning more regularly to the community during summer hunting trips in order to faster store raw meat in community freezers in order to avoid waste (Furgal and Seguin 2006). The adaptive capacity of individuals or households, in turn, is dependent on social, political, economical, and biophysical factors. The ability to travel back to the community more frequently thus depends upon access to equipment, financial resources, and the availability of sufficient time to undertake such a journey.

Figure 2 below illustrates the conceptual model which was developed to assess the vulnerability of Inuit women food systems to climatic change. Of particular note is the focus on both biophysical and human factors affecting food security: vulnerability and adaptability are not just a function of how the climate will change, but how these changes interact with people in specific places at specific times. Food security is not the outcome in and of itself as it 'feeds back' affecting the nature of the food system and possessing the potential to affect the capacity of the food system to deal with climate change and other stresses.

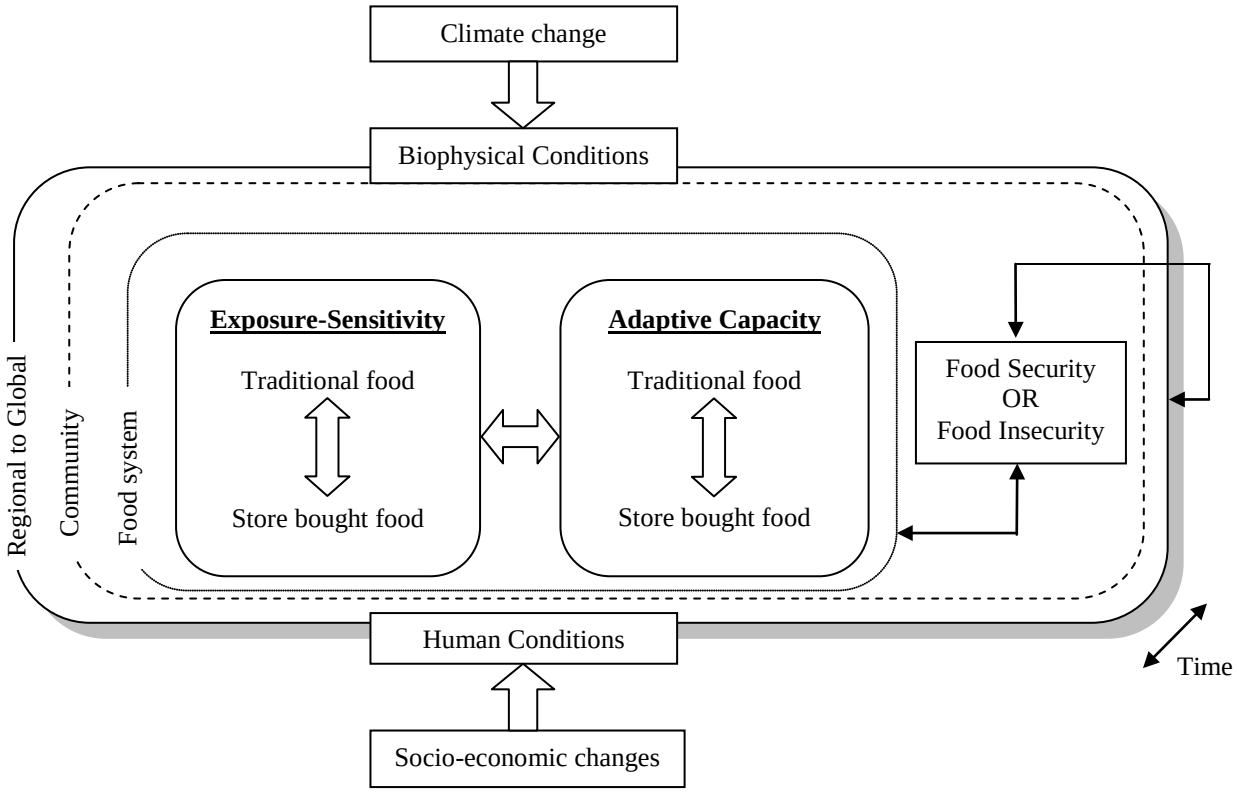

Figure 2. Vulnerability-based conceptual model to assess the food system of Inuit women's current vulnerabilities to climatic stresses in the context of multi-scale social stresses (after Ford (2009)).

3.2 Methodology

3.2.1 Analytical approach

The analytical approach used to apply the conceptual model to characterize vulnerability is based on Ford and Smit (2004), and is consistent with the UN's Adaptation Policy Framework (Lim, Spanger-Siegfried et al. 2005) and other vulnerability studies (e.g. Schröter, Polsky et al. 2005; Ford, MacDonald et al. 2006; Smit and Wandel 2006; Ford, Gough et al. 2009; Pearce, Smit et al. 2010). This approach assesses past and present (current) vulnerabilities first (i.e. temporal analogues), to ground examination of vulnerability and adaptation under conditions of projected climatic and socio-economic change (Figure 3). Noting the significant challenge of assessing current and future vulnerabilities, and consistent with other studies, this thesis focuses on identifying and characterizing

current vulnerability. This is used to hypothesize future vulnerability trends, but leaves a comprehensive examination of future vulnerability for impending work. To assess current exposure-sensitivities and adaptive capacities, the knowledge, experiences, and observations of local elders, hunters, and women (including *Inuit Qaujimajatuqangit* or IQ) are drawn upon, alongside other studies in peer reviewed and grey literatures. IQ is essential to understand the significance of past climatic events, how climate change affects access, availability and quality of food resources today, and adaptations that are being undertaken and barriers and opportunities herein.

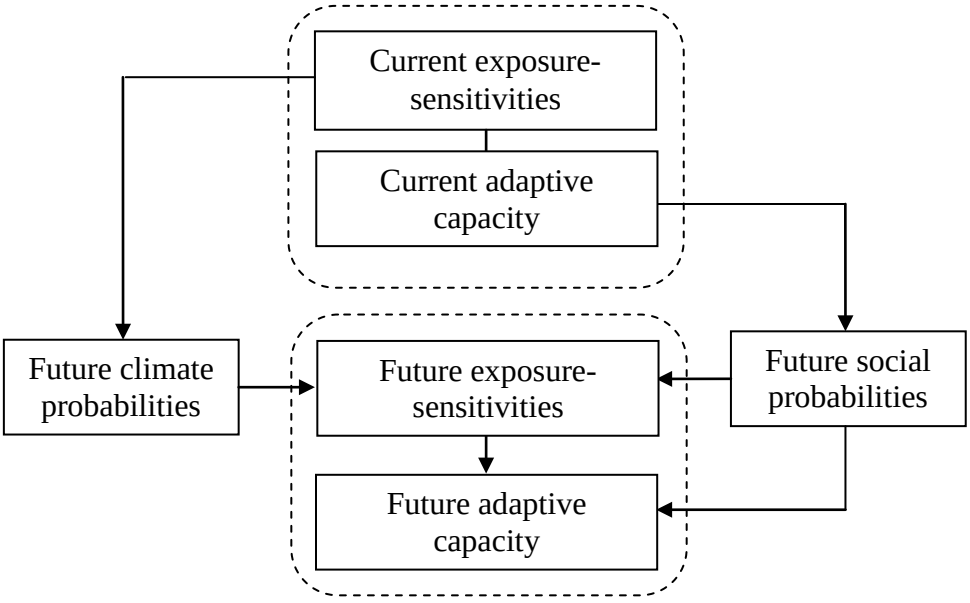

Figure 3. Analytical framework for vulnerability assessment (based on Ford et al. (2008))

3.2.2 Place based analysis

This research uses a community case study to assess the vulnerability of Inuit women food systems to climate change. Given the importance of local context in shaping vulnerability and adaptation, "[v]ulnerability assessments […] appear most successful – perhaps most relevant – when they are conducted for defined human-environment systems, particular places and with particular

stakeholders in mind" (Eakin and Luers 2006: 388). Place-based analysis is well adapted to vulnerability assessment in small and isolated Arctic communities with unique experiences of climatic change and varying capacity to manage climate risks. In fact, case study methodologies have been commonly used in climate change research in Arctic regions and in vulnerability assessment more generally (Ford 2006; Ford, MacDonald et al. 2006; Ford, Smit et al. 2006; Furgal and Seguin 2006; Ford, Laidler et al. 2007; Ford, Smit et al. 2008; Ford, Gough et al. 2009). Using a case study approach allows for the conducting of in-depth analysis in one location in order to compare spatial analogues and scale up insights from different experiences of climate change from community to regional or territorial level to inform policy decision (Ford, Keskitalo et al. 2010).

Research for this thesis was conducted in the community of Arviat, Nunavut. Arviat (formally called Eskimo Point) is the southernmost community on the Nunavut mainland (61°06N, 94°03W) (Figure 4) located on the western coast of the Hudson Bay. The last census reported a population of 2060 people (93% Inuit) living in Arviat (Statistics Canada 2007). Inuit habitants of Arviat are named "Arviarmiut". They come from different groups of "Caribou Eskimo", inland-dwelling Inuit of the Barren Lands in the Keewatin region (now Kivalliq region in Nunavut). This name was given to these Inuit by the members of the Fifth Thule Expedition (1921-1924) (Rasmussen 1926; Birket-Smith 1976). Caribou Eskimo groups include: Qaernermiut, Hauneqtôrmiut, Harvaqtôrrmiut and Pâdlimiut, and Ahiarmiut (or Ihalmiut) (Rasmussen 1926; Gabus 1944; Birket-Smith 1976). Inuit in Arviat are mostly of Qaernermiut ("dwellers of the flat land") and Pâdlimiut ("people of the willow") descent (Arima 1984). The few Ahiarmiut ("the out-of-the-way dwellers") (56) remaining after a famine in the 1950s were also relocated to Arviat (Mowat 1952; Arima 1984).

This community was selected due to community concerns about food security issues and the impact of climate change (Tagalik 2009, personal communication, Arviat), and lack of climate change research in the Kivalliq region where Arviat is located. The community has also expressed the need to include food security as part of their climate change adaptation plan

(ATULIQTUQ, Action and Adaptation) (Sullivan 2009, personal communication, Ottawa).

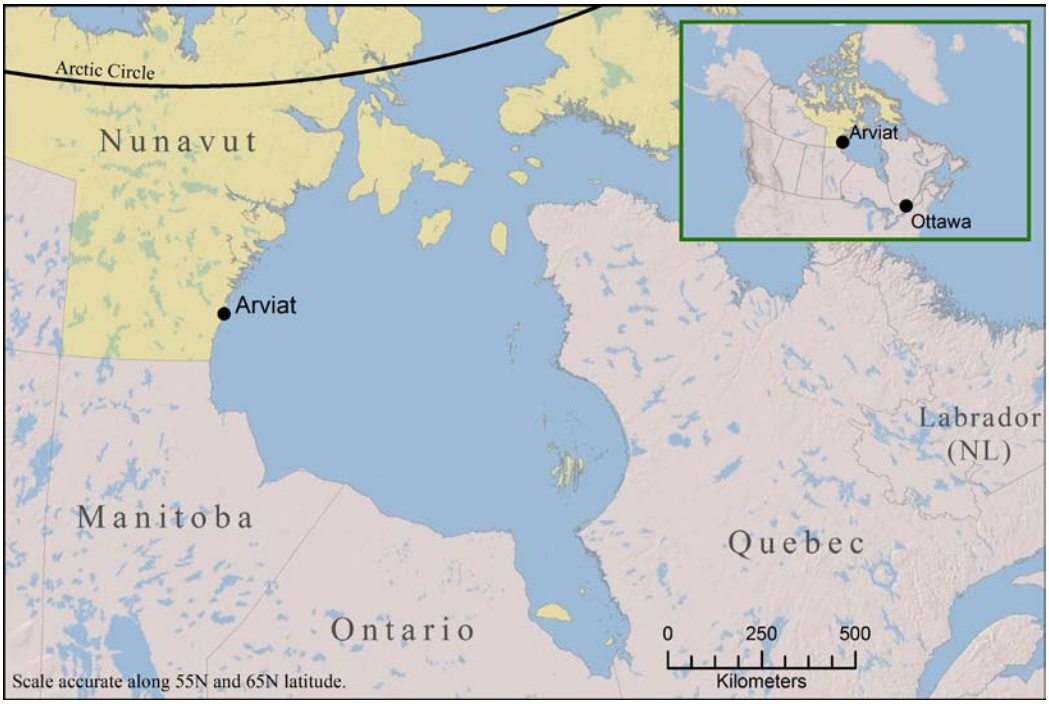

Figure 4. Arviat, Nunavut

3.2.3 Participatory research approach

A community-based participatory research approach (CBPR) was used to draw upon the observations and knowledge of community members in order to identify and characterize factors determining the vulnerability of the food system in respect to women. This approach is widely recognized to be essential for successful community-based health and geographical research and is increasingly the norm in northern regions (Duerden and Beasley 2006; Furgal and Seguin 2006; Skinner, Hanning et al. 2006; Parkinson, Bruce et al. 2008; Power 2008; Ford 2009; Pearce, Ford et al. 2009). CBPR attempts to elaborate significant and culturally relevant research outcomes while equally involving community members and researchers. As Castleden et al write, "[a]n overarching set of goals prevails in CBPR: to equalize power differences, build trust, and create a sense of

ownership in an effort to bring about social justice and change" (Castleden, Garvin et al. 2008: 1394). To that end, local partners and research assistants were involved in each level of research, from the elaboration and execution of the research to the evaluation and dissemination of results.

3.3 Methods

3.3.1 Mixed methods approach

A 'mixed methods' approach was employed in the research conducted for this thesis in order to capture the nature of Inuit women's food system and its determining factors, as well as climate vulnerabilities. Methods used included photovoice, in-depth semi-structured interviews with Inuit women and key informants, focus groups with women and elders, an environmental scan, and participant observation. The research followed an iterative process, with findings from each method reviewed constantly with the community. Two local research assistants, Ms. Hilda Panigoniak and Ms. Sarah Curley, were employed to facilitate the photovoice activity, conduct interviews, provide interpretation during interviews and focus groups, in addition to help with the elaboration of the project, the development of research tools (interview guides, focus group guide), recruitment of the participants, transcription and the dissemination of results to the community.

3.3.2 Sampling

Women participants were Inuit, older than 18 years old and permanent residents of Arviat. Photovoice participants (n=10) volunteered based on community radio advertisements made by the research assistants. Women interviewed (n=42) were selected through a purposive sampling strategy designed to include a cross-section of women who were 'food secure' and 'food insecure' based on Food Bank usage (list of users provided by Health Center) and employment status, as well as women of different ages, marital status and with or without full time hunter(s). Table 1 includes characteristics of the sample population. The number of

participants was directed by theoretical saturation. Participation was on a voluntary basis. All women interviewed were contacted three months later to participate in a follow-up focus group discussion. Twenty-four women participated to 4 focus groups.

- *Female elders* who participated in three focus groups were selected through a purposive sampling strategy. Research assistants contacted and selected 19 elders over 55 years old who permanently reside in Arviat. Participation was on a voluntary basis. Elders were included to obtain an historical perspective of Inuit women's food security, of the climate variability's impact on the food system and coping strategies.

- *Hunters* who participated to two focus groups on a voluntary basis were selected through a purposive sampling strategy. Advertisements were made on the local radio to recruit experienced hunters, 18 years and older who were permanent residents in Arviat. Research assistants selected from respondents and Frank Nutarasungnik contacted hunters recommended by the Hunters and Trappers Organization (HTO). Experienced hunters were included to this research to obtain more information about what affects their ability to hunt and provide country foods to their families and others in the community had and of the impacts of climate change on the food system vis-a-vis their role in providing for family and the community.

Category	**Sub-category**	**Number**	**Percent (%)**
Age	20 to 29	8	19
	30 to 39	15	36
	40 to 49	10	24
	50 to 59	2	5
	60 to 69	3	7
	70 to 79	4	10

Marital status	Married	23	55
	Single	19	45
Employment status	Full time	5	12
	Part time	12	29
	Unemployed	25	60
Number of children per household	0 to 1	12	29
	2 to 3	13	31
	4 to 5	10	24
	6 to 7	7	17
Number of people per household	1 to 2	8	19
	3 to 4	10	24
	5 to 6	8	19
	7 to 8	8	19
	9 to 10	5	12
	11 to 12	2	5
Number of hunter per women's household	At least one hunter	22	52
	At least one full time hunter	6	14
	At least one part time hunter	12	29
	At least one occasional hunter	6	14
	No hunter	20	48
Presence of hunting equipment in women's household	Some hunting equipment	14	33
	- Skidoo	9	21
	No hunting equipment	28	67

Table 1**.** Sample population characteristics of women interviewed in Arviat, Nunavut

*NB: This number does not add up to 42 because 1 woman can have more than one subcategory of hunter in her household.

3.3.3 Photovoice

The first method employed was photovoice and was conducted from September 8 to September 14 2010. Photovoice is increasingly being used in

community-based participatory research, notably with Aboriginal people (Wang, Burris et al. 1996; Wang, Yi et al. 1998; Castleden, Garvin et al. 2008; Lardeau, Healey et al. 2011). It has been used to empower the participants and reduce imbalances in the power relationship between them and the researchers. It is particularly relevant in Nunavut, where communities are in need of research providing meaningful data (Lardeau, Healey et al. 2011). Here, photovoice allowed the research team to introduce the project to the community in an interactive manner and identify main themes to be addressed further in the research. This technique allowed Inuit women to be fully engaged in the research process and help them represent their reality through their own photography. During this activity, the participants were the researchers. A 4 hour workshop was first delivered by Ms. Maude Beaumier and Ms. Marie-Pierre Lardeau who has experience in conducting photovoice activities in the north. Research assistants Ms. Hilda Panigoniak and Ms. Sarah Curley attended the workshop, as note taker and helped with the logistics (contacting participants, obtaining and preparing material (projector, cameras, snacks). They were previously trained in this research method during a workshop delivered by Ms. Gwen Healey, Executive Director of Qaijigiartiit/Arctic Health Research Network (AHRN). The first workshop aimed to explain the motive of this research and key themes, ethical issues regarding taking photos of others and also to teach the participants how to use a digital camera. Then, over the course of the proceeding 5 days, participants took pictures to answer the following question: “What influences what you eat, when you eat and how much you eat”. The most significant photos (between 1 to 3) were selected by each participant and were discussed/interpreted in a focus group setting with Mss. Beaumier, Lardeau, Panigoniak and Curley as facilitators. To prevent the influence in the making of categories by the participants, the facilitators left the room during 15 minutes.

The photos taken by the participants were the property of each woman and, when permission was given, they were also kept by the AHC and McGill University. Participants were compensated for their time with $60 food vouchers given to each participant. This technique was useful in obtaining background

information and for discussing the main themes with the participants (gambling, money, preserving country food, food sharing, women preparing country food, quick meals, weather affects country food access, changing taste, passing on traditional skills and country food is free) but as a method, it was not effective for collecting in-depth qualitative data. See appendix I for results. No quotes from this activity were used in the thesis.

3.3.4 Semi-structured interviews

The second phase of the research conducted semi-structured interviews (n= 42) with Inuit women and key informants. Interviews with women were conducted from October 13 to October 28 2010. Interviews with key informants were conducted throughout the field work, mainly during the first and second trip to Arviat. Semi-structured interviews are a standard method for gathering information in an open-ended format and have been used in various northern research contexts (Huntington 2000; Gearheard, Matumeak et al. 2006; Laidler 2006; Krupnik and Ray 2007; Carmack and Macdonald 2008; Laidler and Ikummaq 2008; Ford 2009; Beaumier and Ford 2010). It is an ideal way of collecting in depth qualitative data about the determinants of Inuit women's food security and the vulnerability of the food system to climate-related risks and change, drawing upon stories and personal experience. An interview guide identifying the key themes (Table 2) to be researched was elaborated based upon previous research on food insecurity (Ford 2009; Beaumier and Ford 2010) and with the help of research assistants, avoiding the construction of a fixed list of questions. The research assistants and the author interviewed individually Inuit women for this phase, and when interpretation was necessary, Ms. Beaumier was accompanied by Ms. Panigoniak or Ms. Curley, or both when interviewing an elder due to the difficulty of interpretation. Ms. Curley and Panigoniak were trained during a two day research workshop in this research method delivered by Ms. Gwen Healey, Executive Director of AHRN. Ms. Beaumier trained them further and monitored their first 3 interviews. Women were compensated for their time and for providing essential information with $40 food vouchers. Key

informants, such as professionals in the health and education sector, community and territorial government representatives, store managers, wildlife biologist and officer, were also interviewed to provide additional contextual information essential to understand the broader scale factors determining the vulnerability of Inuit women's food system. Translation in Inuktitut occurred when necessary. Women's quotes inserted in the thesis are referred to as 'participant' to preserve confidentiality. Table 6 in appendix II provides details about each participant's personal and household characteristics.

Key theme	**Example of topics covered**
Personal information	• Age • Household / family characteristics • Employment & hunting status • Length of time in the community
Food system	• Importance of traditional foods, store foods • Inter- and intra-community food sharing networks • Experience of hunger • Community support (food bank, community feast)
Store foods	• Access • Availability } Determinants and coping mechanisms • Quality • Change over time (weekly, monthly, seasonally, annually, decadally)
Traditional foods	• Access • Availability } Determinants and coping mechanisms • Quality • Change over time (weekly, monthly, seasonally, annually, decadally)
Self-perceived Health	• Mental (stress, worries) • Social (strength of social network)

	• Physical (weight loss, food related disease) • Healthy eating habits perception and knowledge
Environmental changes	• Documented changes • Current and future impact
Future trends and concerns	• Perceived future trends and concerns • Implications for food security • Coping mechanisms • Policy options

Table 2. Key themes and topics covered during semi-structured interviews

3.3.5 Focus groups

Focus groups were carried out with *Inuit women* (n=7) from March 21 to March 25 and March 30-31 2011 to expand on interview data in a group setting and also were used as a "respondent validation" strategy in order to gather feedback on preliminary findings and verify the validity of the researcher's interpretation. Focus groups are particularly useful for stimulating discussion and promote self disclosure, as for some, it provides a more comfortable setting than one-on-one interviews (Krueger and Casey 2009). Small groups of 4-6 women were favored as it is easier to manage than larger groups and it has been shown to enhance communication among participants and ensure effective translation (Ford, Gough et al. 2009). Women were compensated for their time with a $40 food voucher per participant. Ms. Panigoniak and Ms. Curley led women's discussion, and provided interpretation as needed for Ms. Beaumier who was present for all the focus groups. Mss. Panigoniak and Curley were trained to conduct focus groups by Ms. Gwen Healey, Executive Director of AHRN, during a research workshop and specifically trained by Ms. Beaumier for the purpose of this research.

Hunters and *elders'* focus groups were carried out on March 28-29 2011 and April 4-5-6 2011 respectively to acquire additional information on women's food

insecurity and to expand on specific subjects, for example: traditional practices and beliefs, country food accessibility, quality and availability, hunting and trends of climate change over time. Elders and hunters were compensated with a $100 food vouchers and $100 gas vouchers respectively. Ms. Panigoniak and Ms. Curley led the women's and elders' discussions, and provided interpretation as needed for Ms. Beaumier. Mrs. Winnie Malla (Community Wellness Coordinator) and Ms. Diane Angma (Community Health Representative) also assisted with the elders' discussion groups. M. Frank Nutarasungnik, an experienced hunter himself, led the hunters' focus groups, which were conducted entirely in Inuktitut.

3.3.6 Environmental community scan

Environmental community scanning was carried out throughout the field trips by Mss Beaumier, Panigoniak and Curley to collect further contextual information and develop further insights about the food system. The scan involved estimating the cost of a basket of goods to feed a family of four in Arviat for a week based on the Department of Indian and Northern Affairs' Revised Northern Food Basket (INAC 2007), obtaining data on gas and oil prices and on other items such as cigarettes and soft drinks in order to better estimate the cost of living. The quality, accessibility and availability of foods were observed at the local grocery stores, as well as Inuit consumption patterns.

3.3.7 Participant observation

Participant observation was also used, involving actively taking part in community life "to get beyond forcing answers to questions framed by particular knowledge" (Bennett 2002: 139; Laidler, Ford et al. 2009). Participating in community meals, sport and artistic events, social gatherings, attending celebrations and educational activities were an integral part of my research agenda, with notes kept on general observations, impressions, opinions and experiences in a research diary. This also involved staying with an Inuit family for 10 weeks, and conducting 15 weeks of fieldwork. This allowed me to be fully

embedded in Inuit everyday life and understand better how the food system operates.

3.3.8 Secondary sources

A literature review was conducted through Web of Science and PubMed for peer-reviewed articles, to contextualize information provided by women, elders, hunters and key informants. Local documentation available from the Community Wellness Center and the Department of Education was also examined, including:

- Tagalik, S. (2005) Nasivvik Proposal- Evaluation of Diabetes Prevention Program. Arviat
- Tagalik, S. (2006) Arviat Wellness - Successes and Barriers. Arviat
- Tagalik, S. (2006) Arviat: A Case Study of a Community Healing Process. An Analysis of the RespectED Abuse Prevention and Intervention Training Program. A collaboration of the Government of Nunavut, Memorial University of Newfoundland, Mount Saint Vincent University, University of Northern British Columbia.
- Arviat Health Committee (2008) Arviat Health Summit - Report on Discussion.
- Arviat Health Committee (2009) Community Wellness Strategy 2009-2014. Arviat Hamlet Council
- Arviat Health Committee (2009) Arviat Health Summit – Report on Discussions. Arviat
- Karetak, J. (2011) Inuit Qaujimajatuqangit. Department of Education. Arviat

Local sources were reviewed to obtain community-based knowledge not available elsewhere in the literature in order to get a better understanding of Arviarmiut perspectives of health issues, history and the community's objectives in terms of health and wellness.

3.3.9 Data analysis

All data gathered from the interviews and focus group discussions was transcribed and analyzed thematically to create common groups or categories relating to food insecurity and vulnerability of the food system (Ford 2008). Analysis was conducted using QSR NVivo; a software package designed to organize, handle, and facilitate the analysis of qualitative data. From this analysis, percentages were sometimes calculated for answers related to commonly asked questions such as: “Have you run out of food over the past year?”; or “Do you ever worry about running out of food?” In the result section, it is indicated when the question was not asked to all 42 women. The data analysis brought up numerous human factors impacting upon Inuit women’s food system. Concept mapping was used consistent with Ford 2006, 2008 to illustrate the interactions between these factors operating at multiple spatial temporal scales (see Chapter 7).

CHAPTER 4. GENDERED DIMENSIONS OF THE FOOD SYSTEM IN ARVIAT, NUNAVUT

To determine how Inuit women's food system in Arviat is susceptible to climate change, it is important to define the nature of the food system and how it operates today. This chapter examines the gendered dimensions of the contemporary Arviat food system situating it within a historical context. The western definition of a food system, composed of "dynamic interactions between and within biophysical and human environments which result in the production, processing, distribution, preparation and consumption of food" is used (Gregory, Ingram et al. 2005: 2141; Ericksen 2008). Each component is described in the following section, specific to country food and store food systems, and located in a historical context.

4.1 Country food

4.1.1 Production

Traditionally, male hunters in Arviat had the main responsibility of securing food for their family (Van Stone and Oswalt 1959). They were responsible for supplying food to women, children and elderly men (unable to hunt). Caribou Eskimo males harvested mainly caribou (*Rangifer tarandus)* year-long with the main hunting season occurring during caribou migrations in spring and fall; fish such as arctic char (*Salvelinus alpinus*) and lake trout (*Salvelinus namaycush*) were also important in the diet year-round (Birket-Smith 1976). In spring and summer, approximately one quarter of Caribou Eskimo[1] moved to the coast to hunt ringed seal (*Phoca hispida)* and walrus (*Odobenus rosmarus),* although use of sea-mammals was less frequently practiced than as was the case among neighboring Netsilik and Iglulik Inuit (Birket-Smith 1976). Seals were not normally hunted during the winter, except for Qaernermiut living at Chersterfield

[1] Caribou Eskimo including: the Harvaqtôrmiut, the coastal group of the Pâdlimiut, and 2-3 families of the Qaernermiut (Birket-Smith 1976: 125).

Inlet (Birket-Smith 1976). During the summer, Caribou Eskimo also harvested ducks, geese, ptarmigan, gulls and their eggs, ground squirrels and hares (Arima 1984: 449). Men and women collected a variety of berries and roots during the summer. Before Musk-ox (*Ovibos moschatus*) were practically extinct in the southern Kivalliq region at the beginning of the 20th century, they were particularly important during times of caribou shortage, providing important food staples along with fish and ptarmigan (Burch 1977; Arima 1984).

The interviews conducted here reveal that harvesting remains a male activity in Arviat, although some women hunt as a group and/or with their husbands. Husbands, fathers, sons, grandsons, brothers and in-laws remain the main providers of country food to women. Caribou is still the main (and preferred) country food. People also harvest other species in season, most commonly lake trout, arctic char, seal and beluga from which muktaaq is consumed (beluga skin). Entire families pick berries and eggs. As muskoxen return to the area, these animals are also being harvested using a quota system.

4.1.2 Distribution

Historically, "economic interactions [among Caribou Eskimo] were governed principally by residential association, which in turn was strongly influenced by kinship and exploitative task requirements. The land and its resources were held to be for all and not to be claimed by individuals or communities, although each group had a vaguely demarcated home area" (Arima 1984: 455). The harvest was the property of the local group and shared within a camp (Arima 1984). Whether within a camp or between different camps, Birket-Smith (1976: 257 vol. 1) notes that "the distribution of meat which takes place after the hunt […], in the minds of the Eskimos, is […] a right, which does not crave any direct return", given that everyone in the camp was an active member doing their share of the tasks. Indeed, in a Caribou Eskimo family, circle or camp social organization was based on practicality and labour was naturally divided between male and female (Table 3) (Birket-Smith 1976). On the opposite, when an Inuk gave a gift to another person (for example tools), the giver would always

expect a gift in return at some point in time. This practice is, according to Birket-Smith (1976), the result of contacts and gift exchange with Europeans.

Activity	**Male**	**Female**
Building snow house	x	
Pitching tent	(x)	x
Tending fire and lamp		x
Hunting	x	
Fishing	x	(x)
Collecting	x	x
Flensing	x	x
Cooking		x
Dog driving	x	
Working in stone, metal and bone	x	
Skin preparing	(x)	x
Sewing		x
Thong making	x	

Table 3. Traditional division of tasks between Caribou Eskimo male and female (source: Birket-Smith (1976 : 257-58 vol.1))

Today, it is still a common practice for hunters to share meat with close relatives, and it is expected that good hunters provide meat to widows and single women. Yet interviewees noted that many families without a hunter expect relatives or others to hunt and provide for them without any attempt to reciprocate. This attitude is placing the sharing tradition under increasing stress as access to meat becomes more difficult (discussed in next section). Thus, compensating hunters for their time and expenses with money or gas was described as increasingly common. Hunters have also started to ask for money in return for country food. The announcement through the local radio or Citizen' Band Radio (CB Radio) that country food is available to be distributed for free or for sale within the community was described as common. According to the

interviews and focus group discussion results, it is generally acceptable to sell fish, such as Arctic Char, white fish and trout, to other community members. Nevertheless, out of the 36 women, only 6 reported having bought Arctic Char from a local person within the past 5 years. Mostly, women report never having bought country food from a local hunter. Few had previously bought caribou, although it is not a common practice to sell caribou. Women who bought caribou indicate that they were craving it and were unable to obtain it free of charge:

> "I bought a whole caribou for 100 bucks; sometimes I share it with my mom's because they're 17 people in one house" (Participant 29).

> "I bought fish and caribou (from Inuit before). The caribou is more expensive than fish; $100 for a caribou and $50 for half of it. I bought caribou a couple of times when I was pregnant, I really needed raw caribou for my heartburn" (Participant 11).

With the establishment of commercial fisheries in Northwest Territories by the Government of Canada (with Nunavut created from NWT in 1999), several arctic fish species and sea mammals became part of a market economy thus establishing legitimacy for Inuit to sell fish within the community. In past practice, Inuit would have shared fish, seal, walrus and muktaaq as they did for caribou (Tagalik 2011, personal communication, Arviat). In Arviat, some women mentioned that selling fish is an important source of revenue for hunters, and allows them to buy hunting supplies. As participant 7 noted: "Local people, I am ok with it (selling fish) because they're trying to make a living out of it. They probably don't have a job." Compensating a hunter by offering him money to go hunting or directly buying him gasoline was mentioned by 14 women as a way of getting country food when none was available. Nine women bought caribou or fish or compensated a hunter for his expenses; of those nine three were single women:

> "[I buy gas to a hunter] when I am really hungry for country food, maybe once a year" (Participant 14).

> "When my brothers are out of town, I say "I'll pay $100 for whoever can go hunting for me" through the CB and someone offers to hunt for me" (Participant 11).

Country food is also distributed occasionally at the local stores; including dried caribou (caribou jerky), muktaaq, and Arctic Char. Twelve women indicated that they had previously bought fish at one of the local stores. However, the high price for country food sold at the store prevented most women from buying it. Indeed, it was mentioned by a local informant that the stores make a large profit from *country food* sales and they mark up the product almost 100%. In addition, caribou or other country meat has to be processed in a federally inspected meat plant, which is then sold to stores at higher prices than locally harvested game would sell for. Stores add a mark up to the prices they pay the meat plants. For example, a fish sold at the store can cost $54 as opposed to $10-$20 from a local person.

There are diverging opinions regarding the sale of country food by local stores. On one hand, some disagree with this practice because they argue that traditionally Inuit share country food and this practice is a central part of Inuit belief systems. On the other hand, 23 women (out of the 33 that were asked) agreed with selling more country food at the stores because it provides better access to country food to those who don't have a hunter to provide them with country food, particularly single mothers. This shows a shift away from the belief that country food should be shared. Some also noted that the store should sell only country food that is not available around Arviat, such as walrus (which people obtain from Igloolik and Repulse Bay). As a participant 6 explained: "We are just adapting to start having country food at the store". This quote from a woman illustrates well the duality of opinions regarding the selling of country foods:

> "[The store should sell more country food], because older people would buy more, it is acceptable, it would increase the health of people. [But] It can also cause problem because there is an Inuit way of life; giving meat to each other" (Participant 22).

4.1.3 Processing and preparation

Traditionally, meat processing was done in a number of different ways depending upon the season. In general, whole families participated in the preparation of meat. For example, flaying and cutting up caribou was carried out by both sexes; however, for practical reasons, men flay walrus while both men and women skin seal (Birket-Smith 1976). The location of processing also determined whether males or females or both participated in the processing of the meat; men would do the work if they were on a hunt and were not accompanied by women. If the game was brought back to the camp, women and children would participate (Birket-Smith 1976). See Birket-Smith (1976) for more details on the traditional way of processing meat.

Today, meat processing varies with season, and is much more challenging during the winter due to extreme cold temperatures. Generally, it starts on the land and is done by the hunter himself where the hunters flay the caribou and cut it. Then he puts the skin at the bottom of the qamutik (sled) and wraps the meat parts inside the skin. Once the meat is brought back to the household, women, and sometimes both men and women, complete the processing of meat by cleaning it and cutting it up in smaller parts that will be frozen, distributed to others in the community or further prepared to be eaten in the household. Women will prepare the caribou hides from the summer and early fall for sewing (Nutarasungnik 2011, personal communication, Arviat).

4.1.4 Consumption

In the summer, meat was usually boiled. In the winter, especially when fuel was not available, meat was eaten frozen (Birket-Smith 1976). Traditionally,

the main meal was eaten in the evening. In some camps (mainly in the Qikiqtani) men and women did not eat together during this meal. Men would gather at the tent or igloo of the successful hunter to eat and women ate after the men had finished their meal or if they ate at the same time it was separately. For the smaller meals they often ate together. When men were away from the camp hunting, women did not cook meals; they would normally boil tea and eat a small snack of cold meat to save on fuel (Birket-Smith 1976). In the morning, Caribou Eskimo drank tea and did not eat much; they may have had "a little dried or frozen meat, or if there should happen to be any leavings from the previous night, a piece of cold, cooked meat" (Birket-Smith 1976: 267-68 vol. 1). Feasts would occur at no particular time of a year and were often accompanied by singing and drumming.

In addition, various prohibitions existed among Caribou Eskimo around the consumption of certain foods. These rules varied within groups, camps and individuals, and were often implemented by shaman to restore harmony and ensure the availability of and access to food (Birket-Smith 1976). Birket-Smith (1976: 138 vol. 1) notes that some of those rules applied to all Caribou Eskimo groups at all times, for example "the prohibition against eating fish which have died in the net, or frozen fish whose intestines have not been removed." Some rules were connected with seasons, for example, in the winter and summer, the Qaernermiut did not eat caribou meat and fish on the same day. For the Pâdlimiut, this rule only applied to women. Several other prohibitions applied only to women with small children, girls and elderly women. For instance: women were not allowed to eat wolverine meat, eggs, cloudberries nor whortleberries, they were not allowed to eat the meat of cached caribou if foxes had eaten it, they could not eat the muzzle, tongue, liver and kidneys of caribou, or the liver of bearded seal or walrus (Birket-Smith 1976). Other rules forbade women who were menstruating from eating raw or rotten meat; forbade women who had just given birth from eating anything else than the limbs of caribou; and forbade women after the death of a close relative from eating the head and stomach of caribou (Birket-Smith 1976).

Today, Inuit in Arviat consume meat raw, frozen or cooked in various ways (for examples roasted, fried, smoked, stir fried with vegetables). Some Inuit families can afford to eat three meals per day; the main meal, however, remains dinner, which men and/or women prepare. For breakfast, most people still only drink tea and do not eat or eat very little, as they have traditionally. Family feasts occur on various occasions, mainly at set holidays, such as Christmas and birthdays. The Hamlet of Arviat also organizes feasts for the entire community at one of the schools or the community hall for special occasions, such as Hamlet day, Christmas and New Years Eve. Interviews and focus groups reveal that today everybody eats at the same time or when they are hungry and there are no differences between what women, men and children eat. Those involved in this research, including elders, did not reveal any prohibition regarding food consumption as there had previously been. Yet, allergies to country foods are now preventing some children from eating certain foods such as fish and mussels: "some kids have allergies so we have to watch what we cook" (elders, focus groups).

4.2 Store food

4.2.1 Production and processing

Tea, flour, baking soda and sugar were some of the first items introduced to Inuit. As of the 17th century, store foods produced and processed in the south were slowly introduced in the Kivalliq region by the Hudson's Bay Company (HBC) at Churchill, which was officially founded in 1670 (Van Stone and Oswalt 1959) and Fort Prince of Wales on Churchill River, founded at the beginning of the 18th century. In addition, as of 1860, whalers entered Hudson Bay and provided Inuit with food in times of famine, especially to Aivilingmiut (Inuit residing north of Hudson Bay) and Qaernermiut bands (Ross 1975). Missionaries and Royal Canadian Mounted Police (RCMP) also offered relief (family allowance) to Inuit in times of food shortage (Tester and Kulchyski 1994). Flour, baking soda and lard are the main ingredients of "bannock", a bread widely

considered as ‘traditional food’, though initially introduced by HBC employees. Nowadays, store foods consist of a larger selection of perishable and non-perishable items produced and processed in the south.

4.2.2 Distribution

Store food is transported over long distances to Arviat by sea-lift (once a year) and air (every week). It is then sold at three local stores: The Northern Store, Federated Coop and Eskimo Point Lumber Supply, as well as the three convenience stores and the RK’d (a small convenience store with few games that mostly sells “junk foods”). Members of a household buy food supplies, which are shared within the household. Store food is also distributed amongst family members and friends through sharing, however not in the same manner as country food. Store food is normally only shared if somebody asks for an item.

4.2.3 Preparation and consumption

People began to eat more store foods in the 1950’s-1960’s when they were relocated by the governement to their current location. This change in diet is refered to as “nutrition transition”. Its impacts have been extensively described (for example Kuhnlein and Receveur 1996; Kuhnlein, Soueida et al. 1996; Kuhnlein, Receveur et al. 2004; Kuhnlein and Receveur 2007; Kuhnlein, Receveur et al. 2008). Participants revealed that the main food items they buy at the store are: pasta, soup, flour, rice, ground beef, sugar, eggs, bread, cereal, tea/coffee, and ready-to-eat foods (frozen pizza, Kraft Dinner). Women buy food items required to make bannock and items that mix with caribou to make stew, for example frozen mixed-vegetables. Few buy vegetables and fruits on a regular basis due to high prices and limited knowledge on how to prepare and cook them. Two anonymous informants revealed that the biggest sellers are ready made foods (pre-made sandwiches, frozen pizza, fried chicken, fries), and canned and “junk foods” (pops, chips and bars). For some, store food has become easier and faster to prepare than traditional food given the increase in availability of pre-made

foods. Fruits (especially canned fruits), vegetables, fruit juice and dairy goods are increasing in popularity according to store managers. Foods that are sold at the convenient stores and the RK'd are mostly fast foods and "junk foods", are also gaining in popularity, especially in the younger generation.

4.3 Summary – Nature of the food system

Characteristics of the Arviarmiut food system are described in detail in Chapter 4. Production of country food remains predominantly a male activity, while processing and preparing foods are performed by both genders. Family ties and social rules, such as providing meat to elders and single women, direct distribution among individuals. A lack of reciprocity to those who share their country food is stressing the traditional sharing system. Compensating hunters and their families with gas or money is now common practice in Arviat. Selling country food among community members is controversial and still a marginal practice within the community. A shift in traditional Inuit beliefs regarding sharing is noted as more and more Arviarmiut agree with selling country food. The local stores occasionally sell country foods at high prices. Store food consumption has increased at the expense of traditional food from the middle of the 20th century. A variety of store foods are now available in local stores and the most popular items are easy to prepare and often of poor nutritional quality. Store food is shared on a demand basis, as opposed to country food, which is commonly offered, first to family members, widows and single women.

Chapter 5 assesses the food security status of women in Arviat. This provides an indication of the stress that is put on the food system which, when functioning well, provides food security for all people at all times. Chapters 6 and 7 build upon this through outlining climatic and human factors affecting Inuit women's food system, identifying and describing these factors in order to assess their vulnerability to climate change.

CHAPTER 5. FOOD (IN)SECURITY STATUS AMONG INUIT WOMEN IN ARVIAT, NUNAVUT

This chapter describes the current food security status of Inuit women in Arviat, framed within a historical context with respect to accessibility, availability and quality of food consumed. Food security status provides indication of the pressure experienced by women's food system. When the food system is not stressed, adequate food security is maintained.

5.1 Food (in) security status among Inuit women in Arviat

Food security status is determined according to hunger and worry associated with the lack of food, and also the level of availability, accessibility and quality of traditional and store foods. Harvest study data coupled with an increase in population indicates that country food *availability* in the community of Arviat has decreased over the past 20 years. Data from the Survey of Resource Harvesting 1975-1977 (McEarchern 1978) and the Nunavut Wildlife Harvest Study (Priest and Usher 2004), shows that the harvest of the three main staples, caribou, beluga and ringed seal has not increased from 1975 to 2001 (Figure 5), during which the population has increased by approximately 245% (Figure 6) (Statistics Canada 1997; Statistics Canada 2002; Statistics Canada 2007; Nunavut Planning Commission 2008). Consequently, less country food is available per capita. Locally, women participants described a decrease in availability of traditional foods, especially during the winter when fewer hunters can go hunting due to cold temperatures and blizzards. Caribou was particularly scarce during the fall and winter of 2010-2011 in Arviat, primarily due to a decrease in accessibility of caribou which, many said was very far away, located more than 800 km from the community: "Seems like there is not much caribou this year, they're really far from the town too, they're not hard to hunt every winter, but it's harder this year" (elders, focus groups). Seasonality is important in determining availability of country foods.

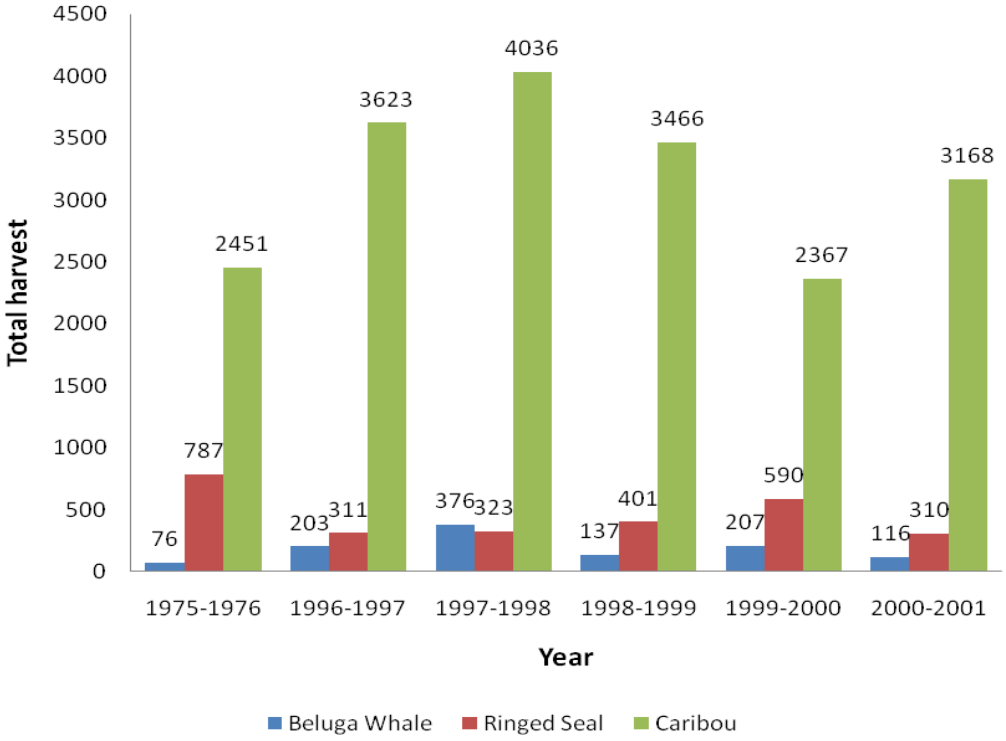

Figure 5. Number of beluga, ringed seal and caribou harvested in Arviat, NU, from 1975 to 2001 (McEarchern 1978; Priest and Usher 2004)

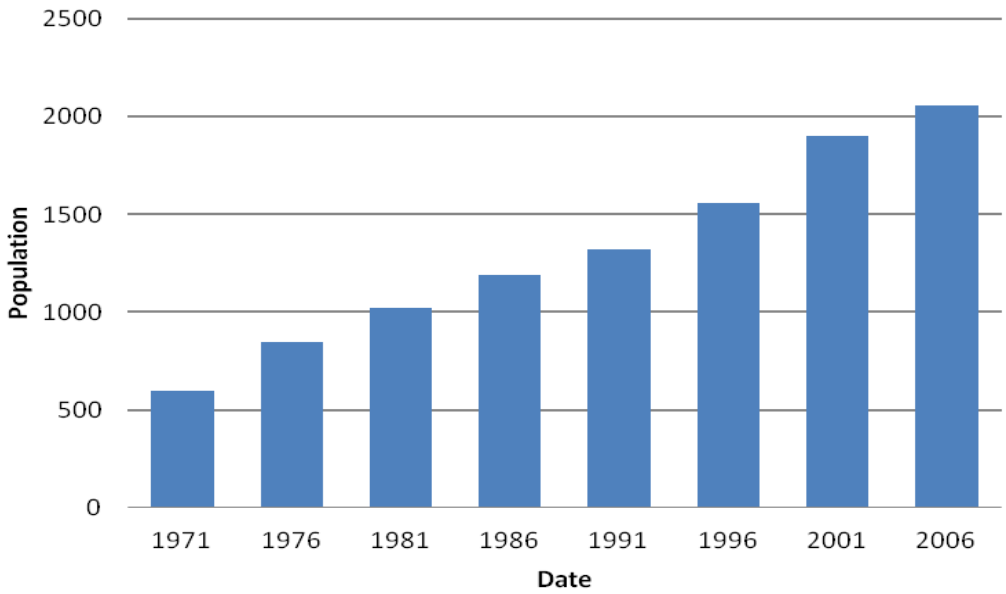

Figure 6. Population of Arviat, Nunavut from 1971 to 2006 (Statistics Canada 1997; Statistics Canada 2002; Statistics Canada 2007; Nunavut Planning Commission 2008)

Accessing country food that is far away from the community is a challenge for many hunters in the community. Some do not have the time required to travel long distances from the community because they are working or must take care of their family. Other hunters do not have adequate financial resources to acquire equipment and gas required. For example, a young mother mentioned that her husband, who is a hunter, who has an ATV, is willing and has the time to hunt but cannot afford it, because they have other expenses to be made first, notably for their children. Reduced access to hunting areas decreases country food security. Participants in this study did not note any problems or changes with regards the *quality* of country food, which was described as very good – it tastes good, it is fresh and is the best food that Inuit can consume.

Store food *availability* has increased over the years, with three stores (Northern Store, Coop, Eskimo Point Lumber Supply), three convenience stores and one RK'd now offering a variety of foods. According to store managers and elders, the variety of products offered in the stores is increasing, with more fruits, vegetable and fresh meat now being made available. However, the *accessibility* of store food is challenging for women due to high price of staples (further discussed in Chapter 7). According to women, *quality* of store food, including freshness, taste and types of food available, is satisfactory, although key informants mentioned that a disproportionate amount of "junk foods" are offered.

According to the Arviat Health Committee overall *food security* status was described as challenging and perhaps getting worse. In fact, more women and their families have been observed to be using the food bank during its short operating span. When the food bank started 3-4 years ago, 60-75 families (households) were getting a bag of food supplies once a month. Today, at least 130-140 families are regularly using it. The community nurse mentioned that even people with good employment status benefit from the food bank, and the organizers must turn them away. She says: "It's the rare person that would ever come to the food bank unless they really need it. They are very proud people here." She adds that many women also go to the Health Center Clinic with their child to ask for food because they haven't eaten in several days.

Running out of food recently, especially store food, occurred in 34 women's households. Twenty women mentioned running out a few times per year. For 11 women, running out of food occurs on a regular basis, every month before they receive money, and sometimes twice a month: "It happens often [that we run out of food], maybe the last few days before we get child tax, we don't have much, even Pampers, we'll run out of that a day or couple day before" (Participant 7). Running out of country food was not common, yet almost every woman asked, said that she would like to eat more country food (of importance for the quality component of food security). Of 42 women interviewed, 18 eat country food more than 3 times per week; 6 women eat it once or twice per week, and 13 women eat it 2-3 times per month. Women who are particularly susceptible to a lack of country food are women living in a household that does not have a man who is able to go out hunting due to lack of money, equipment, time or expertise, or do not have any close relatives that hunt full time. Some women worry once in a while about running out of food, but others worry on a regular basis, every month, usually a few days prior to getting paid, receiving their family allowance or income support cheques. Women are particularly worried about not having enough food to feed their children.

Food insecurity in the north reflects the over consumption of nutritionally poor processed foods (Kuhnlein, Receveur et al. 2004; Egeland, Johnson-Down et al. 2011) and periods of under-eating (Beaumier and Ford 2010; Ford and Beaumier 2010). In Arviat, more than half of the women interviewed (including pregnant women) reported recently eating less and/or skipping meals during periods of store food or country food shortages. Most of these women do not experience this on a regular basis, but rather only during a few times per year. When women are food insecure, they eat less to let their children eat first. "I eat less when the children are around. I want to feed them first" (Participant 39). Women also reduce their consumption of country food when their access is limited, in order to let their children eat it: "I try not to eat lots [of country food] because I want my boys to have a good health and energy" (Participant 15). In addition, most women reported not eating breakfast, which is traditionally a

common practice amongst Inuit. Some skip meals other than breakfast, even when hungry, because of "*the poorness of the food*" available (Participant 2).

5.3 Health consequences related to food insecurity in Arviat

Dietary inadequacy in Inuit, men and women, has been widely associated with the "nutrition transition" – the increase in consumption of nutrient-poor processed foods and the decrease in consumption of traditional foods. In 2006, for 29% of Nunavumiut aged 15 and above, less than half of their diet was composed of country foods (Tait 2008). Results from the Inuit Health Survey 2007-2008 shows that food insecurity is associated with significantly greater intakes of carbohydrates (as percent of energy) and lower intakes of energy-adjusted fiber, folate (DFE), vitamin C, iron, magnesium, calcium and vitamin D among women in Nunavut (Egeland, Johnson-Down et al. 2011). Combine with food insecurity (inadequate access and/or availability of foods of sufficient quality, and reduced food intake), it increases Inuit susceptibility to health afflictions such as obesity, coronary hearth disease, Type 2 diabetes, hypertension and cancer (Kuhnlein, Receveur et al. 2004; Johnson, Nobman et al. 2009; Egeland, Johnson-Down et al. 2011). The community nurse in Arviat reported that the number of Type 2 diabetics had skyrocketed within the past 15 years in large part due to this nutrition transition. In 1995, only two diabetics were reported in the community, and they were both of Caucasian origin. In December 2010, there were more than 20 Inuit diagnosed with Type 2 diabetes, including three requiring insulin injections, and others oral diabetic agents. Iron deficiency and anaemia has also been linked to the nutrition transition and the reduced consumption of high in iron traditional food. This low level of iron intake causes low haemoglobin levels in newborns which is, in turn, linked to an increase in susceptibility to respiratory infections and a low immune response (Pacey, Weiler et al. 2011). Dental decay associated with high sugar intake is another important issue in Arviat related to food insecurity, and the quality of the diet (Pacey, Nancarrow et al. 2010). Nurses in Arviat further reported patients with stomach pain due to not eating for up to five days and drinking only tea to offset hunger pangs. Other evidence of lack of

food for an extended period of time occurs on or immediately after they receive Nunavut Child Benefit (see section 7.3.1 for additional details), when people come to the clinic with severe abdominal pain due to the consumption of a large amount of food in a short period of time. The loss of weight as a result of lacking food was not an important consequence of food insecurity in Arviat, where the over-consumption of foods of low quality and obesity are of greater concerns.

5.4 Summary – Food insecurity among women in Arviat

The quality of country foods in Arviat is high. However, food availability within the community is decreasing, with the number of harvests not increasing at the same rate as the population's growth. Winter is the period with the lowest country food availability due to inhospitable weather which prevents hunters from hunting. In general, access to country food is constraint by several factors, such as time available, limited financial resources and lack of equipment.

Store food quality (freshness, taste) is good according to participants, however, key informants and the author's observations confirms that many store foods, some of which are particularly popular among Inuit, are of low nutritional value. The variety of store foods available have increased over the years, however, high prices constrain access. Overall, the food security status of Arviarmiut is not adequate, with increased use of the food bank and increased incidents of Inuit women compromising their food intake in times of food shortage in addition to and worrying about running out of food. Food insecurity, more specifically link to the nutrition transition and poor quality of food consumed, is increasing the susceptibility of Inuit to chronic health afflictions. The manifestations of food insecurity among Inuit women in Arviat are the outcomes of environmental (climatic and biophysical) and human stresses on the Inuit food system. These are further described in chapter 7 and 8.

In order to assess the vulnerability of Inuit women's food system to climate change, it is important to determine how it occurs in the Eastern Arctic and more specifically the Kivalliq region of Nunavut. This chapter outlines the manifestations and observations of climate change based upon the scientific literature and traditional knowledge of Inuit elders, hunters and women.

6.1 Climate change in the Eastern Arctic: scientific observations and projections

Since 1900, the warmest temperatures Arctic-wide have been recorded within the last decade (Overland, Wang et al. 2011). In 2010, exceptionally warm air temperatures were recorded in the Canadian Arctic as well as record low winter sea extent ice (Richter-Menge and Overland 2010; NSIDC 2010, 2011). The Arctic sea ice extent average during December 2010 and January 2011 was the lowest recorded since 1979 (Overland, Wang et al. 2011). In Hudson Bay, ice extent was particularly low. This area, normally covered over in late November, did not completely freeze until mid-January (NSIDC 2010, 2011). This was also observed by elders in Arviat, who reported the ice on the bay forming about three weeks later in November (Murphy 2010, personal communication, Arviat). This low ice extent occurred in conjunction with abnormally high atmospheric temperatures over the Hudson Bay, about 6°C above normal (NSIDC 2010, 2011). In the Biological Arctic Report Card, Gill (2010) notes that "changes in sea ice conditions and, more broadly, changes in the physical environment are impacting local populations and ecosystems." Arctic species are being affected due to encroachment of sub-arctic species and change in ecosystems (Gill 2010). Gill (2010) reports an important decrease in wild caribou (*Rangifer tarandus)* populations across the Arctic (Figure 7). Regarding the Qamanirjuaq caribou herd from which Arviarmiut harvest the most, survey estimation shows that the herd

went from 496,000 in 1994 to 350, 000 caribou in 2008. Although this estimate shows that the caribou population has not increased over the past 14 years, it does not confirm with statistical certainty that it has declined (Campbell 2010, personal communication, Arviat). In addition, 496 000 might have been a unusually large number of caribou and the population stabilising or declining could be part of natural population cycle (Campbell 2010, personal communication, Arviat). Lastly, the latest Musk-ox survey in the Kivalliq region conducted in 2010 shows a dramatic change in their distribution as compared with historical record as they are occupying more territories and more prevalent around Arviat (Campbell 2010, personal communication, Arviat).

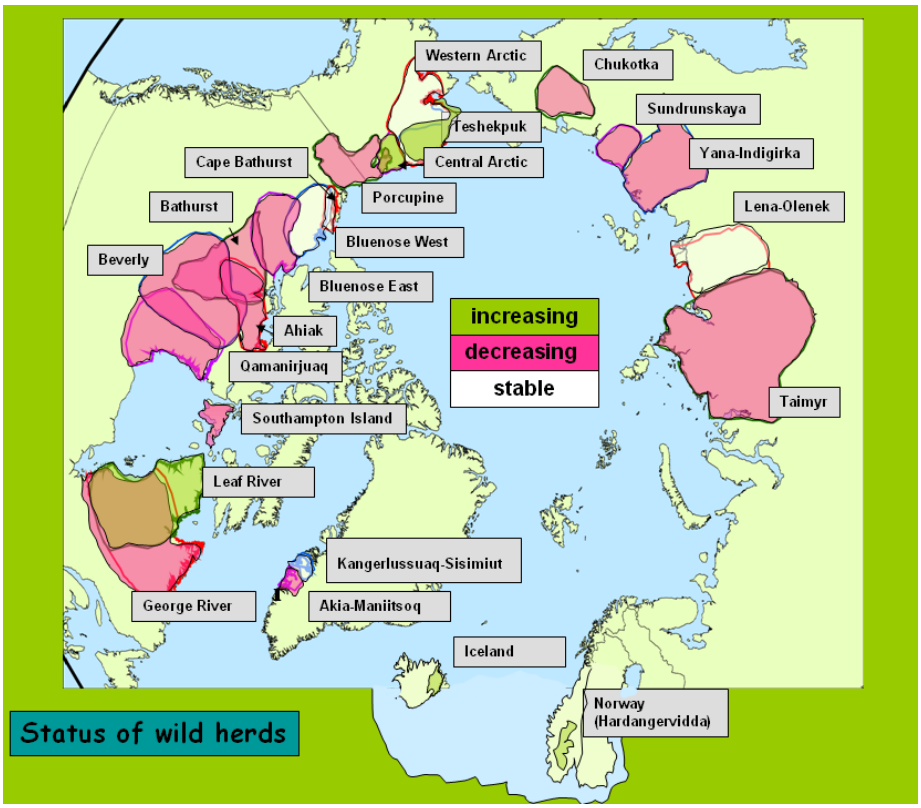

Figure 7**.** Current status of the main migratory caribou and reindeer herds across the circumpolar north. (Source: Russell (2010))

The Arctic Climate Impact Assessment (ACIA) (ACIA 2005) predicts that the average daily temperature of the circumpolar regions will increase

approximately 5-10 °C over the next 150-200 years. In addition, ACIA predicts a change in precipitation, a decline in ice and snow cover, and permafrost loss. A number of studies are predicting permafrost loss in areas surrounding the Hudson Bay (Laidler and Gough 2003; Smith, Burgess et al. 2005), with one study estimating a permafrost loss of 50% by 2100 (Gough and Leung 2002). Permafrost degradation may cause infrastructural damage, and cause hunting trails to be less stable (Bolton, Lougheed et al. 2011; Forbes 2011).

Laidler and Gough's (2003) report outlines the potential impacts of changes in salinity and surface water composition on marine productivity in the Hudson Bay and the effects changes of river systems in Hudson Bay region will have on wildlife, especially fish productivity and behavior. Change in oceanic currents, water temperature and level are factors related to climate change that may impact the distribution of Arctic char, a distribution which is predicted to shrink in the southern Hudson Bay (Forbes 2011). Several studies document polar bear vulnerability to early ice break-up, and the potential negative impacts of climate change on the polar bear population and their prey (ringed seal) in the Western Hudson Bay region (Barber and Iacozza 2004; Stirling, Lunn et al. 2004; Stirling and Parkinson 2006; Regehr, Lunn et al. 2007; Laidre, Stirling et al. 2008; Durner 2009; Prowse, Furgal et al. 2009; Forbes 2011). A disappearance of ice platform, change in sea currents, change in sea ice break up and freeze up patterns is projected to have significant impact on polar bear populations of south western Hudson Bay (Gagnon and Gough 2005) In addition, a reduction in sea ice cover could negatively impact polar bears' genetic diversity (Crompton, Obbard et al. 2008). There are diverging observations regarding the health and abundance of polar bears between scientist and Inuit (Tyrrell 2006; Dowsley and Wenzel 2008; Dowsley 2009). Whether or not climate change is or will negatively impact polar bear populations of the Western Hudson Bay, the perception that it might may have adverse repercussion on Arviarmiut source of meat, hunter-bear relationship and revenue from sports-hunting (Wenzel 2005; Dowsley and Wenzel 2008).

6.3 Climate change in Western Hudson Bay from Inuit Qaujimajatuqangit

Inuit are intimately connected to the land and have an extensive Traditional Ecological Knowledge (TEK) of the physical and biological attributes of the land and its species. But more importantly is *Inuit Qaujimajatuqangit* (IQ), which is described as a set of beliefs, "values, world-views, language, social organization, knowledge, life skills, perceptions and expectations" (Wenzel 2004: 240) of which TEK is an important component and continues to be the basis of Inuit culture today. IQ provides information regarding climatic and environmental changes; it documents the impacts of and adaptations to these changes, and is widely recognized as a valuable knowledge base for assessing environmental change.

Elders have noted that the most significant climate changes have occurred gradually over the past 5 to 10 years and that "the applicability of traditional Inuit seasonal terms has become uncertain due to changes in the environmental conditions normally associated with different times of the year" (Government of Nunavut 2005: 17). Detailed observations have been documented in workshops in the Western Hudson Bay region; these are included in Table 4.

Category	**Change observed in Arviat, Baker Lake and the Hudson bay area**	**Source**
Seasons	Change in duration and timing of season Rapid change of environmental condition during each season, decrease predictability	Government of Nunavut (2005)
Weather	Unstable weather condition (temperature fluctuation, wind shifting and intensity, storm behaviour) Change in weather patterns Less predictable weather patterns Lack of sunshine in the summer Earlier and faster spring thaw (days versus weeks)	Government of Nunavut (2005) Sullivan and Nasmith (2010)
Temperature	General warming trend	Government

	Less extremely cold temperature Cold temperatures Extreme cold period are broken down by warm period causing rainfall in the winter Less clothing required to hunt in the winter Extremely hot temperature during the summer (upinnigaaq and aujaq) Delay caching time up to one month due to long and intense warm period in August	of Nunavut (2005) Sullivan and Nasmith (2010)
Winds, Storms, blizzard, fog	Unpredictable wind direction Rapid shifting of the wind Shift in prevailing wind direction from northwest toward northeast Stronger winds Shorter and less calm period Difficulty in predicting where the wind will come from and its intensity Unpredictable snowstorm Change in snow behaviour during snowstorm Five day storm is not as common now More fog More thunder and lightning storms	Government of Nunavut (2005) Sullivan and Nasmith (2010)
Sky	Less clear sky in all seasons Sun is higher and brighter in the winter, from early November to early March Sun rays are much stronger	Government of Nunavut (2005) Sullivan and Nasmith (2010)
Snow	Late and less snowfall from late September to early November Significant snowfall from early November to early	Government of Nunavut (2005)

	March Change in snow cover (less *Aput* and *qapiq*), harder packed snow Less snow accumulation Snow melts earlier due to warmer temperature and lighter snow coverage Snow drift used to be north-north, now north-northeast	Sullivan and Nasmith (2010)
Rain	Unusual light rain during the winter Rain after snow accumulation Less rain from June to late September Less thunder storm during the summer	Government of Nunavut (2005)
Sea ice and current	Freezes and thickened later and over a longer time period in fall Brakes up and melts earlier Thinner ice throughout the year	Government of Nunavut (2005)
Freshwater Ice	Freezes and thickened later (November versus October) Earlier brake-up and more suddenly (June versus July) Ice much thinner in some area even where there are no or little snow coverage New and increased in area of *piqtait* and *aukarniit* (dangerous spots where there is open water or very thin ice) Smaller ponds and lake area	Government of Nunavut (2005) Sullivan and Nasmith (2010)
Rivers and Lakes	Lower water levels in lakes and rivers Dried small ponds and lakes Can see higher water marks on Magus River Increase sedimentation in mouth of rivers	Government of Nunavut (2005) Sullivan and Nasmith

		(2010)
Vegetation and Land	Introduction of dandelions More moss growing Increased in birch, willow and grasses growth and distribution, resulting from warmer temperature and dryer conditions Rapid movement of tree line northward Taller trees Smaller berries and impaired growth of edible plants and berries due to dryer conditions More *qitquat* (sea weed) in ocean Permafrost melts earlier Near shore islands are now points or peninsulas or new islands are appearing due to low sea level (eg. Quikitaaryuk used to be an island near Arviat, now it's a point)	Government of Nunavut (2005) Sullivan and Nasmith (2010)
Wildlife	Low water levels in rivers and stream affect Char seasonal migration and distribution Thinner caribou, which are not eating properly (dried grass) and bothered by heat in the summer, and hard packed *Aput* (snow) makes it difficult to eat Decreased caribou skin quality, toughness Increase of diseased caribou being hunted Fewer caribou Fewer char Fewer ring and harbour seals Introduction of new species in new area: insects (bees, wasp, hornet, mosquitoes, dragonflies and others), birds (sparrows, snow buntings), moose, killer whale and fish	Government of Nunavut (2005) Sullivan and Nasmith (2010)

	Polar bears found in new areas and in higher numbers around Arviat More geese and ducks More harp seal (pushes ring and harbour seal out of the area) Seal are seen more further south (Nunala and Manitoba border) More ravens, other birds, staying longer in the fall Seals and fish are not as healthy, less meat Sedimentation in mouths of river affects fish stock	
Health	More sunburns today, need for sunscreen Concerns that introduction of new species will results in new germs	Government of Nunavut (2005) Sullivan and Nasmith (2010)

Table 4**.** Climatic changes documented by IQ in Western Hudson Bay regions (sources: Government of Nunavut (2005) in **black**; Sullivan and Nasmith (Sullivan and Nasmith 2010) in **blue**; both reports in **red**.

6.4 Observations of climate change by Inuit hunters and women in Arviat

Hunters who participated to two focus groups have observed various manifestations of climate change. Hunters noted that it used to be colder by the coast about 50 years ago, when they were relocated to Arviat; “Right now, it’s not that cold anymore”. An elder said to a hunter that the weather changes every 50 years and that the winter is not as cold as it used to be. Another hunter noted a change in the water turbulence “when we used to go boating, the sea water used to be very clear, but right now, it’s always making waves”. Hunters all report a shift in prevailing wind direction from the northeast to the northwest. One group of

hunters agreed that they have seen changes in the moon, which seems bigger and closer to the land.

The majority of hunters who participated in focus group discussions did not believe that climate change affects the wildlife. Some noticed a change in taste of caribou, which are less fatty today; however, they did not draw any relationship between these observations and climate change. Mostly, the taste of caribou changes depending on where they feed, closer to the sea or further away inland, and their diet. They mentioned that caribou are skinnier because of they are running around too much due to too many mosquitoes and airplanes which are flying too close to the land. Only one hunter associated the increase in water temperature to seal being far away. Another hunter has noticed that arctic char are smaller, whiter, and taste different at Nuvuk, the point. Knowing that arctic char becomes whiter in warmer water, it could be due to a warming of water temperatures. Hunters said that there is less snow on the ice which makes travelling, and thus access to hunting areas more difficult and dangerous. Mr. Campbell, the regional wildlife biologist, and hunters report an important expansion in grizzly population in the area.

Women also described noticing a change in the timing of the seasons, with winter arriving later and the summer longer in duration. Women trust the knowledge of elders' and hunters' who travel on the land and witness manifestations of climate change over time and through their regular interaction with 'the land': "the elders are saying the summer is too long and the ice is late" (Participant 15). Women also notice a warming in temperature according to the clothing hunters wear: "[today] men use rain coats and rain pants to go hunting" (Participant 27) as opposed to warmer garments and caribou clothing used before. Warming has also altered the timing of activities: "Now [end of October] there is no snow and no ice yet. Usually at Halloween, we are driving our snow machines" (Participant 7). Extreme temperatures were also reported: "weather is getting too cold sometimes and too warm sometimes" (Participant 2); while another participant observed, "2-3 years ago, we were over 30 degrees Celsius for

a week" (Participant 6). It is important to note that there are some contradictions in women's observations of climate change. Three women said that it is getting colder. This may due to the change in atmospheric moisture content. Thus while the average temperature may be higher, it is damper and "feels" colder (Tagalik 2011, personal communication, Arviat). Four women reported seeing fewer blizzards today; however, three women said the opposite. Participant 18 mentioned that the texture of the snow had changed: "it seems like the snow was more cleaner and tougher and harder". Four women noted that the bay is covered by ice later than in previous years, and one woman noticed that the ice was also thinner. Participant 10 remembered the winter 2006-2007, when "the ice was so thin" that she could easily make a hole in the ice all winter long to install her fish nets. Seven women noticed that it rains less nowadays and that the land is dryer, with fewer ponds, lower water level in lakes and rivers: "I remember 1980s, it used to rain lots and today it doesn't rain as much" (Participant 14).

Participant 41 mentioned that the sun is not as strong as it used to be: "during spring time, (the sun) would hurt our eyes, [..] you would have to wear sunglasses, that used to be really strong. But today, when it's spring time, you still need sunglasses, but it's not as strong". Participant 37, an elder, observed that the weather is "not predictable anymore". Before, she would always be able to predict the weather. Today, she says, "it rains once in a while when it used to rain a lot and the ground is drying up". Women notice a change in the weather in general, but few could tell if it is affecting their access to country food or the quality of the food. Few women associated climate change to the perceived decrease in caribou numbers, the delay in caribou southern migration until later in the fall and the presence of more grizzly and polar bears around Arviat. Participant 28, an elder, noted a change in the health of caribou, which she says are "skinny"; another elder, participant 26 said that "bigger lightning" is killing the animals today. She is most likely referring to the 13 caribou that were killed by lightning near Arviat few years ago.

6.5 Summary – Climate change manifestations and observations in Arviat, Nunavut

This chapter provides an overview of the manifestations and observations of climate change in the Canadian Eastern Arctic and more specifically the western Hudson Bay region, from scientific literature and IQ. In particular, these observations note that the temperature is warming, sea ice extent is decreasing and the population of wild caribou surrounding the Qamanirjuaq herd is declining. It is predicted that the Arctic continues warming at a rapid rate. Permafrost degradation is predicted in the western Hudson Bay region, which could have negative impacts on hunting trails. Changes in ocean environment are also predicted with potential impacts on sea mammals and fish productivity, health and distribution.

IQ of people in living in the Kivalliq region and obtained from two reports documents multiple environmental changes related to climate change. Of particular importance are changes such as the duration and timing of seasons which may affect hunting and meat caching periods; instability in and changes in weather patterns and wind direction which may reduce predictability of weather, change in snow cover which may affect travelling time and later freeze up and earlier melt down and thinning of sea ice and freshwater ice which may increase the dangers of and timing for travelling on the Bay and lakes. Changes in wildlife have also been noted, such as declines in the number of caribou and arctic char, and an increase in polar and grizzly bears. In Arviat, specifically, participants have observed changes such as general warming, with extreme high temperatures, longer summers, later ice freeze ups, thinner ice, increases in water turbulence, harder snow cover, less precipitation, and unpredictability in weather and decreases in caribou health. However, decreases or increases in wildlife availability, accessibility and/or quality were not associated with climate change. The impacts of current environmental changes (bio-physical and climatic) on the Arviarmiut food system will be discussed further in chapter 8.

To assess the vulnerability of Inuit women's food system to climate change, it is important to understand all of the socio-economic factors that affect it and, how they affect it along with historical contexts. These factors interact together at different scales to create conditions of food insecurity. This section begins by providing an overview of Caribou Inuit origin and relocation history, which provides historical context for understanding the current food system and drivers of food insecurity. The human factors impacting the food system are than described and conceptualized.

7.1 Historical context

Inuit living in Arviat belong to different groups of inland Inuit inhabiting the Barren land. They were named "Caribou Eskimo" by the Fifth Thule Expedition (1921-1924) (Rasmussen 1926; Birket-Smith 1976). Different hypotheses exist regarding the origin of Caribou Eskimo (Jenness 1925; Birket-Smith 1976; Burch 1978). The latest is that of Burch (1978) who proposes that a group of Copper Eskimo traveled down from the central arctic region, and then along the Thelon River up to the Hudson Bay coast, arriving in the 18th century. During the first and second decade of the 19th century, they would have moved inland. Thus, Caribou Eskimo culture of the early 20th century developed *in situ* in the southern Kivalliq region (formally Keewatin, in the N.W.T.), rather than derived from earlier Thule people who occupied this territory in the beginning of the second millennium A.D. (Burch 1978). During The Fifth Thule Expedition (1921-1924), five main Caribou Eskimos bands were identified: Qaernermiut, Hauneqtôrmiut, Harvaqtôrrmiut and Pâdlimiut (Birket-Smith 1976). In 1930's, Gabus (1944) added another group, the Ahiarmiut.

The culture of Inuit inhabitants of the western Hudson Bay was characterized by its inland nature and the harvest of Barren Ground caribou

(Arima 1984). Caribou Eskimo culture was much different from coastal Inuit cultures, as Knud Rasmussen (1926: 131) observed:

> The Eskimo of this period [1921-24] looked at the sea for their means of subsistence, hunting seal, walrus, and especially the whale. The present inhabitants [of the Barren Ground], on the other hand are far more dependent on land animals. Consequently, they live a nomadic life, following the herds on their migrations up-country during summer and autumn. Only in winter and spring are they to be found on the coast, hunting seal from the sea ice.

Caribou Inuit did not use, consume and know as much about sea mammals as their neighboring Netsilingmiut, Aivilingmiut and Iglulingmiut; their way of living was dependent on caribou harvesting (Rasmussen 1926). Seals were not normally hunted during the winter, except by Qaernermiut living at Chersterfield inlet (Birket-Smith 1976). Only during spring and summer (two months) did about one quarter of Caribou Eskimo[2] move to the coast to hunt seal and walrus (Birket-Smith 1976). Caribou Eskimo consumed caribou all year round whenever possible. Caribou had many other usages, for example: skins for clothing, bedding, tent and kayak; antlers and bones for tools, knives and utensils; fat burned for light (Burch 1972; Arima 1984). Caribou Eskimo consumed ducks, geese, ptarmigan, gulls and their eggs, ground squirrels and hares during the summer (Arima 1984). Their diet did not include significant amounts of plants; and most of their plant matter intake came from eating caribou and ptarmigan stomachs (Birket-Smith 1976; Arima 1984). A variety of berries and roots were also collected and eaten in the summer time. Caribou Eskimo acquired adequate amounts of vitamins by consuming fresh caribou meat and fish (Arima 1984). Musk-ox was an important complement to Inuit diet before they became

[2] (1) the Harvaqtôrmiut, (2) the coastal group of the Pâdlimiut, (3) 2-3 families of the Qaernermiut (Birket-Smith 1976: 125)

practically extinct in the southern Kivalliq region at the beginning of the 20th century (Burch 1977). Fish such as arctic char and lake trout also represented an important part of their year round diet. Fish, musk-oxen and ptarmigan were particularly important during times of caribou shortage (Arima 1984). Inuit lived several starvation periods (Gabus 1944; Tester and Kulchyski 1994; Fossett 2001), which have led to a "breakdown of social values" such as lack of respect for elders (Bennett and Rowley 2004: 90).

As of the 1930's, Inuit were relocated for different reasons; for example to sanatoriums for tuberculosis treatments, to Hudson's Bay trading posts as employees in order to exploit the full potential of fox fur trade, and for schooling in the 1950s-1960s (Tester and Kulchyski 1994). During the 1950's, the main relocation to settlements, coordinated by the federal government occurred. The collapse in the fur trade at the end of the 1940's resulted in hardship among populations already living close to HBC posts and RCMP stations in Hudson Bay. For more than 10 years previous to the relocation, Inuit populations were encouraged by HBC to trap valuable white fox in exchange for food, a system which de-emphasized subsistence hunting (Tester and Kulchyski 1994). When fox became scarce and difficult to hunt, while at the same time the amount of food that could be obtained from it declined, Inuit were ill-prepared and had very little meat in reserve for the winter. Consequently, relief from the government administered by the RCMP and relief credited by the HBC trading post became particularly important for the prevention of starvation among the Inuit population (Tester and Kulchyski 1994). With many complications related to the allocation of relief to semi-nomadic groups, the federal government encouraged Inuit to move to settlements such that provision of welfare and family allowance would be ensured (Tester and Kulchyski 1994). Thus, during the 1940's, Inuit families who were still living on the land, in hunting and trapping camps, were resettled by the military to rudimentary housing. (Tester and Kulchyski 1994). By 1960, almost all Caribou Eskimos were relocated to settlements and in 1982, the majority of

Qaernermiut and Pâdlimiut were located at Eskimo Point (Arviat) where their "existence became heavily subsidized" (Arima 1984: 460).

The relocation of the Caribou Inuit has been highly criticized, notably by Mowat (1952) who, in *People of the Deer*, places blame on the federal government's poor administration of the relocation of Ahiarmiut, which almost led to their extinction. Missionaries also played a role in the relocation: "while church was encouraging Inuit to come to the settlements to attend mass and to have their children attend church-run boarding and day schools, the RCMP and some administrators were encouraging Inuit to spend time on the land, hunting and trapping for a living. The overwhelming fear of many government officials and the RCMP, responsible for the delivery of welfare services, was that Inuit would become dependent on social assistance in the settlements" (Tester and Kulchyski 1994: 54). It is important to note that the role of the churches and the HBC in creating conditions of dependency is a subject of controversy (Tester and Kulchyski 1994).

This relocation gave rise to a myriad of cultural and socio-economic changes among the Caribou Eskimo population, and across the Canadian Arctic (Wenzel 1991; Damas 2002). "The collapse of fur prices, changes in education, dramatic changes in the welfare system, the pressing medical needs of a generation exposed to tuberculosis, polio, outbreaks of flu, typhoid and other contagious disease, medical evacuations, and possibilities of wage employment put pressure on Inuit culture to conform to the foreign social relations characteristic of permanent settlements" (Tester and Kulchyski 1994: 44-45). Environmental dispossession resulting from relocation and the assimilation policy of the federal government has negatively affected Inuit identity, physical and mental health (Richmond and Ross 2009). The foundation of Nunavut in 1999 was an important step for Inuit in re-taking ownership of their land, their resources and for articulating their culture. Yet, even if "the persistence of [Inuit] identities and the re-creation of traditions show that indigenous cultures can thrive the modern world" (Csonka and Schweitzer 2004: 45), several psychosocial

challenges associated with recent colonization and the paternalistic policies of the welfare state remain to be overcome (Tester and Kulchyski 1994; Csonka and Schweitzer 2004; Lehti, Niemela et al. 2009). Ultimately, these changes and acculturative stresses provide the context within which the contemporary Arviat food system operates, and shapes how socio-economic-environmental stresses are experienced and responded to.

7.2 Household and Community level factors affecting women's food system in Arviat

The cost of living is high in Arviat, where southern goods and material must be transported over long distances, long cold season, and high operating costs for businesses. Store food is expensive due to the costs associated with the transport of food by plane or ship; the higher operating cost of stores in the north and high store mark ups, which, in some instance is more than 100% the retail value. In fact the price of a weekly basket of food for a family of four in Arviat ($552.51) is more than twice that of the same basket in Montreal, Québec ($223.40)[3] (see Table 7 in Appendix II for the complete list of items and prices). Food is one of the main expenses for women in Arviat. The high price of food combined with low income reduces considerably women's consumer capacity: "I can't afford to buy all the meat at the store because they're expensive. I got used to buying pasta, for example macaroni, spaghetti, noodles mostly, cereal, flour, baking powder and lard" (Participant 4). Infant products such as diapers, milk formula and wipes were also reported as being a significant part of women's main expenses: "with little kids too, it's so expensive up here! I can't afford to buy all the meat at the store because I have 2 little kids at home who are on diapers" (Participant 3). Women worry about not being able to afford these items. Rent and electricity are important expenses, but the majority of families are living in subsidized housing where these costs are minimal. For those few who own their

[3] Price of the basket of food calculated according to items included in INAC revised Northern Food Basket for a family of four for one week (2007) http://www.ainc-inac.gc.ca/nth/fon/fc/pubs/nfb/nfb-eng.asp#tab1

houses, mortgage, heating and electricity bills were indicated as significant expenses.

Harvesting costs are high and are most often covered by hunters and their family. Acquiring and maintaining hunting equipment (a ski-doo, ATV, boat, riffles, qamutiq [sled], net) require important investment in addition to paying for gasoline ($1.19/L in 2010) as well as ammunition for every trip. The high cost of hunting has resulted in a recent trend in hunters selling country food to other community members. Generally, only fish (Arctic Char) is sold by people who hold a commercial fishing licence issued by the Government of Nunavut, with prices averaging between $15-20 per fish. Caribou is rarely sold due to traditional beliefs that it should be shared. One woman reported having bought a piece of caribou for $50 at the local store where it is occasionally sold. However, it is more expensive than from a local hunter as it must come from a meat processing plant where it is inspected according to federal regulation. Rankin Inlet is the only plant in the Kivalliq regions and it provides Arviat stores with dried caribou and Arctic Char. The stores also sell muktaaq (beluga skin) and fish.

Given this high cost of living, financial resources are an important factor affecting women's capacity to access store foods and country food. Women, especially single parents, earn less than men. In 2005, the median income (after taxes) for married or common-law couple family types in Arviat was $36,960 and for female single-parent families $16,352 (Statistics Canada 2007). This is considerably lower than the median incomes for Nunavut and Canada (Table 5). Male single-parent families in Arviat also had considerably lower incomes ($18,240) in 2005 compared to couple families (Statistics Canada 2007).

Unemployed women reported struggling to purchase enough food in stores for their children. Amongst the 42 women interviewed, 25 were unemployed, 12 had part-time or occasional employment and five reported working full time (Table 1). The sample population unemployment rate is much higher than that of 2006 Census, with 8.5% unemployment rate among women in Arviat (Statistics Canada 2007). The employment rate for males is higher than for females, but males have a higher income. This indicates that women occupy lower paid jobs

then men, with women often employed in clerical type employment. The most popular employment category for women in Arviat is "sale and service occupations", whereas for men it is "trades, transport and equipment operators and related occupations" (Statistics Canada 2007).

Formal education is a requirement for most community employment; employment enables a family to both purchase sufficient quality foods and to afford hunting. An anonymous key informant affirms that there are well-paid positions for those who have the appropriate training. In 2006, 80% of people over 15 years old in Arviat did not have a postsecondary certificate, diploma or degree, and only 9% had a high school diploma (Statistics Canada 2007). Additionally, the school dropout rate is reported to be increasing. One elder observed, "it's really hard when you don't have an [formal] education. I am a good translator in Inuktitut, but I don't have education, so people don't hire me". Seeking casual work, such as cleaning houses, doing laundry or babysitting, is a strategy used by women without formal education to earn extra income in order to purchase groceries. Table 5 provides statistics on income, employment and education in Arviat, Nunavut and Canada.

Population and family characteristics	**Arviat**	**Nunavut**	**Canada**
Median after-tax income married and common-law families	$36,960	$56,397	$58,018
Median after-tax income female lone-parent	$16,352	$22,069	$32,609
Median after-tax income male lone-parent	$18,240	$20,864	$41,661
Employment rate all	43.3	55.2	62.4
Employment rate female	43.5	54.5	57.5
Employment rate male	43.4	55.8	67.6
Unemployment rate all	13.0	15.6	6.6
Unemployment rate female	8.5	13.0	6.6
Unemployment rate male	15.6	17.8	6.5
Percentage of population over 15 years with no certificate, diploma or degree	71%	57%	24%

Percentage of women over 15 years with no certificate, diploma or degree	70%	59%	23%
Percentage of men over 15 years with no certificate, diploma or degree	71%	56%	24%
Percentage of population over 15 year with high school certificate or equivalent	9 %	11%	26%
Percentage of women over 15 year with high school certificate or equivalent	10%	11%	27%
Percentage of men over 15 year with high school certificate or equivalent	9%	11%	24%

Table 5. Population and family characteristics for Arviat, Nunavut and Canada in 2006, except for median income data that are from 2005 (Statistics Canada 2007)

With low employment rates, many women rely on income support to meet their family's needs. According to the Income Support Division (2011), in 2010, 46% of families in Arviat claimed income support. The income support program is based on family size and income, rent and heating fuel bills. Participant 34 reported that, once rent and power bills are deducted from her allowance, she had $813 left per month to meet the needs of a family of 4 (in addition to other governmental support to be discussed). Income support allowance is normally divided into cash and a cheque restricted to food only. On a monthly basis, one woman with a large family obtains $200 in cash and a single individual $100 in cash; the remaining amount differs according to variables noted previously and is allocated as a cheque which must be spent at the local stores. Women stated that this restriction constrains their access to country food, because only the cash portion can be used to buy gas and other supplies to go hunting.

In addition to income support, families with children under 18 years old are eligible to receive the Nunavut Child Benefit (NUCB) and the National Child Benefit Supplement (NCBS). The majority of women interviewed claimed NUCB as a source of revenue. During the benefit year from July 2010 to June 2011, the basic benefit was $1,348 ($112.33 per month) for each child with a supplement of $94.00 ($7.83 per month) for the third child. Families who have an income above

$40,970 receive a reduced benefit[4]. NCBS provides $174.00 per month for the first child, $154.00 per month for the second child and $146.50 monthly for each additional child[5]. Families with modest incomes can also qualify for the GST (Goods and Services Tax) credit, which is paid four times per year. The credit is allocated to people over 18 of age, and depends on the number of children registered for the NUCB and net family income[6]. Elders aged 65 and over may receive an allocation from the Canadian Pension Plan (CPP) and/or Old Age Security (OAS)[7].

Selling arts, including carving, sewing clothing (parka, amautiq, mitts, hats), making kamiit and wall hangings, is another source of income; as one participant notes, "I look for ways to make money, I sew wall hangings, and add beads to them, cause I love doing art work" (Participant 36). Selling arts and crafts is also a method women use to quickly earn money in order to be able to afford food in times of food and money shortage; as one participant recounts, "I have to brain storm 'how could I get it [money to buy food]?' So I am really good at sewing so I just work on my sewing, bring it everywhere for whoever wants to buy it so I get the money then think about what's the most important thing that my kids can share, noodles, macaroni, anything that is useful" (Participant 6). Selling items from their households such as a couch, washer and dryer, or clothing was mentioned by 7 women as a way of quickly generating money in times of food shortage: "[we sold little items from our house] before, when we didn't have a job" (Participant 41).

Whether women have high or low incomes, planning is important especially given the high cost of living in the north. However, the women interviewed noted money management is a challenge and most have had little or

[4] For more information - Canada Revenue Agency, National Child Benefit, http://www.cra-arc.gc.ca/bnfts/ncb-eng.html
[5] For more information - Canada Revenue Agency, National Child Benefit, http://www.cra-arc.gc.ca/bnfts/ncb-eng.html
[6] For more information – Canada Revenue Agency, Goods and Services Tax/Harmonized Sales Tax (GST/HST) credit, http://www.cra-arc.gc.ca/bnfts/gsthst/menu-eng.html
[7] For more information – Human Resources and Skills Development Canada, Canadian Pension Plan and Old Age Security, http://www.hrsdc.gc.ca/eng/oas-cpp/index.shtml

no training in budgeting. Most women have learned on their own, a few have learned from elders, parents, friends or through the Healthy Moms, Healthy Babies Program (available only to high risk pregnant women). In Arviat, there are no financial planning services available. There are four ATM machines at two local stores and one at the RK'd from which Arviarmiut can only draw money with a fee depending on the amount withdrawn and the location of the withdrawal. In Nunavut, only three banks offer banking services, the Royal Bank of Canada (RBC), the Canadian Imperial Bank of Commerce (CIBC) and the First Nations Bank. All banking is done online or through phone/mail. Only ten women reported having a bank account where they deposit their NUCB cheque automatically. This service has helped some saving: "I save money when I get my Child Tax [...]. I get my Child Tax put in my account directly" (Participant 2). Many women do not have a credit card and may not qualify to obtain one given their financial status. Nevertheless, the Northern store sells 'DirectCash' Bank cards for $18 each, onto which money is to be added before use. The Northern store and Coop also offer a credit account, which allows people to purchase what they need without having the funds to do so and pay their accounts monthly, with substantial interest, if the balance is not paid off monthly. This provides consumers with some flexibility, although it may put people into debt and thus reduce their ability to deal with future shortages in the food system.

According to an education professional working in Arviat, one of the main impediments to community member's abilities to budget is the provision of income support on a monthly basis. With almost no means of savings, people cash their "cheque on the 19th and by the 22nd, probably 70% [of beneficiaries] have spent it all" (Key informant). Many women said that it is difficult to wait one month to get money again to buy food: "[we run out of food] at the end of the month [because] it's hard being on income support, no job, when [the payment] is only once a month" (Participant 34). The interviews provide evidence that female beneficiaries of income support have difficulty planning adequately for one month. An anonymous informant reported that many women ask for a money advance on a monthly basis from the income support office. Money advances are,

for the vast majority, requested by women and must be based on a child's special need supported by a Health Certificate. On one hand, many beneficiaries interviewed mentioned that the basic amount allocated to them is hardly enough to meet their own and their children's needs. On the other hand, according to the informant's experience, those who know how to budget their resources well and select food carefully, rarely ask for a money advance. It is important to note that there are multiple factors, other than "carefully buying foods" which impede women's ability to buy enough food for their families, regardless of their financial status. In fact, 81% of women interviewed mentioned running out of food before they could be able to afford or get more, when only 60% were unemployed at the time. Particularly, women with children are not able to save, as one said: "We go pay cheque to pay cheque, we don't save, we can't with little kids, cause we have to get what we have to get for them" (Participant 7).

Budgeting skills and knowledge about store foods (discussed subsequently) being limited, food purchases are often directed by taste and preference regardless of price and nutritional value. Women interviewed reported that the food items they purchase the most are the cheapest and the ones that last the longest, such as pasta and rice; yet observations at the local store as well as information from the store managers show evidence that food selection is highly influenced by preferences. The most popular food items are ready-foods and "junk foods" which are expensive and particularly popular among young people. As elders states: "when money is available our younger children are eating more junk food than country food" (elders, focus groups). Thus, "sometimes [more] money means poorer health status because of what people are spending their money on" says a dietician who has been working in Nunavut for over 10 years. Lack of budgeting skills and financial resources is particularly problematic when extra purchases are made, which constrain resources available for food purchasing thus creating conditions of food shortage: [running out of foods] happens when my nephew wants my money to buy something for him, games or whatever, or when she [my mom] is saving money to buy big equipment like Honda or ski-doo machine" (Participant 38).

Inadequate financial resources negatively affect women's food security, and without adequate knowledge about store foods, women have difficulty purchasing food nutritionally adequate of high quality/price value. Indeed, there is an indication that knowledge about store foods and how to prepare them is limited amongst women in Arviat. The Principal in charge of food programs in schools in Arviat well illustrates this in observing: "95% [of Arviarmiut] know how to make bannock. They know they need flour, baking powder sugar and lard. As far as anything else, they don't know". This can be explained in part by the fact that only 50 years ago the selection of store food was limited to basic items such as flour, sugar, tea, lard and canned meat. Southern foods were mainly introduced to Inuit by HBC in the early 18th century when permanent trading posts were established at Churchill and Fort Prince of Wales (Ross 1975). In 1944, when Inuit were experiencing hardships due to the collapse of the fur trade, the Federal government established Family Allowances to provide healthy foods and good clothing for Inuit children only (Tester and Kulchyski 1994). The allowance, which was provided "in kind", allowed for the further incorporation of southern food into Inuit's diets. The items provided to mothers were selected from a specific list of southern foods including milk formula, pablum, peanut butter, sugar, and some items that were not available in most arctic communities such as fresh eggs (Tester and Kulchyski 1994). Tester (1994) notes that Family Allowance was often only provided as relief. Store food selection only began to expand in the 1980's.

Given this recent history of the consumption of southern foods, and the large variety of food available as compared to 30 years ago, education on nutrition, meal preparation and cooking is of critical importance. Indeed, as many health practitioners confirmed, education is a priority. Yet, most women interviewed had never participated in any cooking classes. Four women remembered learning about how to cook at elementary or high school, Arctic College or the Adult Education Center. Five women reported learning to cook by watching cooking shows on television or by consulting cookbooks. Many women

have learned to bake, to cook with vegetables and to make a meal last longer, by adding rice to a country food meal for example through Healthy Moms, Healthy Babies (HMHB) programs. HMHB is sponsored by the Canada Prenatal Nutrition Program (CPNP)[8] and provides a small number of high-risk pregnant women with useful information about nutrition and healthy foods as well as cooking skills. Although this program was described as useful, it has its limitation as it is only available to high-risk pregnant women and mothers can only continue in the program until their new child reaches six months. In addition, even when women were given information, they may not have had the opportunity to practice their new cooking skills at home because of missing ingredients, equipment or the material required, and/or because they were had a large family to care for.

Few women mentioned that the CPNP program provides information about healthy eating once a week at the Arviat Health Center and this is available to all pregnant women. Winnie Malla, the community wellness worker along with Obed Anoee and Diane Angma, the community health representatives, host weekly radio programs to discuss community health issues and provide advice on healthy foods, nutrition and disease prevention. The Arviat Wellness Center, in a partnership with local stores promotes strong foods and healthy products through promotions and occasional food tasting in stores and twice weekly cooking classes open to the public. However, these classes are based on successful access to third party funding.

Store food knowledge is important, especially in times of country food shortage as country food remains the healthiest food for Inuit according to community and territorial health professionals as well as Inuit women. Yet, some women report that knowledge on country food preparation is not as readily transferred to the young generation as it used to be: “we should learn more from our elders how to prepare or take care of country food better. I haven’t eaten some buried [cached] caribou for a long time” (Participant 15). Traditionally, Inuit

[8] “CPNP is a community-based program delivered through the Public Agency of Canada” http://www.phac-aspc.gc.ca/hp-ps/dca-dea/prog-ini/cpnp-pcnp/index-eng.php

women would learn by watching and helping older women in the camp preparing the meat. Today, most women have learned to cook country food from their mothers or elders. Elders now teach young women how to integrate store food and country food knowledge in order to prepare a healthy meal for them and their families, such as caribou stir-fry and fish stew.

Yet, the decrease in women's knowledge about the preparation of country food may contribute to a decline in women's consumption of traditional foods. Data from interviews and focus groups shows that, in general, elders eat more country food than youth, and have integrated less southern foods into their diet: "we get heartburns from eating fast food so elders eat more country food to get rid of their heartburns or to avoid them" (elders, focus groups). In addition, elders stated that they would eat more country food if it was available and they miss eating some parts of the caribou that are not consumed as much anymore such as caribou rectum, kidney, heart, liver, tongue and guts, and other country foods such as goose, ptarmigan, seal, walrus, muktaaq, mussels, oysters, cloudberry, blueberry and blackberry. Nevertheless, even if country food knowledge is less transferred to the younger generation, women and elders confirmed that country food is still regularly consumed and prepared by all generations when available.

The availability of country food in a household is highly dependant of the presence of a fulltime hunter in the household or in the close family. Full time hunters are the main providers of country foods, not only for their immediate family but also for many others in the community. They ensure a regular supply of country food to the community, especially of caribou, the preferred food. Egeland et al. (2011) observed among food insecure households, first, a significantly lower prevalence of having an active hunter in the home and secondly, a lower frequency of past-year traditional food consumption. Already, many do not have a hunter in their family and depend on others sharing meat: "Widows don't have hunters, also people who lost their parents, or don't have a son are those who don't have a hunter" (hunters, focus groups). Commonly, hunters providing country foods are between 50 and 60 years of age, which

further increases their susceptibility to experiencing a sudden inability to hunt; Statistics Canada 2006 Census reports 55 men in Arviat were aged between 50 and 59 years old out of a total population of 1000 men of which 610 are over 15 years old (Statistics Canada 2007). This is indicative of the precarious situation many households find themselves in. Even households that are food secure can rapidly become food insecure with the death, injury, or illness of a hunter. Women are worried that the lack of training for young people will even further reduce the availability of country food in Arviat in the future and thus their consumption of it.

Indeed, nowadays, young men are not being trained in hunting skills as they have previously. Traditionally, young men would follow older hunters, notably elders, and learned by watching and doing: "Long time ago, there was no transportation, we used to go by dog team and learn when we follow our father" (hunters, focus groups). Elders would teach young hunters about the laws of nature and hunting. This is well illustrated by Barnabas Peryouar, a Qaernermiut, in the book *Uqalurait:* "Our elders told us to shoot the [caribou] bulls only in June, July and August, as that is the time when they are the fattest and the skins are good for clothing. When an elder looked over our kill upon arriving home and saw that we broke one of the laws, we got scolded" (Bennett and Rowley 2004: 51). Caribou Eskimo leaders were successful hunters and important guides. They were called *ishwhomattapok, isumatak* or *Kulawak*, which means "the one who is thinking", in other words, "a thinking individual", able to locate and harvest caribou repeatedly over a period of time (Van Stone and Oswalt 1959: 9). Leaders had no definite authority over others, who had the freedom to follow their suggestions or not, and did not exert any specific effort to teach younger males. Leaders also changed according to success rates; the greater the success the more families would join his camps, and vice versa. "Families who once had an influential leader often experienced a difficult time surviving after his abilities had begun to fail." (Van Stone and Oswalt 1959: 10).

Today, there are many experienced full time hunters in Arviat who have extensive knowledge related to hunting, fishing and meat processing. However,

many factors play a role in reducing the opportunities for young men to go hunting with them and learn, as has been traditionally the practice. First, the establishment of schools in Nunavut has reduced the time available for children to go out hunting with their families to nights and weekends. In addition, schools include traditional knowledge in the school curriculum; however, the southern education system promotes a passive way of learning that is scarcely applicable to hunting skills. The schools, along with community elders, organize trips to bring students out on the land and teach them traditional skills. However, some hunters believe that those trips are not long enough to properly learn hunting skills: "We have to be out on the land for two full weeks to learn how to hunt and butcher meat, staying out there and not come back to the town in between. It seems like we haven't done that for a couple of years now" (hunters, focus groups). Other hunters believe that traditional training should be done by parents, and if the schools are to be involved, they should work with the parents: "The school is taking over parent's role to teach hunting and survival to their children. Parents and school should work together" (hunters, focus groups). As the Elders focus group expressed:

> "There should be more [training], when they're not in school they don't know how to hunt or what to do, no transportation, not being taught makes them lazy and start making trouble so it's better if we just go ahead and tell them to follow when their father or whoever's going out on the land when they're taught they learn" (elders, focus groups).

Secondly, for the past 30 years, Arviat has had one of the highest per capita birth rates of Canada, with an average of 60-70 births per year (data available at the Arviat Health Centre, 2009). Thus with a very young community (1600 out of 2060 under the age of 18), there is an inequality between the high number of young men that could be trained and a far fewer number of experienced hunters available to train them. As a hunter (focus groups) says: "There are too many kids, too many to teach! They are mostly waiting for trips with the school".

Third, hunters mentioned a lack of hunting equipment and transportation as important factors impeding young man to learn how to hunt. Hunting today requires expensive equipment such as firearms, bullets, nets, skidoos, boats or four-wheelers and replacement parts which many young men and even more experienced hunters can't afford. This equipment was introduced by whalers and the Hudson's Bay Company and replaced traditional hunting and fishing techniques (Arima 1984). When hunters were earning income from the fur trade, it was possible to afford gas and new equipment to go hunting. However, today the fur trade is not a viable option and hunters have to cope with the increasing price of gasoline, food and supplies and limited financial resources: "Everything is expensive [now]. I used to make money selling fox furs, and other animal with furs. Almost everybody was making lots of money. Today, most of us can't afford gas" (hunters, focus groups). Yet, hunters who have a full time employment and who can afford hunting have limited time to go. Families in which women have a well-paid employment can afford having men hunting full time.

Fourth, youth have access to a greater variety of activities today in Arviat, which they may favor over hunting: "Today, there are too many things they want to do. Before, there was no computer, no mp3, only TV and radio. We wanted to go out hunting with hunters" (hunters, focus groups). Young people in Arviat have many interests such as playing video games, dancing, singing, playing musical instruments, social networking and church youth groups. Traditional activities such as hunting remain important for youth's cultural identity, but now they balance their time amongst many other modern past times.

The erosion of land-based skills and knowledge among the younger generation has been documented across the Canadian Arctic (Condon, Collings et al. 1995; Ford 2006; Ford 2009; Pearce, Wright et al. 2011). Youth now have a decreased ability to hunt efficiently and ensure their own safety while travelling on the land due to reduced skills and knowledge related to, for example, reading the weather, the snow and ice condition, navigating in storms, making an emergency snow shelter, thus their vulnerability to climate risk is higher than knowledgeable hunters and their ability to access country food lower (Ford, Smit

et al. 2006; Ford, Pearce et al. 2007; Ford, Smit et al. 2008; Ford, Gough et al. 2009; Laidler, Ford et al. 2009). Ultimately, these factors combine to reduce the availability of country food in the community of Arviat, which has a large population of young men (Ford 2009; Beaumier and Ford 2010; Ford and Beaumier 2010).

All factors enunciated above negatively affect women's food system. Yet, strong social bonds help strengthened Inuit women's food system in the community of Arviat. The ability of women to obtain country foods is highly dependent on hunters in their family or extended family. Sharing country food is embedded in Inuit culture. Traditionally, before contact with Europeans, sharing revolved around food, and country food would be distributed between members of a family, or camp. Within a camp, everybody had his/her own responsibilities and those who were not hunting were responsible for other tasks, assuming that "general reciprocity" took place as in many small scale societies (Sahlins 1965). In times of food shortage, sharing was an important strategy to ensure survival of the group. Limited scholarship exists describing how the Caribou Eskimo sharing system functioned, particularly when compared to the Baffin region (Mathiassen 1928; Damas 1972; Wenzel 1991; Wenzel 1995).

Today, the family is still central to the sharing network. As the hunters' illustrate: "We give to our family first, then we let anybody who want some get the left over's for free. When we have big meat, we share it. It's not hard sharing meat" (hunters, focus groups).Women mostly ask their close family members for food or go to their houses to eat a meal: "Sometimes [for] 2 weeks we don't have food so we'll go eat at my mom's when we don't have food. I don't go anywhere or ask anyone for food so only to my mom's or go eat at my sisters when we run out of food we try to go eat there" (Participant 14). Women also noted that there are fewer family feasts than there used to be. Even when family live in another community, women in the community may still obtain country food shipped by air. Participant 19 who has family outside of Arviat asks her family to ship her country food, mainly caribou, when it is scarce. There is a program that reduces

the shipping cost for country food, yet the cost remains high and prohibitive. This illustrates the importance of family units in sharing and in managing food security.

Money, in contrast, is not as readily shared as food; mainly it is shared within the nuclear family. Ten women interviewed indicated having asked relatives in the past for money to buy food in times of a food shortage. Although, money is in most cases borrowed, it must be reimbursed. Only one single mother reported asking for money every month from her parents. Ten women reported borrowing money from friends or relatives, which they have reimbursed. Within a household, food sharing has been disrupted by the introduction of money, which often belongs to one individual rather than the entire household such as food. Some mentioned that the purchase of large quantities of junk foods by one family member, who doesn't share, impedes the family's capacity to buy enough food to feed everybody in the household. Financial resources can also be borrowed through an informal lending system that has developed in the community. These loans are usually at high interest rates. More often, someone in need will simply publically ask for money or the thing that is needed. Again, this is evidence of a shift in cultural social values where publically soliciting aid would have been seen as shameful to your extended family and where any request for help would have been prefaced with an indication of how the person could barter the implied reciprocal obligation (Tagalik 2011, personal communication, Arviat).

Store food is also not shared as country food is because (I) it has a high 'direct' cost, (II) it was not shared traditionally, but rather traded for fur and provided during times of country food scarcity. In addition, households may not have store foods to share due to a high demand from the children; Elders affirmed that: "It's always hard to have money, so we don't always share store food. Plus, we run out of store food faster than country food when you have a lot of kids or grandkids" (elders, focus groups).

When a family cannot provide women with country food, women obtain it from other hunters in the community. Some women get country food from people who offer it to anybody in need through the local radio or CB. Offering country

food is common, however, asking is perceived differently. Indeed, only a few of the women interviewed had previously asked on the local radio or CB for country food. Some mentioned being embarrassed to ask through those means of communication. However, to understand better how food is distributed today at the community level, it is essential to understand the community structure and societal divisions. First, there is a division related to origin, as mainly two Caribou Eskimos bands were resettled into Arviat: the Qaernermiut and the Pâdlimiut (Arima 1984). Qaernermiut are "dwellers of the flat land" and lived inland along the Thelon River, near Baker Lake. Pâdlimiut, "people of the willow" were the most populous and most southerly group. They lived inland and on the coast, between Churchill and Rankin Inlet (Birket-Smith 1976; Burch 1986) (Figure 8)[9]. Also, few remaining Ahiarmiut (56 people) were relocated to Arviat (Tagalik 2011, personal communication, Arviat). Fossett (2001) explains that in the 1940's a hierarchy existed among Eskimo bands of the Western Hudson Bay and it was widely recognized by Inuit. The Aivilingmiut was the highest status group due to their economic status, and greater involvement with 'qallunat' (white men), notably whalers. Ahiarmiut were ranked lower because of the lower degree at which they had accepted socio-economic changes. Secondly, there is a division related to religious association. Van Stone and Oswalt (1959: 8) describes the different "small social segments composed of individuals who interact casually with one another" at Eskimo Point (Arviat) in the 1950's. Church alliance was one of the most obvious ones, as families lived near their church during the summer and the social cohesion of Catholic or Anglican faiths were promoted. This was facilitated by provision of food and supplies to members of each church. The competition between the two missions for recruiting the most successful families led to hard feelings between the missionaries. This was felt among Eskimo who "were aware of the factionalism and tend to assume the same attitude toward Eskimos of other faith" (Van Stone and Oswalt 1959: 8). This

[9] Inuit were semi-nomad and moved frequently within a large region. There were no definite boundaries defining a territory, which may change according to environmental changes. Birket-Smith alludes that Qaernermiut territory may have once been more south than it was when the 5th Thule Expedition was there, from 1921 to 1924.

religious division influenced further social organization within the community as Eskimo of the same religious orthodoxies tended to marry.

It is not clear how these two divisions play a role (if any) in food sharing networks as they exist today in Arviat. Participant 15 explained that because she was of Pâdlimiut descent, some Inuit in the community would not share with her. Yet, there is indication in the literature that Pâdlimiut shared with Arhiarmiut in times of starvation (Bennett and Rowley 2004). Andy Mamgark, a Pâdlimiut, explains in the book *Uqalurait* that when living on the land, if one camp lacked food, another camp would allow them to get meat from their caribou cache by indicating the location of the cache with an Inukshuk (Bennett and Rowley 2004). Of course, there are other societal divisions (e.g. societal class) existing today which are not addressed here and that must be considered in order to further understand the current Arviarmiut sharing network.

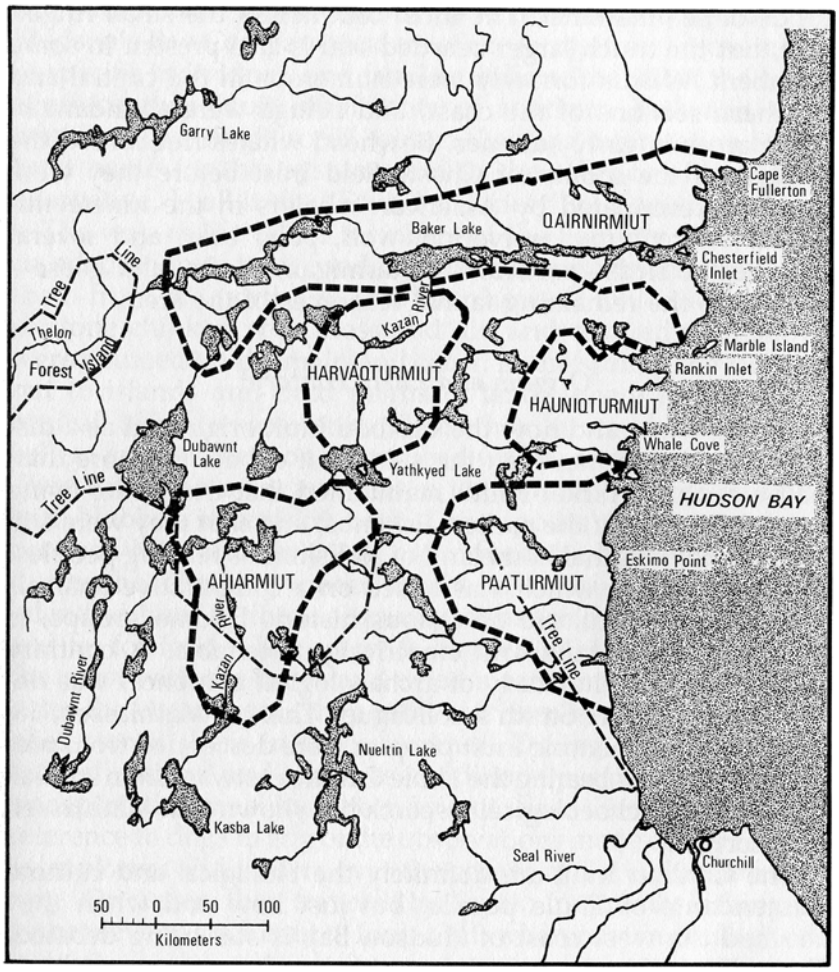

Figure 8. Caribou Inuit societal territories 1890 (source : Burch (1986))

Although sharing food strengthens the Inuit food system in many ways, it may also impede Inuit independence and create conditions of food insecurity in families who give a lot. The notion of sharing has concurrently evolved with societal changes. The provision of 'free' food relief (Family Allowance) by missionaries and RCMP officers, and later on by income support from the federal governmental, as well as by community support such as food banks, have contributed to changing perceptions of sharing and self-reliance over time. Community members have been accustomed to obtaining money and goods through these support systems, without having to give back, consequently developing a dependency on others, which some community members do not agree with: "you have to learn up north to live on your own, not depend on other

people all the time, or else, you'll get the habit of depending on other people, so you have to learn it on your own" (Participant 19). "In [traditional] Inuit society, one of the most important and respected characteristics of a successful person is their capacity for self-reliance and their ability to meet life's challenges with innovation, resourcefulness and perseverance" (Pauktuutit Inuit Women of Canada 2006: 32). Yet, with introduction of modern Canadian law, education and welfare systems, Inuit have seen their traditional values, knowledge and way of living diminished which led to reduction of self esteem and ability to care for one-self (Richmond and Ross 2009).

Some families, mostly those with a full-time worker or hunter, experience strong pressures from relatives and other community members to share their food resources. "Sharing" thus becomes problematic when food resources get depleted by others in need, especially when they do not give in return: "[my common law's] relatives have been coming to our place and they just feel at home and cook whatever they want. [We are only left] with rice" (Participant 13). "Free country food" is a recurring theme enunciated by women during the photovoice activity (Figure 9), interviews and focus groups. Participant 41 considered selling country food as "not using your Inukness".

Figure 9. Photo selected during the photovoice activity to illustrate that "country food is free" (Credit: Margaret Kanayok)

However, the assumption that country food is "free" is challenged by other community members who believe that sharing should be reciprocal and one can not only just receive from others, but must also "share" in return, whether it is by offering material goods or services. Harvesting country food is expensive, and hunters and their families are not as willing as they used to be to give out country food free of charge outside of their family. Some women agree with local people selling country food: "Local people. I am ok with it because they're trying to make a living out of it. They probably don't have a job" (Participant 7). However, women who cannot obtain country food from their family, have more difficulty accessing it: "When we want some [country food] for free, no one answers but when we want to pay them someone offers" (Participant 15).

Some women said that country food sharing is in decline in the community due to high cost of harvesting and individualistic behaviour: "[When we don't have country food] we can't do anything, we can't go anywhere so we just stay home, what else can we do? Nobody wants to do anything for anyone anymore" (Participant 7). One elder (Participant 39) mentioned that her family does not share country food with her and even when she asks through the CB radio, it is difficult to get country food. She has bought arctic char and caribou from local hunters. Nevertheless, elders who are still hunting are believed to continue giving meat to other community members without asking for anything in return, a value that still holds significant importance in the community as the hunters' focus groups demonstrates: "I think we have to teach more young people to cut their meat and give it to anyone who is hungry" (hunters, focus groups).

With sharing, several community support programs help strengthens Inuit women's food system. Arviat is an active community, one which has implemented a number of food education and provision programs. Past programs include a community kitchen, a harvesting and cooking with country food project, and Healthy Dads harvesting program. Current programs include: (1) the Healthy Moms, Healthy Babies which serves food to and educates high-risk pregnant women, (2) the monthly Community Food Bank which provides 80 to 150

families with a bag of non-perishable store food items, (3) the Breakfast Program serving the three community schools (Levi Angmak Ilinniarvialaaq Elementary, Qitiqliq Middle School, John Arnaludjuaq High School) as well as the community at large which offers a hot breakfast every morning, (4) the Soup Program at the middle and elementary schools which serves soup with chicken stock, barley, red lentils and rice to all student at 10am, and the snack program at the John Arnaludjuaq High School which offers fruit to all students in the afternoon. A community-based nutrition project, funded through Aboriginal Diabetes Initiative funding, was planned in Arviat in 2009 and is ongoing. The Arviat Health Committee also runs a community kitchen open to all community members. It teaches participants how to prepare healthy meals, provides them with the ingredients, notably country food, the material and space to prepare the meat together and to eat together afterwards.

The Arviat Health Committee (AHC) has evaluated educational programs as successful. However, although food provision programs are useful to families in need, they may also contribute to increasing dependency on governmental and community support, especially when no educational component is included. In addition, the lack of funding prevents the educational programs from running over the longer course of time. Chronic under-staffing in various health positions such as Home and Community Care, the lack of dedicated Public Health nurse positions, do not allow the community to address specific needs such as food insecurity, poverty, hygiene and communicable diseases. Arviat is a large community with large needs, and a significantly lower ratio of Health and Social Services (HSS) staff to population than many other Nunavut communities (Government of Nunavut 2008).

Factors enunciated above are all affected by substance use and gambling which are taking away money from purchasing food, engaging in hunting activities and sharing. Drug and tobacco use, as well as gambling are a phenomenon often associated with acculturative stresses related to assimilation policies implemented by the federal government between the1940s and the 1970’s

(Krummel 2009; Lehti, Niemela et al. 2009). Rapid social changes and identity loss among adults has also been linked to suicide, the rate of which has rapidly increased over the last decade and the suicide rate among Inuit is significantly higher than the Canadian average (Silviken and Kvernmo 2008). Yet, little has been published regarding the mental health consequences of acculturative stresses among Inuit (Lehti, Niemela et al. 2009).

Tobacco and drugs are widely used and expensive in Arviat. Women, health and education professionals have confirmed that there are "tremendous high rates of smoking and tobacco use" (Key informant), including chewing tobacco (snuff). In Nunavut, 58% of the adult population smokes tobacco on a daily basis (Figure 10) (Tait 2008). This rate is three times higher than the Canadian average (17%). One pack of cigarettes in Arviat cost approximately $16 in 2010. General food security literature highlights higher prevalence of food insecurity among children and adults living in households with smokers (Cutler-Triggs, Fryer et al. 2008).

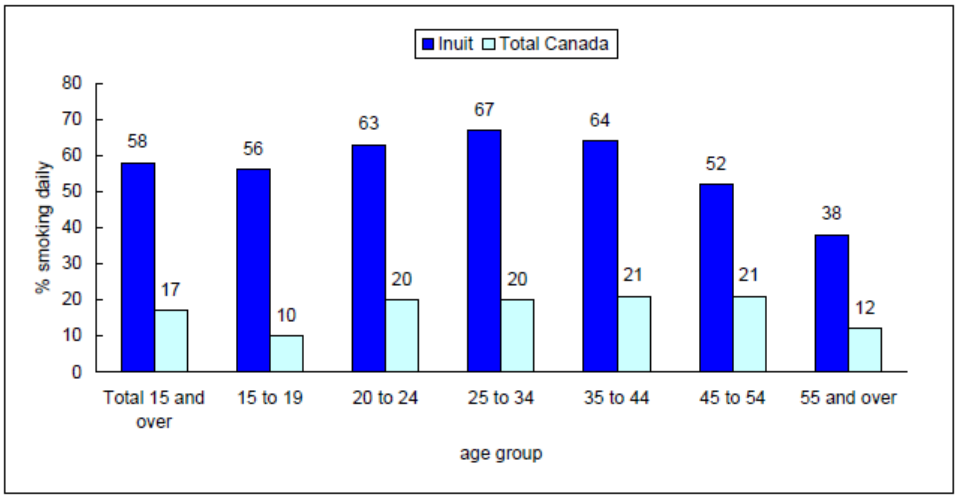

Figure 10. Daily smokers among Inuit and total Canadian population aged 15 and over, 2005/2006 (Source: Tait (2008))

Drug use occurs in Arviat, although there is presently no data available to determine its extent. A community nurse said that dependence on drugs is high.

Mainly, people consume “soft drugs” such as marijuana, and there have been a few cases of cocaine use. Nunavut has the highest prevalence of drug use in Canada, with 60% of residents reporting using marijuana or hash in 1996, with drug use particularly widespread among Inuit women (Bureau of Statistics 1996; Muckle, Boucher et al. 2007).

Women confirmed that gambling is widespread in Arviat. Local Bingo and Nevada (instant lottery ticket) are the most popular, and Arviarmiut may spend a considerable share of their revenue to play: “People are very addicted to Nevada; the floor of the radio station is covered with cards of Nevada” (Participant 19) (Figure 11). One key informant relates, “child tax was on the 19th, the following 24th or 23rd, if they haven’t any money left over, they bought Nevadas for the chance of taking their $50 in tickets and making $100. And those are the same people that come to the food bank. […] I think if we had a bingo every day, they would be playing. I know three people that spent on payday $600 of their cheque on Nevadas, and they come on Monday, no money left” (Key informant). Bingo is played every week Thursday, Saturday and Sunday. Cards are sold for $10 for a single and $20 for a double. Nevada cards are sold by packs and the amount spent depends of how many are bought. Commonly people buy more than one pack. Pattick is a local card game that is popular and involves money. Online gambling such as poker has gained in popularity amongst Arviarmiut over the past 10 years.

Figure 11. Photo selected as part of the photovoice activity to illustrate how gambling takes away money that could be spent on food. The photo shows Nevada tickets covering the floor of the radio station building where it is sold (Credit: Winnie Malla)

Some women mentioned being able to limit the amount of money they spend: "I like to play Bingo but I don't spend too much on Nevada, I always limit myself to $10 or $20 when I play Nevada" (Participant 6). However, it is not true for all. Some interviewees described the situation of women going into debt, not able to buy food and essential infant care supplies due to losses of money playing Bingo, to the extent that they would try selling personal items to make a little bit of money. There is a controversy regarding Bingo as once a month, the money collected is used to fund the Arviat Food Bank Program, yet many of the food bank users spend their money on Bingo.

7.3 Territorial and Federal level factors affecting women's food system in Arviat

Most airlines provide a subsidy through Nunavut Tunngavik Inc. (NTI) for country foods being shipped between communities. Inter-community sharing networks can be a way of coping with country food scarcity. People who have family in other communities may benefit from their proximity to country food when it is not available in Arviat. Participant 19 receives caribou a few times a year from relatives in Whale Cove, Repulse Bay and Baker Lake. Even with the subsidy, this remains an expensive strategy given the reality that country food must be transported over long distances via plane as, with the exception of Apex and Iqaluit, no community in Nunavut has road access.

In addition, the NTI *Nunavut Harvesters Support Program* (NHSP) manages four different programs through which financial assistance is provided to Nunavut residents who need equipment for hunting or sewing or to promote traditional learning skills: Capital Equipment Program, Small Equipment program, Community Harvest Program and Atugaksait Program. NHSP was

established in 1993 by the Government of the Northwest Territories and the Tunngavik Federation of Nunavut.

In Arviat, the Hunters and Trappers Organization hires hunters in December-January to hunt caribou, which is then distributed to people in need, such as elders, single parent families and families that have no means or transportation to hunt. Approximately 70 caribou are provided to the community. Participants were quite satisfied with this program that provides people who are country food insecure with caribou meat. The Arviat HTO administers the Capital Equipment Program, which administers an annual draw among community members who fill out an application form and whose applications meet the criteria, which are sent to the NTI for final approval. The successful applicant receives a snowmobile, a boat and motors or an ATV that is delivered to their community on the sealift. There have been some criticisms of this program by those who believe that the equipment distributed is not being used for harvesting purposes. There is also no requirement for the recipients to harvest and give back to the community. There have also been cases of recipients who immediately sell the equipment locally and use the money for other purposes. Participants have suggested that the HTO more closely monitor how recipients use their equipment.

Finally, the Federal government subsidizes the sending of nutritious perishable and non-perishable food items as well as other essential items (such as toilet paper and diapers) to northerners living in isolated communities through the *Nutrition North Canada*, which replaced the former *Food Mail Program* on April 1st 2011. Yet, the list of eligible items began to change in October 3rd 2010. Until October 1, 2012, the new program is in a transition period as it is adjusting to northerners and stores' requests and concerns. Right now, two levels of subsidy exist. Level 1 ($1.10/kg) is applied to the most nutritious, perishable foods (fruits, vegetables, bread, meat, milk and eggs). Level 2 ($0.05/kg) is applied to eligible foods with longer shelf lives (flour, crackers, and frozen foods).[10] Prior to April

[10] For further details about Nutrition North Canada program, refer to: http://www.ainc-inac.gc.ca/nth/fon/fm/index-eng.asp

1st, shipping freight of items part of the Food Mail Program was $1.30/kg, $0.20 cheaper than regular shipping price of $1.50/kg.

Women also have the possibility of ordering individually from participating grocery stores in the south to benefit from the Nutrition North freight reduction. It is not clear whether it is less expensive to order individually or buy at the local store. Even if it is, there are several barriers preventing women from using the Nutrition North program: the majority do not have a credit card, are not aware how to access the program, do not have a computer with internet access, or cannot save enough money to buy in bulk a year in advance. In addition, with limited knowledge about healthy store foods, it is uncertain to what extent Inuit women benefit from this program with regards to food security.

7.4 Conceptualization of human factors affecting women's food system in Arviat

Figure 12 conceptualizes the multiple human factors affecting Inuit women's food system previously framed within a context of rapid socio-economic changes and climate change. This concept map highlights the interconnections between the factors that affect women's food system at the household, community and territorial/global levels. For example, the Nutrition North program subsidies healthy store foods in order to make them more affordable. However, if there is no program at the community level to promote these items and educate people about their benefits and usage, knowledge about healthy store foods will remain limited and their consumption among Inuit marginal. Ultimately, Inuit will not benefit fully from the federal financial support and the food security outcome will be null and the quality of diet unimproved. The country food component of the food system is greatly affected by factors at the household and community level (presence of a hunter in the household or close family, training of youth, country food knowledge, financial resources, sharing practices). Nevertheless, territorial programs such as the Nunavut Harvesters Support Program, are important to improve hunting capacity, but may not have all of its full effect on food security if they are not well implemented at the community level. For example, the program

providing hunting equipment to hunters in Arviat have been criticized for not being properly monitored and providing snowmobile or ATVs to people that are not using them for harvesting purposes. Furthermore, the effect of one factor affecting the food system could easily be multiplied due to the multiple interconnections between factors with wide reaching implications for food security or insecurity status. For example, gambling and addictions reduces financial resources, disrupts household dynamics, strains family relationships, and negatively affect sharing in the community, further compromising food security.

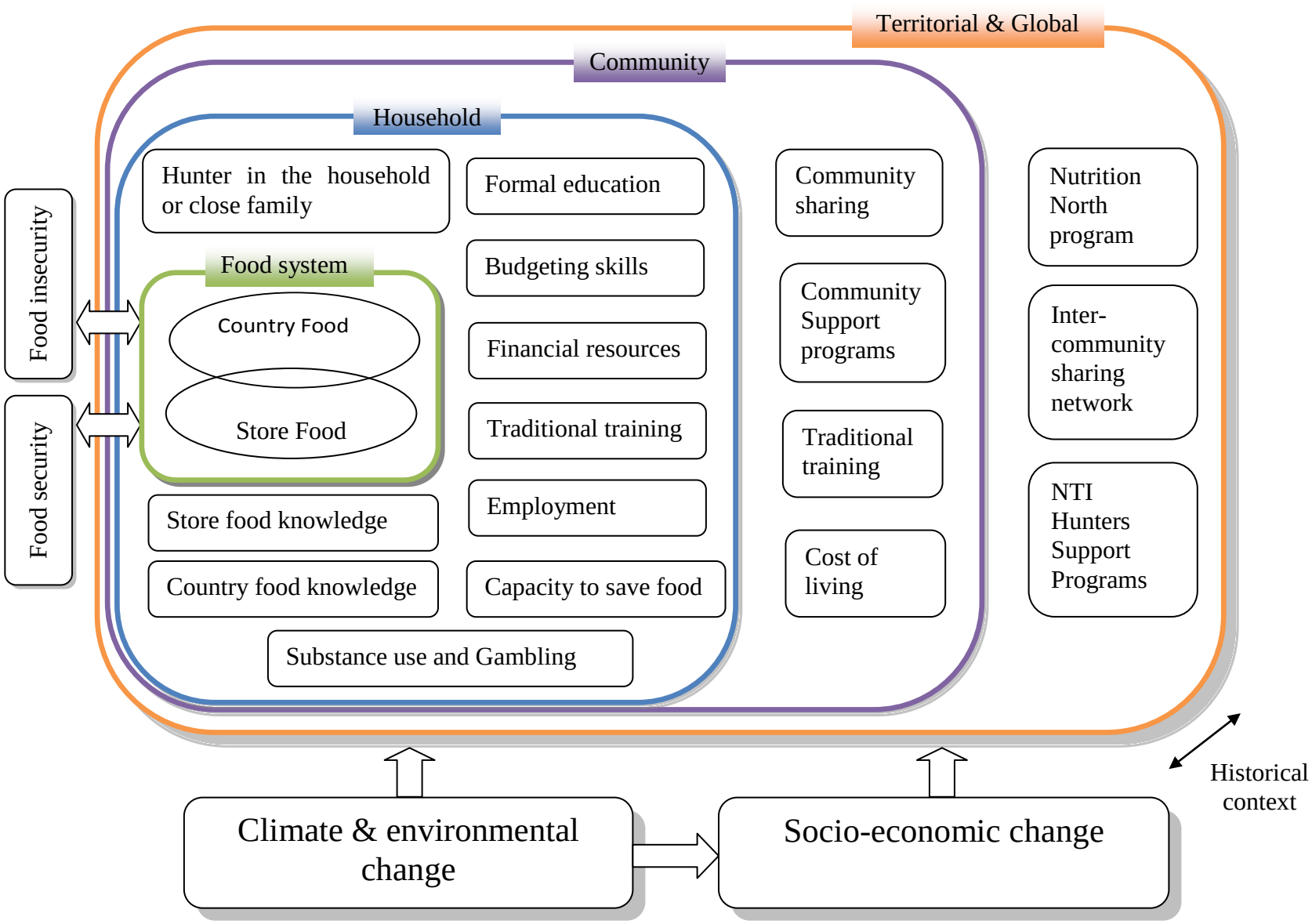

Figure 12. Factors affecting Inuit women's food system and ultimately food (in)security status in the context of climate change and socio-economic change in Arviat, Nunavut.

7.5 Summary – Human factors affecting the Inuit women's food system

Chapter 7 outlines the multiple human factors which impact the food system and ultimately determine the food security status of Inuit women in Arviat. These factors act at different levels: household (financial resources, budgeting, store food knowledge, traditional training, presence of a hunter in close family, substance use and gambling), the household and community (traditional training), community (sharing, community support, cost of living) and territorial/federal (Food Mail and Nutrition North programs, Nunavut Harvesters Support Program, inter-community sharing networks). Each of these factors were identified by participants in this study as being important yet, it falls outside the scope of this thesis to evaluate the weight that each factor plays in creating conditions of food insecurity among women in Arviat. This task is even more complicated given the numerous interactions between factors affecting the food system shown in Figure 12. While these factors, combined with environmental factors, may weaken or strengthen the food system, Inuit women's food insecurity status, as described in chapter 5 confirms that they are currently weakening the food system. The historical information provided in this section is crucial for fully understanding and contextualizing how the Inuit food system has evolved and the various pressures and respites that came with colonisation. Human and environmental factors are brought together in chapter 8 to assess the current vulnerability of the Inuit women's food system to climate change.

CHAPTER 8. VULNERABILITY AND ADAPTATION OF THE INUIT FOOD SYSTEM TO CLIMATE CHANGE

The aim of this thesis is to identify and characterize the vulnerability and adaptability of the Inuit women's food system to climate change in the context of multiple stresses, using a case study from Arviat, Nunavut. Chapter 6 outlined the manifestations of and observations of climate change in the Eastern Arctic and western Hudson Bay area as well as biophysical changes; while chapter 7 identified and described human stresses to the Inuit women's food system in the context of rapid changes in living condition. Chapter 8 builds upon these by bringing together human and environmental (climatic and bio-physical) factors which affect the food system of women in Arviat in order to assess its vulnerability and capacity for adapting to climate change. Key findings in this chapters show that climate change *per se* is not a major stress on the food system of women in Arivat, and that various human factors are far greater stressors, playing an important role in determining food insecurity status of women, as described in chapter 5. Nevertheless, the country food system is (and has always been) sensitive to changes in the environment. Coupled with human stresses, key findings show that environmental variation can lead to transitory periods of food shortage when country food accessibility and/or availability are reduced.

8.1 Assessment of current vulnerability of the country food system to climate change

Caribou shortage event of fall 2010 to spring 2011, although it was not directly linked to climate change, illustrates the variability of country food system and impacts on the food system. The main caribou-hunting season occurs in the fall and spring, when thousands of caribou pass close to the community during the course of southern and northern migrations. During the fall 2010 migration to wintering grounds in northern Manitoba, Saskatchewan and southern Northwest Territories, the majority of caribou passed approximately 800 km away from the community, a distance that would take

an experienced hunter some 4-5 days, under good weather conditions to travel via snowmobile. During the following winter, hunters reported only a few hundred caribou were found scattered within a range of 160 km from Arviat and these were mostly cows and calves. Very few bull caribous were harvested during this period. Bulls are preferred for the larger amount of meat per animal they provide. The spring northern migration to calving grounds in 2011 occurred four weeks later than usual, coming at the end of May rather than the end of April.

This change in migration pathway of caribou was an important stress on the Inuit food system, and led to caribou shortage for men and women in Arviat from October 2010 to May 2011. Almost no hunters had the time or the money to travel the 800km needed to reach caribou, especially with the high price of equipment and gasoline and the limited financial resources available in poorer families. With little caribou harvested during the fall migration, people were not able to save meat during the fall for the winter, and in the spring, they had to wait almost one month longer then usual prior to being able to obtain meat from the late caribou spring migration. The change in caribou migration pathways demonstrates the precarious nature of the country food system and its sensitivity to environmental changes. Concurrently, it shows the instability of the Inuit's food security, which depends largely upon access to caribou, the main staple of country food along with fish and muktaaq.

Indeed, the country food diet of younger women today is no longer as diverse as it has been previously. Traditionally, the main staple of the Caribou Eskimo were caribou, yet, many other foods were consumed in times of caribou scarcity, most notably during the winter, such as ptarmigan, fish, musk ox and hares, (Arima 1984). Caribou Eskimo did not harvest sea mammals during the winter (except among a few coastal Qaernermiut) as opposed to all other Inuit groups that lived on the coast and harvested seal and walrus during the winter (Rasmussen 1926; Birket-Smith 1976). The annual visit to the coast by Caribou Eskimo was no longer than 2 months in the summer, when they harvested seals at the floe edge and from kayaks (Birket-Smith 1976).

Today, while elders still consume other country foods when caribou, fish and muktaaq are not available, younger women turn to store foods. Flexibility in the country food diet today is affected by a quota system and

changes in livelihood. First, musk ox, which was a critical resources in times of caribou shortage during the nineteenth century (Burch 1977), can no longer be considered as a substitute for caribou as its harvest is controlled by a quota system; for example, from July 1 2011 to June 30 2012, 25 muskoxen were allocated to the community of Arviat. Secondly, the younger generation did not develop a taste for various country foods as had elders who were born 'on the land' and who survived starvation periods by eating country food alternatives. Thus, women tend to rely on store foods in times of caribou scarcity rather then consuming other country foods. Most often, women turn to cheaper foods, ready-made meals and non-perishable goods when caribou is not available: "When we can't get country food, we have to [change diet], but we have no [store] meat, so we have to eat what's in our cupboards" (Participant 14). Women, who have the means, are able to purchase meat (ground beef or chicken) or fish at the local store. Yet, store food (including store meat) does not compare with country food: it has a different taste, does not provide the same feeling of satiety, is expensive and nutritionally inferior. For example, caribou meat, bone marrow, liver, tongue, brain, heart and stomach content contain essential nutrients and are important sources of protein to Inuit, which is hard to acquire with store foods consumed today (Lawn and Harvey 2003; Berti, Soueida et al. 2008; Sharma, Cao et al. 2010; Egeland, Johnson-Down et al. 2011).

Changes in caribou migration pathways combined with human factors such as changes in livelihood, away from semi-nomadic hunting groups to sedentary lifestyles with a waged economy, and changes in diet away from country foods with a lack of affordable healthy store foods alternatives increases the vulnerability of Inuit women's food system to environmental changes; these have negative implication on the food security of women. Yet, it is important to note that historically, this exceptional event might have triggered mass starvation among the Caribou Inuit population. In that sense, changes in living conditions have considerably improved food security among the Inuit by ensuring constant a supply of food. However, the quality of food available and as illustrated previously, the accessible of food in local stores in Arviat creates a different level of food insecurity related to inadequacy of food quality, which has several negative health implications for present day Inuit

health (Kuhnlein, Receveur et al. 2004; Johnson, Nobman et al. 2009; Egeland, Johnson-Down et al. 2011) (see chapter 5).

Furthermore, increases in temperature and permafrost loss in the area surrounding the western Hudson Bay (Gough and Leung 2002; Laidler and Gough 2003; Smith, Burgess et al. 2005) and the increase in grizzly and polar bears around Aviat further stress the food system by negatively impacting traditional food preservation practices. Inuit, of all generations, enjoy eating caribou meat that has been cached in the fall and undergone processes that give it a definite taste. Traditionally, people made pirujuaq (cache meat) in the fall to store and preserve caribou meat during the winter, when caribou is particularly hard to harvest. Cached meat is buried under stones and boulders and rest over bones, laid over the frozen ground, such that air can circulate (Figure 13).

Figure 13. Inuit meat cache on Kazan River, Keewatin District, N.W.T, 1930 (source: Library and Archives Canada/PA-101294)

With the permafrost period already shortened around Arviat, the caching meat period is also shortened. People have adapted by making pirujuaq later in the fall, if necessary, and removing the meat before the temperature rises too high in the spring (Government of Nunavut 2005; Sullivan and Nasmith 2010).

Moreover, the high number of grizzly and polar bears in the area of Arviat, makes it difficult to preserve caribou meat in pirujuaq as more bears eat it: “Today, I think it’s useless [to do pirujaq] because of polar bears or grizzly bears will eat it. […] Back then, there were hardly any polar bears, and

today, they are all over. […] Polar bears used to eat only sea animals, but today they eat anything they can find. […] Grizzly bears never used to be around, but they are now" (hunters, focus groups).

Thus, increase in temperature, permafrost degradation and the increase in grizzly and polar bears numbers further stress the Inuit food system by reducing the pirujuaq period and even contributing to the cessation of this practice. This stress particularly affects those who do not have a freezer large enough to save meat during the winter, primarily affecting the poorest families. No coping strategies have been put in place to help people save meat during the winter. A long-term adaptation strategy would be to store meat in the community freezer during the winter, which is as of today only open during the summer. This change would not come, however, without an increase in operational costs. Furthermore, participants noted that the freezer is too small to accommodate a population of nearly 3000 people. Thus, increasing the size of the current freezer or building another one would improve storage room. Again, this adaptation strategy would demand considerable investment from the hamlet.

Additionally, increases in temperature in the summer affect hunting patterns. With more high summer temperatures, some hunters have stopped hunting during the hottest months in order to prevent meat wastage: "I don't hunt too much when it's too hot, July through August, because the meat spoils fast and it taste different, the meat gets really soft" (hunters, focus groups). Thus, increasing temperature trends in the Arctic (Figure 14), associated with climate change, stress the Inuit food system by reducing hunting during hot months and concurrently decrease the supply of country food in the community. Participants interviewed in this study did not indicate the presence of an adaptation strategy for this impact. One potential strategy would be to increase the amount of meat harvested during the spring migration. Again, this would require an increase in the availability of storage room in home or community freezers.

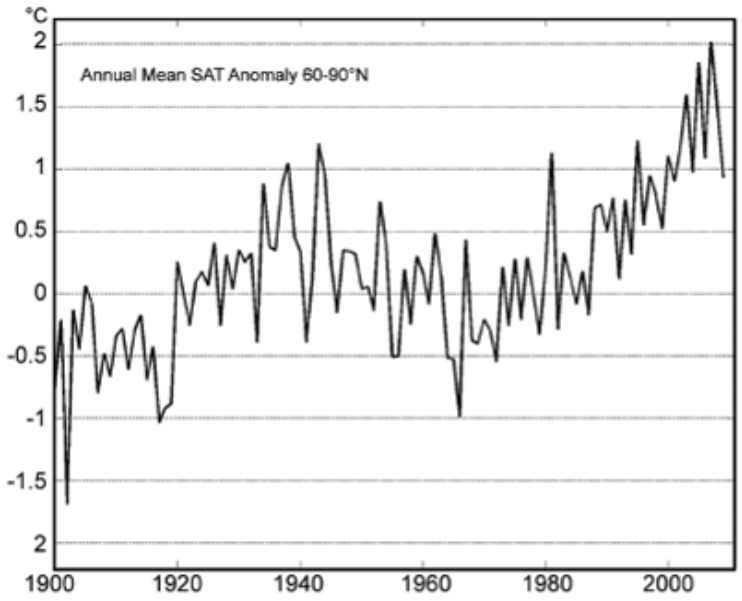

Figure 14. Arctic-wide annual average surface air temperature anomalies relative to the 1961–90 mean, based on land stations north of 60°N (Source: Overland et al.(2011))

8.2 Current vulnerability of the store food system to climatic risks and change

Store food is sensitive to climatic hazards, weather they are due to climate change or not. Delays due to fog, high wind, blizzard or white-out, in transport of fresh produce are common in the Arctic; they are particularly problematic with perishable produce often close to, and in some cases exceeding, expiry dates on arrival in communities. In addition, the sea-lift which transports non-perishable food items to the communities is susceptible to sea ice variation and changing weather conditions. On one hand, delays in re-supply are common and can cause temporary shortage of certain non-perishable food items at the stores. On the other hand, earlier ice-break ups has lengthened shipping season. In spring 2011, the NSSI vessels were loaded 10 days earlier than it was 10 years ago. Longer ice free season allows the vessels to do four trips rather than three (Rogers 2011).

Generally, women did not identified delay in food transportation as a major concern with regards to store food freshness. Mostly, women cannot obtain food of adequate quality because of a combination of limited financial

resources, high cost of living, including high price of store food, and limited budgeting skills and knowledge about store foods, not because of delay in food transportation. To cope with store food shortage, participants mentioned increasing their consumption of country food (caribou, fish) or bannock (flour, water, baking soda, lard) when country food is available*:* "we run out of store food sometimes […] we eat more country food when we run out" (participant 1). However, during the data collection period, from September 2010 to April 2011, country food, notably caribou, was scarce. Thus, families, especially the poorest, were particularly vulnerable to suffer from food insecurity and consume cheap store foods of poor quality. The replacement of country food with store food have been shown to negatively impact household economic sustainability (Myers, Fast et al. 2005) and overall health (Kuhnlein, Receveur et al. 2004; Johnson, Nobman et al. 2009; Egeland, Johnson-Down et al. 2011).

8.3 Current vulnerabilities of Inuit women's food system are primarily linked to human factors

This vulnerability analysis shows that the food system of Inuit women is vulnerable to climate variability and environmental change, but that climate change is not an important determinant of food insecurity among Inuit women at present. Food security is complex and results from interactions between multiple human, historical and environmental factors which effecting the food system on different levels and scales. Currently, socio-economic and historical factors documented in chapters 7 are the most important in determining food insecurity. Some of the main drivers of food insecurity today emerge as a result of rapid changes in livelihoods experienced by Inuit over the course of the last 60 years. The vulnerabilities outlined in this section, (caribou shortage event of 2010-2011, the increase in temperature, degrading permafrost and increase in grizzly and polar bears which reduces the pirujuaq period, and high summer temperatures which prevent hunting activities during the summer; as well as a shift to reliance on store food in times of caribou shortage) show how "Inuit food security is inherently dynamic, as reflected in its transitory nature and influenced by the changing nature of the Inuit livelihoods, social relations

and the Arctic environment" (Beaumier and Ford 2010; Ford and Beaumier 2010: 58). Caribou scarcity itself did not result in food insecurity; but it did when coupled with the historical context – the change from semi-nomadic to sedentary lifestyle, hunters' lack of money, time, skills or willingness needed to go hunting far away from the community and the lack of healthy and affordable alternative at the local stores. The higher vulnerability of single mothers to food insecurity is linked to economic inequalities as chapter 7 demonstrated. Single female families are more numerous than single male families in Arviat and experience greater difficulty in affording store food and obtaining country foods when the supply is low.

The food system's current vulnerabilities have emerged alongside a changing Inuit society, but "western" modernity has also facilitated a number of current adaption strategies. For example, the introduction of store foods now secures availability of food all year long and prevents Inuit from starvation. Community and territorial financial support also play an important role in providing education programs and food relief, ensuring minimum financial security through income support program and family allowance. Modernity has also benefited hunters who now commonly use modern tools to facilitate harvesting in order to adapt to changes in environmental conditions. In the planning of hunting trips, it has become normal to verify the weather forecasts prior to departure: "a long time ago, we used to see the weather through our eyes, not by calling the weather forecast or searching online" (hunters, focus groups). Global Positioning Systems (GPS) are now used by hunters to orient themselves, which can play a role in decreasing their travelling time, reduce gas consumption and preventing wastage of meat during the summer (Ford, Smit et al. 2006). Caribou collaring information is also available to certain hunters in Arviat, enabling them to more accurately and efficiently locate caribou, which can also reduce travelling time. The Maguse road is another benefit, one that allows many hunters to access easily that hunting area. However, this road has some negative aspects, as it has significantly increased traffic to Maguse Lake, which some elders and hunters believe disturbs the caribou and drives their migration pathway away from the community.

With increasing difficulty in predicting the weather (Sullivan and Nasmith 2010), these tools will facilitate future adaptation to climate change. Although, the use of, and dependence on new technologies has also been shown to limit adaptation. For example, the use of snowmobiles allows hunters to travel great distances from the community, yet it does not provide the warning or locate dangers as a dog team would have when it was still used to travel about 50 years ago (Ford, Smit et al. 2006). Ford et al. (2006) and Aporta and Higgs (2005) have associated an increase in risk taking behaviour with the development of modern technologies such as GPS and two-way radio, which provide a 'false' sense of security.

Inuit have long adapted to changing climate within certain coping limits enabled by extensive knowledge of the land, the wildlife and hunting techniques (Ford, MacDonald et al. 2006; Ford, Smit et al. 2006; Ford, Smit et al. 2008; Wenzel 2009). Sharing resources is the foundation of the traditional Inuit subsistence economy (Wenzel 1991; Condon, Collings et al. 1995; Collings, Wenzel et al. 1998) and has always been an important mechanism for maintaining an adequate food supply (Fossett 2001; Bennett and Rowley 2004). Today, sharing remains *the* most important practices for Inuit women in Arviat in times of food insecurity, even if the conception of sharing is changing (discussed in chapter 7). Yet, when caribou are far away, hunters harvest fewer and can only share with close family members: "When it's bad weather for 1-2 weeks, it's hard to get country food […] people go on air if they want to buy some, […] even from other communities, they go on air and say: "I want to buy complete caribou, here's my phone number"" (Participant 35). Sharing is most efficient when country food is available, as store food is not as readily shared. Thus, caribou shortage event stress sharing networks and further compromises the food security of Inuit women.

8.4 Summary - Vulnerability and adaptation of the Inuit food system

Country food and store food systems are sensitive to changes in the bio-physical and climatic environments, whether they are related or not to climate change. Change in caribou migration pathway in winter 2010-2011

away from the community, the increase in temperature, permafrost degradation and the increase in grizzly bear in the area of Arviat which shortens the period for making pirujuaq or prevents it, the increase in meat spoilage due to hot summer months, delay in store food transportation due to weather related hazards and lengthening of the sea lift shipping season due to longer ice free season are evidences of the food system vulnerability to environmental (climatic and bio-physical) changes. These stresses exacerbate the pressure that already exists on the food system due to multiple human stressors. Single women are more at risk to be food insecure than men because they are economically disadvantaged. Despite adaptation strategies, and a greater diversity of food available all year long, in addition to territorial and federal financial support programs for hunters, families and the introduction of technology (weather forecast, GPS, collaring information, roads), sharing continues to remain the most important traditional practice for alleviating periods of food insecurity among Inuit women.

This research looks at the vulnerability and adaptability of Inuit women food system to climate change. Findings from this research shows that human stressors are more important in determining the food insecurity status of women and show that climate change is only one factor among many, which may exacerbate that pressures that already exists on the food system. The discussion examines what insights this work hold for food system vulnerability research in Arctic regions, by comparing and contrasting Arviat assessment with that of Igloolik and Qeqertarsuaq The conclusion summarizes the main findings and identifies entry points for further research.

9.1 Discussion

There is an increasing body of literature assessing the vulnerability and adaptability of Inuit communities to climate change, especially in the Canadian arctic (e.g. Van Oostdam, Donaldson et al. 2005; Ford, MacDonald et al. 2006; Ford, Smit et al. 2006; Furgal and Seguin 2006; Statistics Canada 2007; Ford, Smit et al. 2008; Tait 2008; Ford, Gough et al. 2009; Laidler, Ford et al. 2009). These studies examine how food systems might be affected by climate change. However, few specifically explore the arctic food system's vulnerability to climate change with respect to food insecurity. Nor do they examine the role human and non-human drivers play across multiple spatial-temporal scales. An exception includes Ford (2009) who focuses on extreme climate condition in 2006, most notably sea ice abnormality, which coupled with socio-economic variables (e.g. high cost of gas, unemployment, high cost of living) even further stressed the food system of Igloolik Inuit (Igluligmiut) exacerbating high baseline food insecurity. Similarly, Goldhar and Ford (2010) show how climate variability, reductions in sea ice extent and a shift in the timing of eider ducks migration affected Inuit food system in Qeqertarsuaq, a municipality of Greenland. Bringing together the research work conducted here with these two studies holds the potential to help better

understand how some of these broad trends, in terms of how climate affects the food systems of the Inuit.

The vulnerability of Arviarmiut women's food system is similar to that of Igloolik, notably in terms of ***human stressors*** (high cost of living, food, fuel, gas, housing, limited financial resources, and decline in traditional training). In Qeqertarsuaq, the capacity of the food system to adapt to climate change is negatively affected by resource management issues and the high price of traditional Greenlandic foods sold at the local market, the grocery stores and by local hunters. Important differences in colonization history and modernization, with Greenland having been colonized in the 1800's as opposed to 1950's for Canadian Inuit, shape differently food system's sensitivity and capacity to adapt. In general, Inuit in Greenland benefit from a greater economic self-sufficiency and longer history of self-governance.

With regards to ***exposure-sensitivities***, important differences were noted, especially related to location and the nature of the country food system. Arviat is on the mainland, in contrast to Igloolik and Qeqertarsuaq. Arviarmiut do not traditionally consume sea mammals (seal, walrus) during the winter, thus does not use the sea ice as hunting platform as much as Igloolik and Qeqertarsuaq. Arviarmiut also do not need to travel on sea ice to access hunting areas on the mainland, a key challenge facing Igloolik with respect to changing ice dynamics. Lower reliance on sea mammals therefore makes the Arviat food system less sensitive to trends of decreasing and thinning of sea ice, which is the most visible manifestation of Arctic climate change (Overland, Wang et al. 2011). Yet, Arviarmiut are more sensitive to change in caribou migrations away from the community – or declining population health and abundance of caribou – as they rely heavily on caribou for food, culture, and social relations. Thus, their food system diversity and flexibility is lower than Inuit in Igloolik and Qeqertarsuaq, with fewer species and environments exploited. This holds implications for adaptive-capacity.

Sharing and trading food was noted in all studies as strengthening the food system, ensuring food security and facilitating adaptation to climate change. However, there is a general trend towards a decline in sharing food, which in Qeqertarsuaq affects particularly women who receive an important

portion of their food from sharing networks. Adaptation in all three communities is facilitated by the diversification of the food system with store foods and traditional foods, hunter support programs that provide financial assistance and equipment to hunters, and Inuit adaptability due to experience of past climate variability and extensive knowledge accumulated through time. However, Qeqertarsuaq, Igloolik, Arviat and elsewhere in the Canadian north, there is a trend towards the decreased transmission of traditional skills and knowledge to the younger generation, which may affect future generations capacity to adapt to climate change (Condon, Collings et al. 1995; Ford 2006; Ford 2009; Pearce, Wright et al. 2011).

9.2 Conclusion

This thesis provides baseline data about the vulnerability of women's food system in Arviat, NU, to climate change in the context of socio-economic stresses in order to ultimately understand the conditions that create food insecurity for women in the Canadian Arctic.

The use of photovoice is novel in the north, providing a key tool through which key concerns and themes could be identified and further addressed in interviews. Semi-structured interviews provided most of the information used to assess the vulnerability of women's food system to climate change. Focus group discussions were essential to obtain feedback from the community on the preliminary results and to obtain additional information and clarification. The contributions of Inuit elders, hunters and key informants were important, especially to gather details about historical context from elders, observations of climate change and bio-physical changes from hunters and elders and broader determinants of food security and factors affecting the food system from key informants. The use of these tools allowed the researchers to interact with informants at the personal as well as community level and to accurately depict the food security concerns of Inuit women in Arviat.

Key findings show that the food system of women is affected by environmental (climatic and biophysical) variability. Arviarmiut did not associate change in caribou migration pathway and increases in bear

populations with climate change, but rather with natural cycles. Yet, temperature increase and permafrost loss which decrease the period of pirujuaq and high summer temperature which reduce the frequency of hunting activities in July and August - changes which the scientific literature associates with warming of the arctic (Gough and Leung 2002; Laidler and Gough 2003; ACIA 2005; Smith, Burgess et al. 2005; IPCC 2007)

The pronounced caribou shortage in fall-winter 2010-2011, and its role in creating food insecurity among women provides insights to the precarious nature of the food system of women in the Canadian Arctic to environmental variability and potential vulnerabilities to climate change. The current global vulnerability of *Rangifer tarandus* to climate warming and landscape change (Vors and Boyce 2009) and population decline of caribou herds surrounding Arviat (Gill 2010; Russell 2010) suggest that the herd harvested by Arviarmiut may not be exempt from the effects of climate change and mining development in the Kivalliq region in the future.

Currently, multiple human and historical factors play a predominant role in determining the food security status of women. Financial resources and budgeting skills, store food knowledge, decreases in the transmission of country food knowledge, decreases in traditional training, substance use and gambling and high cost of living negatively impact the food security of Inuit women. Single-women are particularly at risk of being food insecure as they are economically disadvantaged. Gender-related inequalities with respect to the impacts of climate change on the Inuit's food system have been identified as a concern, however remains an area which the extant literature scholarship has yet to substantively address (Kukarenko 2011). Indeed, the literature on the human dimensions of climate change has often been approached from a male perspective (Ford 2006; Ford, MacDonald et al. 2006; Ford, Smit et al. 2006; Furgal and Seguin 2006; Ford, Laidler et al. 2007; Ford, Smit et al. 2008; Ford, Gough et al. 2009; Dowsley, Gearheard et al. 2010) as male hunters travel long distances over land, ice and water sometimes in harsh weather conditions to access country foods and provide for their family. In this sense, men are more likely to be impacted by climate hazards than women. Yet, climate change also affects women's lives by impacting how they engage in traditional activities such as sewing, fishing, skinning, berry-picking,

travelling to their camps, hunting with their partner or by themselves (Dowsley, Gearheard et al. 2010). Furthermore, concerns and fears for family and friends travelling on the thinning ice, especially in the spring, have been associated with contributing to psychological stress among women (Dowsley, Gearheard et al. 2010; Cunsolo Willox, Harper et al. In press). This research only examines women's food system vulnerability to climate change. More research is needed to fully understand gender-related vulnerabilities to climate change.

In Arviat, several adaptation strategies have been established as a result of modernization. Yet, due to complex interactions between the multiple factors affecting women's food system, these strategies sometimes fail to ensure food security for everyone. The introduction of store foods resulted in the eradication of starvation among Inuit, yet without adequate education, price, and supply of healthy store foods, it has created insecurity related to the quality of food being consumed, which, in turn, has had significant health repercussions among Inuit in Arviat, and elsewhere in the north, with rising rates of chronic disease (Bjerregaard, Young et al. 2004; Health Canada 2005; Chateau-Degat, Dewailly et al. 2011; Egeland, Johnson-Down et al. 2011). Alongside changes in living condition came a decline in the diversity of country food consumed, due to the younger generation that have not developed the taste for different foods such as hare or ptarmigan as they have not lived "on the land" and have store food readily available. Thus when caribou, the preferred country food, is not available, young Inuit women are more likely to consume processed food of poor nutritional status, hence to be food insecure.

Sharing is inherent to Inuit culture and remains the most important mechanism for women to obtain country foods and maintain an adequate food supply in times of food shortage. Women who do not have a full time hunter (who has the means to hunt) in their household receive food primarily from their close relatives and secondly from other community members. Yet, the conception of sharing and its place in Arviat is presently in transition with the underlying general reciprocity principle in jeopardy. The assumption that country food is free because it comes from the land and the high harvesting cost are at the core of this problematic.

While climate change was not identified as an important stressor on the food system currently by interviewees, when participant observations are examined in the context of scientific literature on climate change there are clear linkages between climate change and food security for women in the Canadian Arctic. Indeed, climate change projections indicate that the arctic will continue warming at a rapid rate (ACIA 2005; IPCC 2007). Thus, with human stressors weakening the food system of women and their importance in determining food security or insecurity, socio-economic stresses and disparities must be addressed at the household, community and territorial/global levels in order to prepare for future climate change and improve the overall health of women.

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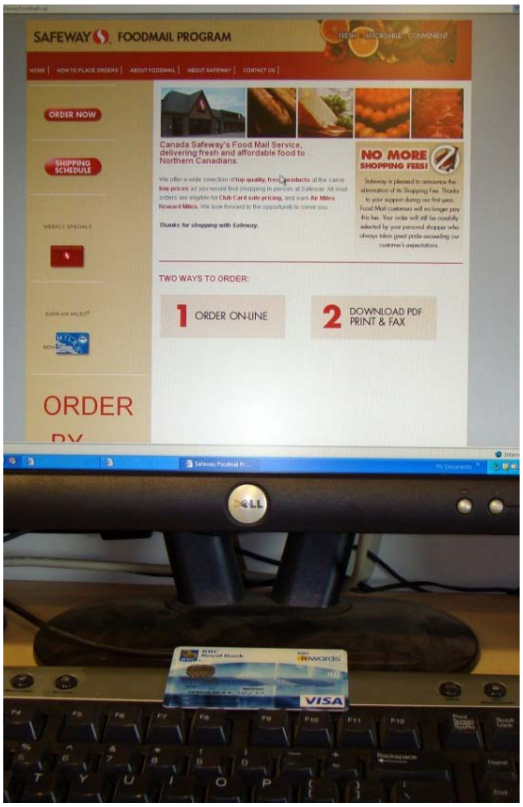
APPENDIX I

Photovoice results

1. Gambling takes away money from providing food

2. Money – Even though you are unemployed, there are other ways of making money to buy food such as carving

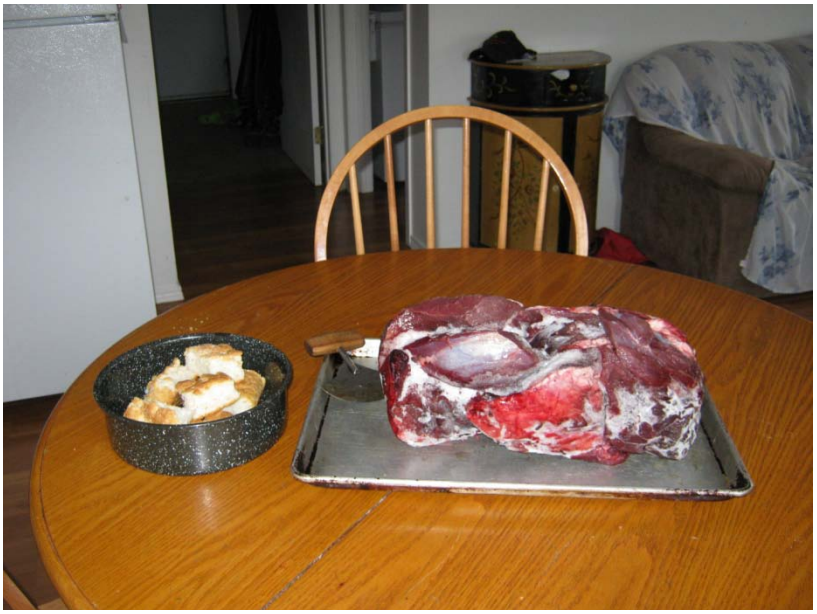


3. Preserving country food - The Community freezer is used to store our country food that we will share during the winter

4. Food Sharing – We are sharing food not only with family but within the community

5. Women preparing food - Women prepare healthy meals for their family using country foods

6. Quick meals - Differences between southern and country food: we can prepare quick meals with both; country food is the healthiest option here!



7. Weather affects country food – Bad weather means … an empty net

8. Changing taste - traditional food mixed with frozen vegetables.

9. Passing on traditional skills - While mother makes nipku, children learns to help out by preparing fathers fresh catch

10. Free! – Country food is free and healthy

11. Kids enjoying healthy foods - Kids enjoy country foods and fruits especially if they are taught to eat them at a young age.

APPENDIX II

Participant Number	Age	Maritial status	Employement Status	Number of children in the household	Number of people in the household	Number of full time hunter in the household	Number of part time hunter in the household	Number of occasionnal hunter in the household
1	57	Married	Unemployed	5	10	0	2	0
2	44	Married	Unemployed	3	5	1	0	0
3	23	Single	Unemployed	3	4	0	0	0
4	32	Married	Part time	6	8	0	1	0
5	37	Single	Part time	2	5	0	0	0
6	43	Married	Part time	4	8	2	0	0
7	37	Married	Part time	6	10	0	1	0
8	45	Single	Part time	1	2	0	0	0
9	34	Married	Unemployed	0	2	0	1	0
10	63	Married	Part time	1	3	0	1	0
11	26	Married	Unemployed	2	8	0	0	0
12	22	Married	Unemployed	2	9	0	0	0
13	26	Married	Unemployed	1	3	0	0	0
14	34	Single	Unemployed	4	5	0	0	0
15	37	Single	Unemployed	2	3	0	0	0
16	32	Married	Full time	4	6	0	0	0
17	44	Married	Unemployed	3	7	0	0	0
18	26	Single	Unemployed	1	5	2	0	0
19	35	Married	Full time	5	7	1	0	0
20	29	Single	Unemployed	1	2	0	0	0
21	74	Single	Unemployed	0	2	0	0	0
22	74	Single	Part time	1	2	0	1	0
23	32	Single	Unemployed	2	3	0	0	0
24	41	Married	Full time	6	8	0	0	0
25	40	Married	Unemployed	7	9	0	1	0
26	69	Single	Part time	0	3	0	0	0
27	48	Married	Part time	4	6	1	1	0
28	73	Single	Part time	0	1	0	0	1
29	54	Single	Full time	1	2	0	1	0
30	48	Single	Unemployed	2	4	0	0	0
31	22	Single	Unemployed	5	11	0	1	0
32	36	Single	Unemployed	2	3	0	0	0
33	38	Married	Unemployed	3	5	0	1	0
34	32	Married	Unemployed	2	4	0	0	0
35	35	Single	Unemployed	5	6	0	0	0
36	47	Married	Full time	7	11	0	0	1
37	79	Married	Unemployed	0	2	0	0	0
38	24	Single	Part time	2	4	0	0	1
39	61	Single	Unemployed	7	8	0	1	1
40	38	Married	Unemployed	6	9	0	0	1
41	40	Married	Part time	5	8	0	0	1
42	36	Married	Unemployed	4	7	1	0	0

Table 6. Women's participant to semi-structured interviews personal and household characteristics, Arviat, Nunavut

APPENDIX III

			Montreal	Arviat
Perishable products	**Quantity**	**Unit**	**Price ($)**	**Price ($)**
2% fresh milk	4.76	L	8.68	15.46
Mozzarella cheese	485	g	8.88	15.16
Processes cheese slices	385	g	3.84	9.07
Yogurt	1.67	kg	11.36	15.75
Eggs, large	18	egg	5.24	6.39
Chicken drumsticks	2.68	kg	15.25	22.49
Pork chops, loin	1.21	kg	6.91	21.52
Ground beef, lean	1.34	kg	12.97	16.06
T-bone steak	470	g	12.22	13.87
Sliced ham	135	g	2.16	3.66
Frozen fish stick	135	g	0.90	1.91
Bologna	60	g	0.29	0.99
Wieners	100	g	0.44	0.89
Bread, enriched white	660	g	2.42	4.16
Bread, 100% whole wheat	660	g	2.42	4.23
Oranges	1.23	kg	2.68	8.88
Apple juice, frozen	130	ml	0.55	1.32
Orange juice, frozen	1.13	L	6.33	12.70
Apple juice TetraPak	880	ml	1.15	8.42
Orange juice TetraPak	375	ml	0.49	0.98
Apples	4.38	kg	9.55	37.51
Bananas	3.58	kg	5.44	3.65
Grapes	500	g	2.35	6.14
Fresh potatoes	3	kg	6.81	14.73
Instant potato flakes	200	g	1.66	2.00
Frozen French fries	1.17	kg	1.75	5.38
Frozen broccoli	695	g	4.85	11.06
Frozen carrots	260	g	1.71	3.98

Frozen corn	260	g	1.14	1.76
Frozen mixed vegetables	1.74	kg	5.78	18.77
Carrots	2	kg	2.72	19.16
Onions	695	g	0.95	4.91
Cabbage	520	g	0.90	1.01
Turnips	350	g	0.53	0.29
Margarine, non-hydrogenated	715	g	4.56	5.12
Butter	65	g	0.43	78.60
Non perishable products	**Quantity**	**Unit**	**Price ($)**	**Price ($)**
Evaporated milk, 2%	1.58	L	7.64	14.90
Skim milk powder	90	g	1.53	2.29
Canned pink salmon	270	g	2.52	3.11
Sardines in soya oil	270	g	2.14	20.86
Canned pork-based luncheon meat	50	g	0.29	0.54
Canned corned beef	40	g	0.45	0.52
Canned ham	200	g	2.04	
Canned beans with pork	290	ml	0.58	1.79
Canned spaghetti sauce with meat	155	ml	0.58	1.32
Peanut butter	90	g	0.66	1.04
Canned beef stew	180	g	0.48	1.71
Flour, all purpose	1.92	kg	3.45	9.90
Pilot biscuits	275	g	1.96	4.33
Soda crackers	680	g	4.18	6.22
Spaghetti	385	g	0.64	2.58
Rice, long-grain parboiled white	330	g	2.02	2.95
Rolled oats	275	g	0.67	1.53
Corn flakes	440	g	2.34	5.32
Macaroni and cheese dinner	550	g	4.65	5.84
Canned whole tomatoes	215	ml	0.43	1.12

Canned tomato sauce	300	ml	0.97	2.24
Canned fruit cocktail in juice	398	ml	1.50	3.99
Canned peach in juice	398	ml	1.15	3.99
Canned pineapple in juice	285	ml	1.07	2.40
Canned green peas	900	ml	3.37	6.99
Canned kernel corn	1.09	L	4.08	6.27
Canned green beans	315	ml	1.18	2.45
Canned carrots	325	ml	0.56	2.82
Canned mixed vegetables	545	ml	0.94	3.14
Canola oil	185	ml	0.88	2.54
Lard	105	g	0.65	0.97
Sugar, white	600	g	0.90	2.61
SUB TOTAL			212.76	526.20
TOTAL (5% added to cost)			**223.40**	**552.51**

Table 7. Indian and Northern Affairs Canada (INAC) Northern Food Basket for a family of four for one week in Arviat, NU, and Montreal, QC, September 2010.