

THESIS

NEW RISKS, NEW STRATEGIES: GREENLANDIC INUIT RESPONSES TO CLIMATE
CHANGE

Submitted by

Kimberly Wolfe Derry

Department of Anthropology

In partial fulfillment of the requirements

For the Degree of Master of Arts

Colorado State University

Fort Collins, Colorado

Summer 2011

Master's Committee:

Advisor: Lynn Kwiatkowski

Kathy Galvin
Lorann Stallones

Copyright by Kimberly Wolfe Derry 2011

All Rights Reserved

ABSTRACT

NEW RISKS, NEW STRATEGIES: GREENLANDIC INUIT RESPONSES TO CLIMATE CHANGE

As climate change accelerates, its effects are especially pronounced in the Arctic region. The Arctic has a history of susceptibility and vulnerability to climate change. The Arctic's indigenous peoples are facing increased challenges, most notably in their abilities to harvest food resources. This thesis uses field research and literature review to explore the ways in which Inuit in Greenland are able to manage their resources and responses to the changing climate conditions, and to prevent and cope with climate related injury. An in-depth analysis of the plight of the Inuit includes discussion of the historical political, social, economic, cultural, and geographical factors that shape and inform their methods of responding to climate change. This thesis describes ways that the Inuit perceive climate change and interact with their changing environment, and the extent to which they apply their traditional ecological knowledge and contemporary technology to survive and shape policy that influences their coping responses. It also discusses Inuit people's vulnerability to injury in relation to climate change. In this thesis, I argue that climate-related changes in sea ice conditions increase vulnerability to potential injury events during travel on ice for Greenlandic Inuit hunters and fishermen,

particularly in remote locations. Specifically, individuals living in remote areas have less access to resources that can increase their chances for survival than do their counterparts living in population centers. In general, Inuit employing a wide range of coping responses are better positioned to act in response to climate change in spite of the emerging hazards. In addition, my research illustrates that different individuals within and across Inuit communities will be successful in this regard, which is largely based on historical legacy, intra-community access to resources, and differences within and between communities (including, *e.g.*, gender, age, occupation, and location). Inuit individuals that I found to be the most successful in employing a wide range of coping responses include those who are hunters by occupation, and work as fishermen as well, living in or near larger population centers, with good access to resources and high levels of traditional ecological knowledge that is continuously negotiated in response to rapidly changing environmental conditions. Finally, in this thesis, I draw conclusions concerning which Inuit are most vulnerable to increased risk of injury related to changing sea ice, and which types of responses are most effective. The Inuit that I have found to be most vulnerable to increased risk of injury related to changing sea ice are those who are younger, traditional hunters living in more remote coastal villages, with reduced access to resources, low levels of traditional ecological knowledge, and limited hunting/fishing skills. Based on my research, the types of responses that I found to be most effective include making extra preparations, such as taking extra food and supplies, before going out hunting or fishing. In addition, people are becoming more “risk averse” and avoiding dangerous areas and travel at certain times of the year. Other coping responses involve group travel and a stronger reliance on intra-communal resources.

For Byler

TABLE OF CONTENTS

ABSTRACT	ii
DEDICATION	iv
TABLE OF CONTENTS	v
 CHAPTER 1	
INTRODUCTION TO THE STUDY	
Introduction.....	1
<i>Northwest Greenland</i>	3
Sea Ice Hazards for Inuit Hunters and Fishermen	5
<i>Subsistence Hunting and Fishing Strategies</i>	6
Theoretical Approaches	8
A Critical Biocultural Approach.....	8
<i>Vulnerability to Climate Change</i>	12
<i>Resilience Theory</i>	14
Significance of This Study.....	17
Summary	17
 CHAPTER 2	
RESEARCH METHODOLOGY	
Introduction.....	19
Community Involvement	20
<i>Institutional Support</i>	20
Description of Research Sites	21
<i>Uummannaq</i>	21
<i>Ilulissat</i>	22
<i>Nuuk</i>	22
Data Collection	23
<i>Analysis of Secondary Sources</i>	24
<i>Participant Observation</i>	24
<i>Semi-structured Interviews</i>	25
<i>Life Histories</i>	26
<i>Key Informants</i>	26
Limitations to the Research	27
Summary	27

CHAPTER 3

GREENLAND: HISTORY, CULTURE, AND HEALTH CARE

Introduction.....	28
The Arctic Region.....	28
Danish Colonization and Greenland Home Rule Government.....	29
Inuit Hunting Culture.....	31
Development in Greenland.....	31
Health Care in Greenland.....	33
<i>Traditional Inuit Health Practices</i>	33
<i>Contemporary Health Care</i>	34
<i>Mental Health</i>	35
<i>Suicide</i>	36
<i>Substance Abuse</i>	38
<i>Challenges to Health Care Delivery</i>	39
Summary.....	42

CHAPTER 4

INUIT PERCEPTIONS OF CLIMATE CHANGE

Introduction.....	43
<i>The Hunters</i>	43
Climate Change in Greenland.....	45
Resource Co-management.....	47
Different Ways of Knowing.....	51
<i>Perceptions of Climate Change</i>	56
Arctic Sea Ice.....	58
Local Weather Patterns.....	61
Wildlife.....	62
Summary.....	62

CHAPTER 5

MULTIPLE PERSPECTIVES OF RISK

Introduction.....	64
Risk Perception Research.....	64
<i>From Risk Perception to Risk Exposure</i>	66
Inuit Perceptions of Risk.....	69
Injury and Perceptions.....	71
<i>Frequency and Number of Injuries</i>	71
<i>Predictability of Injuries</i>	72
<i>Young Adults and Injury</i>	73
<i>Importance of Injuries</i>	74
Summary.....	79

CHAPTER 6

POLITICIANS, ECOLOGISTS and HUNTERS

Introduction.....	81
Theoretical Framework.....	83

Danish Colonial Rule and the Royal Greenlandic Trade Department.....	85
<i>Political Economic Shifts</i>	85
<i>The Geography of Colonization</i>	89
<i>Culture</i>	92
<i>Home Rule Government</i>	93
Changing Gender and Household Relationships	98
Local Government Responses.....	101
Local Organizations	104
Inuit Responses to a Changing Environment.....	106
<i>Age: Younger and Older Inuit</i>	111
<i>Occupation: Hunters and Fishermen</i>	113
<i>Resource Use Diversity and Flexibility</i>	115
Summary	119
 CHAPTER 7	
CONCLUSION	
Consequences of Climate Change	123
Future Research	130
The Future of the Inuit in Greenland	130
 REFERENCES	134

CHAPTER 1

INTRODUCTION TO THE STUDY

Introduction

Climate change and its related impacts have recently become important environmental, social and political issues in the Arctic regions. The Arctic has a history of susceptibility and vulnerability to climate change and scientific scenarios suggest that northern regions will experience a greater degree of change than other regions (Weller 2000). Results of scientific research and evidence from indigenous peoples show climate changes in the Arctic are more pronounced than in any other region of the world. There are several reasons for the distinct existing change and projected future changes in climate in the Arctic. The most notable influences on high-latitude warming are feedback mechanisms from changes in sea ice and snow cover patterns. As areas of snow cover and sea ice disappear, there is a change in snow *albedo*, which is the percentage of incoming solar radiation that is reflected, and a resulting change in surface temperature. Snow and ice strongly influence whether incoming solar radiation is reflected or absorbed by the Earth's surface. As more soil and vegetation is exposed due to decreases in snow cover, absorption of heat by land will increase, which adds to the typical heating, compounding the regional effects of warming (Harvey 1998).

If the scientific predictions and scenarios occur, climate change will have a potentially devastating impact on the Arctic environment and the people who live there.

In particular, indigenous peoples, whose livelihoods and cultures are inextricably linked to the Arctic environment and its wildlife, will likely be affected the most.

Environmental changes will be the most evident in the reduction of sea ice and permafrost, reduction in seasonal snow, and the disappearance of the existing glacier mass (Maslanik et al. 1999; Siegert and Dowdeswell 2000; Weller 2000). Such changes are likely to disrupt the migration routes of caribou, seals, whales and fish, which will affect the hunting, trapping and fishing economies of many small, remote Arctic settlements, more so than in larger Arctic communities, where mixed economies can act as somewhat of a buffer.

As the climate changes, the Arctic's indigenous peoples are facing specific challenges, most notably in their abilities to harvest food resources. While scientific projections suggest there will be significant changes in the climate of the Arctic, very few studies have paid attention to understanding the impacts of changes in the climate of the Arctic on the relative collective health and degree of risk of physical injury of indigenous communities in relation to indigenous peoples' cultures and societies.

This thesis is an investigation of how climate change in Arctic Greenland influences accidents which cause economic losses and vulnerability to injury. The broad aim of this research is to understand how Greenlandic Inuit interact with the changing environment, and how changes in this regard influence their vulnerability to injury. I look at how local individuals, who engage in hunting and fishing activities, perceive the changing risk factors of travel across unreliable sea ice and the value of modern and traditional ecological knowledge for managing injury-related risks. The study identifies climate-related conditions that represent hazards, which can lead to injuries.

Additionally, I discuss the increased awareness of the changing ice conditions, which may lead to decreased injuries within the community. I use this paper to explore the ways that the Greenlandic Inuit are responding to climate change, and the ways that historical, political, economic, and cultural factors shape these survival strategies.

Changing ice conditions in Greenland leads to unpredictable and unsafe conditions for hunting, and thereby threatens the Inuit way of life. In many instances, the ways in which the Inuit experience climate change and negotiate its hazards depend on their utilization of knowledge. The Inuit draw on past experiences and knowledge passed down from other hunters to establish their own knowledge base. This accumulated knowledge is then used to evaluate the current environmental conditions and to predict and avoid hazards. The Inuit have accumulated a base of knowledge passed on through generations of hunters, but their perspective on ice and climate conditions is not universal: frequently, it conflicts with the science that Western knowledge employs. Put another way, the scientists who study the Arctic environment understand that environment differently than do the Inuit. These conflicts illustrate and underscore the differences between Inuit and western knowledge and the basis for that knowledge. Accordingly, this paper explores how different perspectives on the problem of climate change factor into the larger problem faced by the Inuit in Greenland.

Northwest Greenland

Geographically, my work focuses on the towns of Uummannaq and Ilulissat of Northwest Greenland. I conducted research in this area during March and April of 2008. While the two communities maintain unique social and cultural identities, they are similar in that they are communities where being a hunter or fisherman are occupations

critical to the survival of the community. The majority of individuals in the area are economically dependent on the harvest of fish and seal, in particular. I argue that climate-related changes in sea ice conditions increase vulnerability to potential injury events during travel on sea ice for Greenlandic Inuit hunters and fishermen, particularly in these remote locations. Specifically, I note that individuals living in remote areas have less access to resources that can increase their chances for survival than do their counterparts living in population centers. I address questions related to the kinds of coping responses that locals are making to accommodate the changing sea ice conditions in order to prevent injury events from occurring. I also argue that many Greenlandic Inuit hunters and fishermen have demonstrated significant capacity to cope with varied exposures to changing environmental conditions associated with hunting and fishing, drawing on their knowledge of ice behavior to manage hazardous situations, and using new technology where appropriate to manage climate change related risks that can lead to injury. However, not all members of these communities have equal access to coping strategies. Economic resources, institutional arrangements, and sharing networks can facilitate or limit access to equipment and resources, and as Leatherman (2005) observes, this can lead to variation in coping responses within communities. Throughout this paper, I discuss the ways that variances in individuals' social positions create disparities among people in terms of options for coping strategies based on different social and economic contexts. In this discussion, I will link issues of power and inequality with human-environment interactions, and address these relationships at the intersection of global and local levels.

Sea Ice Hazards for Inuit Hunters and Fishermen

Inuit communities of the Arctic have relied on fish and wildlife as important food sources, and in this way food gathering has become a central feature of their identity. They have expressed concern about climate change and the possible effects of these changes on Arctic ecosystem health and community stability (Krupnik and Jolly 2002; Peterson and Johnson 1995). Although the importance of sea ice knowledge remains strong in many Inuit communities, it is possible that the accumulated knowledge of ice held by elders is less applicable today because of environmental change. Today's hunters may find their previous knowledge about currents and wind and ice conditions less useful than in the past, because the ice and environmental conditions today are different than those experienced by their elders (Norton 2002). Previous generations may have known the ice as being more stable and consistent from year to year, and also more predictable (Fox 2004; Norton 2002). Increased unpredictability of sea ice conditions and weather patterns can pose new injury-related risks to communities that rely on traditional knowledge of past environmental conditions. This research will also address issues of new injury-related risks in relation to reliability of traditional ecological knowledge for Greenlandic Inuit.

Initially, research on the human dimensions of climate change in the circumpolar region focused on traditional Inuit ecological knowledge in an effort to bridge the gap between indigenous and scientific ways of understanding climate change and variability. However, other literature includes the element of human vulnerability to climate change discussions. For instance, Huntington (1992) has observed that during the first few months of winter in the Arctic, when snow pack is light, hunters rely on frozen rivers for

long-distance travel. While a hard freeze enabling safe travel has historically come by the beginning of November, warmer temperatures in recent years have left areas of thin ice or open water well into December. If significant climate warming occurs, these late freeze-up events could become more common (Huntington 1992). Snow-covered thin ice presents a potential hazard, particularly in the fall, for those hunting seal or traveling over the sea ice or mainland hunting areas (Ford 2005; Fox 2004). Ford (2005) claims that Canadian Inuit have noticed more snow on thin ice in recent years, resulting in situations where hunters have gone through the ice on their snowmobiles. As noted earlier, I will build on this existing literature of Inuit understanding of Arctic ecology and address how such knowledge relates to the processes by which individuals and communities respond to injury-related risk accompanying changing sea ice conditions.

Subsistence Hunting and Fishing Strategies

The last half of the twentieth century saw notable changes in Inuit hunting and fishing strategies that have exposed hunters and fishermen to new hazards, further compounding the effects of climate change on indigenous hunters (Ford 2005; Usher 2000). In particular, hunting-based risk assessment has changed, and many people are now more likely to harvest at specific times of the year, or in weather conditions traditionally considered unsuitable (Ford 2005).

There have also been changes in Inuit livelihoods as a result of the transition from traditional subsistence to a mixed economy characterized by the co-existence of a market and traditional sector. These changes have intersected with other social changes to increase Inuit people's vulnerability to climate related changes. Many hunters work full-time jobs in addition to hunting activities and time off from work for hunting trips must

be booked weeks or months in advance (Berkes and Jolly 2002). Weather or safety conditions might be ignored because of time availability when harvesting decisions are made (Ford 2005). When a trip has been planned and time taken off from work, hunters are very motivated to proceed with hunting, even in the case of poor weather or unsafe hunting conditions. More risk-taking behavior is also associated with technological developments (Ford 2005; Riedlinger 2001). Although Geographic Positioning Systems (GPS), Very High Frequency (VHF) radios, and the functioning of a community search-and-rescue group may increase safety in many ways, these technologies have also resulted in less caution and some overconfidence (Ford 2005; Riedlinger 2001). Consequently, some hunters are now traveling in conditions that would have traditionally been considered dangerous (Ford 2005; Riedlinger 2001). I will also discuss here how new hunting strategies may lead to greater injury vulnerability under the conditions of a changing climate.

For the past ten years, Inuit throughout the Arctic have experienced unprecedented climatic and environmental change. Unpredictable sea ice and local weather patterns, and altered migration routes of fish and mammals are among the more pronounced changes. Such disruptions are felt in social, cultural, political and economic terms for the Inuit, as they negotiate responses to new risk. Factors such as social position, economic resources, and institutional arrangements affect the coping strategies available to individuals in these communities, which in turn affect the ways in which those people are able to manage hazardous situations. These circumstances are shaped by larger global factors that intersect with local concerns of power and inequality. In the

next section, I outline the theoretical approaches and concepts that are used throughout the thesis to establish an analytical context for the discussions that follow.

Theoretical Approaches

A Critical Biocultural Approach

For this thesis, I will draw upon the biocultural synthesis, as introduced by biological anthropologists Goodman and Leatherman (1998), which was later referred to as the critical biocultural medical anthropological approach (Leatherman 2005). The critical biocultural approach, as I will refer to it throughout this thesis, advocates a synthesis of concepts from ecological anthropology and human adaptability studies and anthropological political economy. Ecological anthropology, a biocultural perspective in medical anthropology, views health and disease within a complex ecosystem that includes physical, biological, and cultural factors (McElroy and Townsend 2003). The ecological anthropology model suggests that these factors are interrelated and a change, such as a shift in subsistence patterns as discussed by McElroy and Townsend, can create an imbalance in the other factors (McElroy and Townsend 2003). Such a shift in subsistence strategies often leads to exposure to new risks and ultimately to systemic imbalance; it can also cause stress and disease or negative health consequences (McElroy and Townsend 2003).

Human adaptability studies were designed to increase understanding of human biological variation under a variety of ecological conditions (Wiley 2004). This body of research examined genetic adaptations to different environmental contexts and evidence of the physiological alterations caused by exposure to particular environmental stresses over the course of an individual's life, identified as adaptability or plasticity (Harrison

1997). Many human adaptability studies investigated the health effects of human-environment interactions, with adaptation as the core concept to describe and evaluate the relative benefits of genetic, physiological, behavioral and social responses to the multiple stresses produced by physical, biological and social environments (Wiley 2004). Adaptation has been conceptualized in a variety of ways by anthropologists over time; however, adaptation was initially defined as “the ability to survive, function, and reproduce” (Mazess 1975). Within human adaptability studies, Mazess (1975) relates environment to disease and nutrition and argues that adaptive responses to specific stressors vary among individuals and social groups, and that different groups have different criteria for assessing relative benefit and adaptive value. Similarly, Thomas, Gage and Little (1979) observed that adaptive responses to one stressor could influence or constrain another stressor within the same environment. These theorists maintain that initial responses can create future problems or situations that require additional responses that may or may not be beneficial.

Critics of applying adaptation analysis suggest that historical perspective must be included in the analysis of human-environment interactions and that the underlying reasons for variation in exposure must be addressed (Leatherman 2005; Goodman and Leatherman 1998). As Leatherman (2005) and others (Blakey 1987; Gould and Lewontin 1979; Goodman and Leatherman 1998) observe, the concept of adaptation as previously used in anthropological research has the potential to “naturalize social processes,” and in so doing tends to maintain existing socioeconomic inequalities. These theorists argue that the inclusion of a political economic approach to biological studies will reveal the social processes of relations of power in historical context, which

ultimately have biological consequences. The definition of adaptation has been expanded to incorporate socioeconomic variables and economic structures in analyzing how people cope with illness and the impact of class divisions on health (Leatherman 2005). For example, Leatherman (2005) conceptualizes individual and family-based responses to illness as a “coping process” rather than as an adaptation. I will use this perspective of “coping responses” as a process as described by Leatherman (2005), rather than “adaptation” throughout this thesis. This view sees adaptation as a variety of coping responses to constraints that are attributed to social relations that deny access to resources and options, creating contradictions in everyday life.

The critical biocultural approach originated from a discussion between proponents of the biocultural approach and proponents of critical medical anthropology. While this collaboration is an effort to combine seemingly divergent concepts from ecological anthropology, adaptability studies, and political economy, the common goal is to draw attention to the power relationships that assume control over resources and labor and how such control affects human health (Leatherman 2005). The biocultural perspective considers the social, cultural, ecological, and biological aspects of health, and how these are interrelated within and across populations (Wiley and Allen 2009). Biocultural anthropologists use biological indicators or markers to evaluate the effects of constraining factors on health in an effort to illustrate the variation in how people in different environments and cultural groups respond to illness and the constraints on their health (Wiley and Allen 2009). Although the biocultural approach focuses on understanding biology and behavior in environmental contexts, it also considers historical processes that influence health indirectly (Wiley and Allen 2009). Among the many

issues that biocultural anthropologists study are the biological impacts of poverty, malnutrition, and illness within specific environmental context and include social, cultural and behavioral variables (Wiley and Allen 2009).

The critical medical anthropological (CMA) perspective views health in a way that recognizes different cultural models of sickness and understands the social and cultural factors that influence health, health beliefs and behaviors, healing systems and well-being. Advocates of the CMA approach are particularly interested in the structure of social relations and the interrelationships of social groups with larger local, national and global human society. Additionally, the CMA perspective examines social origins of illness, and cultural constructions of health, particularly how structures of power and inequality in healing systems influence ideas of health and health practices (Singer and Baer 2007).

The addition of an anthropological political-economic analysis to the biocultural perspective incorporates the roles of unequal class, gender, and ethnic social relationships on patterns and contexts of risk (Leatherman 2005). Leatherman (2005) advocates the use of concepts such as power, the political economy of risk, social inequality, and the role of culture. The critical biocultural perspective explores how local environments are characterized by large-scale processes, such as global capitalism, and how local-level social and economic inequalities, such as class, ethnicity and gender, shape exposure to stress, illness, injury and adaptive response, as described by Leatherman (2005). Additionally, Leatherman (2005) stresses that the intersection of global and local perspectives must be taken into account when understanding the biological factors of health and illness.

Within a framework of political-economic relations, the critical biocultural model also examines the intersection of specific cultural, social and biological factors. Unlike traditional bioculturalism, the critical biocultural perspective does not treat biology or the environment as independent variables (Goodman and Leatherman 1998). Instead, Goodman and Leatherman (1998) view the physical environment and human bodies as entities shaped by the larger political economy.

Particularly important to my thesis are the specific political and economic factors that underlie, shape, and sustain situations that lead to increased injury-related risk associated with climate change. I hope to illustrate ways in which structures of power, economic resources and sharing networks facilitate or limit access to resources and equipment for Inuit coping strategies. In the case of travel on unpredictable sea ice, for example, new exposure and risk of potential accidents creates opportunities for an increased number of injuries among Inuit hunters and fishermen. How these new dangers are perceived and negotiated by Inuit, however, is best understood in terms of social position and economic context.

Vulnerability to Climate Change

The concept of vulnerability fits well with the critical biocultural approach by drawing attention to the variation of coping capacities among individuals and communities. Regarding vulnerability to climate change, a growing number of researchers have focused on the socioeconomic processes that constrain people's ability to cope with climatic hazards. Leatherman's significant contribution to these approaches is the historical and global perspective.

Geographers such as Smit and Pilifosova (2003) conceptualize vulnerability as a function of exposure-sensitivity of a community to the effects of climate change and its adaptive capacity to deal with that exposure. Smit and Pilifosova (2003) describe exposure-sensitivity as the susceptibility of individuals and communities to conditions that represent risks, including those associated with climate change. Exposure-sensitivity is dependent on the characteristics of climatic conditions and similar to Leatherman's conceptualization of vulnerability, the nature of variation among individuals within a community (Cutter 2003; Smit and Pilifosova 2003). The characteristics of climate-related conditions can include magnitude, frequency, and timing of conditions, such as strong wind or heavy precipitation (Cutter 2003). Exposure-sensitivity is also linked strongly to livelihoods and subsistence strategies, and importantly, it varies within the community (Adger 2000; Bohle et al. 1994; Chambers 1989; Watts and Bohle 1993). For example, in Arctic communities, different animals will be hunted at different times of the year depending on an individual's knowledge of the environment, their past experience, time constraints, and access to technology (Krupnik and Jolly 2002), which Smit and Pilifosova (2003) feel can result in a diversity of exposure-sensitivity. According to Smit and Pilifosova (2003), exposure-sensitivity is dynamic, and changes as the community responds to the climatic conditions. It also reflects human social and cultural processes. Social changes, for example, influence decisions such as where, what and when to hunt, and what equipment to take along (Krupnik and Jolly 2002). Similarly, Leatherman (2005) observes variation among individuals within communities and how this relates to their vulnerability to stresses. Climate-change interacts with social and cultural processes

to affect the circumstances related to climate-related conditions, changing the nature of the potential risks or exposures (Krupnik and Jolly 2002).

Other geographers, such as Bohle et al. (1994) and Adger and Kelly (1999) emphasize the social construction of vulnerability, focusing on ways that access to resources and what Sen (1999) refers to as entitlement of individuals to call on these resources influence their capacity to adapt to climate changes. These studies describe the diversity of vulnerability of communities, regions and countries to climate-related hazards in terms of the physical events and the socio-economic and institutional capacities to deal with the events.

Resilience Theory

From an ecological perspective, resilience theory was introduced by Holling (1973) and stresses variability and flexibility. Without the constant occurrence of overcoming a variety of disturbances, organisms are likely to adapt to a steady state (Holling 1973). When dramatic changes occur, these organisms are more likely to perish because the search for stability has used up surplus resources and because they have suppressed their capacity to cope with the unexpected (Holling 1973). The ability to learn from errors and to gain experience in coping with a wide variety of difficulties has proved to be a greater aid to preservation of the species than efforts to create a narrow set of controlled conditions within which they would thrive for a time but leaves trees, crops, and animals vulnerable to more severe damage when things change (Holling 1973). Resilience is the capacity to change to better cope with the unknown and learning to bounce back without changing the system's structure (Holling 1973). The concept of resilience is widely used in ecology, but only recently is its meaning and measurement

employed regarding social resilience (Adger 2000). Following Adger's perspective, I argue here that while Greenlandic Inuit are made increasingly vulnerable to climate change, their social resilience helps some to cope with new stress that such change brings, thereby making them resilient. By contrast, those with limited access to resources tend to be more vulnerable.

Smit and Pilifosova's (2003) idea of adaptive capacity refers to a community's potential or ability to address, plan for, or adapt to exposure-sensitivity. It is synonymous with resilience, which refers to an increase in the capacity to cope with stress, as used by Turner et al. (2003) and Kofinas (2004). These concepts apply to a study of the Inuit people. Many people in the Arctic, for instance, have learned to modify their behavior, such as avoiding traveling in dangerous areas to manage and take advantage of their local climatic conditions. Most communities are adaptable to normal climatic variations. Smit and Pilifosova (2003) argue that this ability to adapt reflects resource use options and risk management strategies to prepare for, avoid/moderate, and recover from effects of exposure to climatic conditions. It is influenced by characteristics such as economic wealth, social capital, infrastructure, social institutions, experience with previous risk, and the range of technologies available for adaptation and equality, which may facilitate or constrain the ability of a community to deal with climate-related risks (Adger 2000; Bohle et al. 1994; Chambers 1989; Watts and Bohle 1993). These determinants are interdependent and are influenced by human and biophysical conditions and processes operating at various scales globally and locally (Cutter 2003; Smit and Pilifosova 2003). Adaptive capacity is also dynamic, varying over space and time and influenced by social and cultural factors (Smit and Pilifosova 2003). The concept of vulnerability as

understood by Cutter (2003) and Smit and Pilifosova (2003) relates to exposure-sensitivity and adaptive capacity in communities as continually influenced by social and biophysical conditions and processes operating at various scales. Vulnerability indicators, such as an increased incidence rate for potential injury and risk, are significant tools because they tie the concerns of adaptation policy and planning to local communities. Some studies conducted in the Arctic focus on changing climatic conditions and changes in livelihoods from a traditional subsistence lifestyle to a mixed economy characterized by market and traditional sectors. This parallel climatic/economic shift has altered and increased the exposure-sensitivity of communities to climatic risk (Krupnik and Jolly 2002).

In this thesis, I refer to vulnerability as the ability of people to cope with and respond to exposure, particularly as it relates to livelihoods, access to resources and power relations (Adger et al. 2001). I will focus on vulnerabilities specifically related directly and indirectly to hunting, fishing, travel on sea ice, and living on the land. In general, my research indicates that the Inuit who successfully negotiate climate change will be those individuals who employ a diverse array of coping responses in avoiding injury and managing risk. While this holds true for many Inuit hunters, variations within communities render this anything but universal. Individuals within communities share many common characteristics, but are not homogenous. Therefore, the degree to which members of that community have access to resources or are affected by environmental stresses varies from individual to individual, and some individuals may experience increased stress through increased diversification of coping responses. The following

section will discuss the potential anthropological and social significance of the research that has been conducted here.

Significance of This Study

Geographers such as Fox (2004) and Ford (2004) have conducted research illustrating how Inuit observations of climate change in the Arctic can inform scientific studies of change. From an anthropological perspective, studies that address the impact of climate change on health limit their focus to the spread of infectious disease (Moran 2006). Throughout this thesis I will build on these previous studies and highlight the specific challenges of the Inuit. The significance of my thesis is to draw attention to local sociocultural dimensions of climate change within the broader context of global influences and describe how this relationship affects Inuit coping strategies in the face of increased risk of injuries. An assessment of how large-scale processes, such as global capitalism, shapes local social and economic inequalities will help to illustrate the underlying factors that influence how Inuit negotiate responses to exposure. An anthropological perspective of the factors that impact resource use options and strategies to manage new climate change related risk will include social and cultural factors, as well as power relations that lead to variation within a community.

Summary

Circumpolar Inuit retain a strong connection to the land and spend a considerable amount of time hunting on sea ice. Because there are no roads that connect villages, most travel in Greenland is with dogsled, kayak or aircraft. For these reasons, climate-related changes, such as variable sea ice conditions, pose new challenges to Arctic communities. The critical biocultural approach is appropriate for this project

because it is necessary to look at the larger influences that shape vulnerability to injury, and Inuit responses to climate change and injuries. I will identify climate-related conditions that represent hazards, which can lead to injuries. Although an increasing amount of attention has been paid to climatic variation, there has not been anthropological research that tries to understand the health and injury consequences of environmental change among indigenous communities in the circumpolar Arctic.

The thesis follows the general organizational structure outlined below. Chapter two discusses the methods used for the research portion of the project, and discusses the role that active community involvement played in all stages. Chapter three begins with an introduction to the history and culture of Greenland. I argue that these factors have shaped contemporary health and wellness for Inuit people. Chapter four details Inuit observations of climate change. In this chapter I argue that it is important for communities, scientists, and governments to work together to co-manage wildlife resources in the face of climate change in the Arctic. Chapter five includes an analysis of Inuit perceptions of risk and the importance these perceptions have in understanding the frequency and severity of accidents on sea ice. I point to the importance of including local perceptions of risk and injury into injury prevention efforts in this chapter. Chapter six discusses individual, government, and community action in response to climate change, including those initiated by local indigenous organizations as well as by individual Inuit. In this chapter the main arguments of the thesis are detailed. I describe the variation of coping responses among individuals and communities, and how they have been shaped by larger processes over time. The final chapter summarizes the study and concludes with suggestions for future research.

CHAPTER 2

RESEARCH METHODOLOGY

Introduction

The purpose of this chapter is to describe the methods of this research, why they were employed, and the data gathering protocols. In order to understand the nature of vulnerability of Greenlandic Inuit communities to climate change related risks and identify the processes by which communities respond to injury that is related to changing sea ice conditions, I spent two months living with the Inuit in two communities, Uummannaq and Ilulissat, in West Greenland.

Some of the experience that I bring to this research is based on eleven years of work and travel around Greenland in general, and in Kangerlussuaq, the main international airport town, in particular. I was introduced to the Greenlandic Inuit in 1997 while working in Kangerlussuaq for the logistic support provider for National Science Foundation (NSF) funded projects. Since that time, I have worked and traveled throughout Greenland, particularly along the West coast. Most of the contact that I have with Greenlandic Inuit is in the context of work in Kangerlussuaq; I have interacted primarily with those who have traveled from their home villages in search of employment with the airport, so my perspective of Inuit health concerns is limited. Many spend anywhere from four months to several years in this transient airport town. In contrast, a few others may spend a dozen mostly-consecutive years in Kangerlussuaq, leaving only

occasionally to visit family in other parts of the country. I have learned about the social and cultural life of the Greenlandic Inuit through Greenlanders that I have worked with and befriended and used that knowledge to help shape this thesis.

Community Involvement

This research included active community involvement at all stages. Essential steps included communicating with local indigenous organizations, such as the Uummannami Meeqqat Angerlarsimaffiat (UMA). UMA is a foster home for Greenlandic children. I became connected with them through a colleague who helps to organize science support and dissemination of results from research in Greenland. I also worked with other community members at the research planning stage for my project, the inclusion of locals in the timing and design of field research, employment of local people as research assistants and translators, and a commitment to dissemination of results in a way that meets the communities' needs. I am humbled by the amount of support from local Greenlanders that I received prior to and during my stay.

Institutional Support

I received approval for this research from the Colorado State University Institutional Review Board (CSU IRB). Final interview questions were submitted to the CSU IRB for review and approval and were reviewed by Greenlandic Inuit for cultural appropriateness. Additionally, I worked with the Research Liaison of the Danish Polar Center in Copenhagen, Denmark, on the necessary applications for approval to conduct research involving human subjects in Greenland.¹ The approval process includes an ethical evaluation by the Commission for Scientific Research in Greenland prior to

¹ The Danish Polar Center, based in Copenhagen, Denmark, is responsible for assisting researchers with studies conducted in Greenland as part of an inter-governmental agreement between the Danish government and the Home Rule government in Greenland.

issuing the research permit. Other institutional support includes working with faculty at Ilisimatusarfik, the university in Nuuk, Greenland; I am affiliated with the university through its Culture Studies program. Guidance and logistical support from two local organizations has helped to organize and facilitate this project. The first, the Inuit Circumpolar Council (ICC), is an international organization focusing on the rights and interests of circumpolar Inuit. The second, Inutek, the Technological Society of Greenland, promotes sharing research about Greenland with Greenlanders. I have also received general assistance from the Research Coordinator of the Greenlandic Home Rule in Nuuk. The following section will further describe local assistance that I received as well as a description of the research sites.

Description of Research Sites

Uummannaq

Uummannaq is one of Greenland's northernmost municipalities, and is situated on a rocky, heart-shaped island just off the west coast. In winter, Uummannaq Bay is filled with large icebergs and the mountains and valleys from the mainland and other islands can be seen in every direction. There are approximately 2,500 inhabitants in the municipality, many of whom are occupational hunters and fishermen. In Uummannaq, my host was the director of the UMA, the local children's home, along with her family, and the children and staff. The home hosts Greenlandic children who come from families with severe social problems and who have very little contact with their relatives, are orphans, or are mentally and/or physically disabled. The UMA aims to help the children overcome traumatic experiences through educational activities, projects, group therapy, and re-socialization. The educational and therapeutic activities keep the Greenlandic

culture central, while staying open to other cultures of the world. The activities the children participate in include hunting and fishing projects, boat trips, hiking and dogsled expeditions, art and music therapies, video workshops, camps, education, and summer holiday travels. I engaged in participant observation, as I participated in many of these activities during my stay. The time I spent with research participants included hunting and fishing trips with Inuit during sea ice travel, and attendance at a wedding, a confirmation, several birthday parties, many dinners, and community events, such as dogsled races.

Ilulissat

Also on the northwest coast of Greenland, the town of Ilulissat is located at the mouth of Jakobsaven Fjord, where the largest icebergs outside of Antarctica fill the fjord and float south along the coast. With a population of just over 5,000 people, the town supports a small college, a growing tourist industry and the largest fish processing factory in the country. During my stay in Ilulissat, I rented a room at the local hostel and spent most of my days with a Greenlandic research assistant and local hunters, fishermen and their families. I spent much of this time at the fishing dock, eating with families at their homes, looking at photos and watching homemade videos. Less time was spent dog sledding in Ilulissat than in Uummannaq because there is no longer any sea ice in the area; however, the Jakobsavn Glacier and ice fjord, which is at the edge of the town, still freezes long enough to support dog teams for fishing transportation for part of the winter.

Nuuk

Nuuk, the capital of Greenland, sprawls along a peninsula at the edge of the Godthabs Fjord, on the southwestern coast. The largest city in the country, with over

15,000 residents, Nuuk is an important administrative and business center for Greenland. While in Nuuk, I stayed with the Chairperson of Inutek, who helped to arrange meetings with land and resource managers, professors, and engineers during my visit. In return, I gave a presentation on the culture of polar research at Katuaq, the Culture Center of Greenland, for the members of Inutek and interested public. During this time, I was able to meet with faculty at Ilisimatusarfik, the University in Nuuk, to discuss my project and ask questions, as well as access resources at their library.

Data Collection

Data collection techniques included participant observation, informal interviews, and formal semi-structured, open-ended interviews. Interview subjects ranged from male hunters and fishermen to females who travel on the ice. The interviews also included life history interviews, and interviews with key informants. Each method added unique insight into the research problem.

Study participants were partially recruited from men and women who I already knew in Kangerlussuaq, Ilulissat and Nuuk, Greenland. My rapport-building techniques stemmed from these relationships as well as community-oriented activities. The sample of participants was also obtained by using reverse snowball sampling, which involved a recruitment script that was written on a notecard that I gave to people I knew. These participants gave the notecard to other potential research participants, who then had the option to contact me if they were interested in taking part in the project. This sampling method was requested by the Human Research Committee at CSU to further protect participants' identities. Participants were also recruited using snowball sampling, where respondents suggested others who might be willing to be involved. Research assistants

also helped to recruit participants. Involving community members from the beginning increases the chances for successful data collection (Berkes and Jolly 2002). I hired Inuit research assistants to help me collect research data. Prior to being involved with the project, the assistants were briefed on the aims and objectives of the research, methods to be employed, and their roles. They also helped to identify potential problems and cultural sensitivities.

Analysis of Secondary Sources

Information on risks and coping strategies, their determinants, and how they have changed over time was derived from analysis of secondary sources. I carried out a literature review of articles related to climate change as it affects Arctic communities. This also included a more general review of the literature about the history and social and cultural characteristics of the Inuit, as well as anthropological theory related to my analysis. Gaps were identified in the literature review, which were addressed in the interviews.

Participant Observation

Participant observation is an observational method where the researcher becomes part of the events being observed and an active member of community life (Bernard 2006). It is one of the main qualitative methods used for conducting research with Arctic communities (Brewer 2000; Berkes and Jolly 2002; Krupnik and Jolly 2002).

Application of this method ranged from partaking in shared meals of traditional foods with families, walking around the community with a local teacher, participating in hunting and fishing trips, taking part in organized dog-sled trips, to experiencing and observing daily community life. Activities varied in duration and frequency, from a few

hours to several days. Gathering information by participating in and observing daily life through participant observation allowed me to ask questions in context, while community members discussed their observations and opinions. During these occasions, I was able to experience and discuss general notions of risk, what issues are important to community members, and how these issues are shaped by social and cultural influences and environmental changes.

Semi-structured Interviews

I conducted 19 formal, semi-structured interviews with male hunters/fishermen and eight with women who are non-hunters/fishermen. The reason for unequal numbers of men and women is that very few women hunt or fish by occupation. Although they were not hunters, most of the women I interviewed have experience traveling on the ice. Interviews were conducted at locations determined by interviewees, with most taking place in homes or hunting camps. Prior to the interview, the purpose and intent of the study was explained and each participant gave verbal permission to be interviewed. Interviews were conducted in a combination of English, Greenlandic and Danish, depending on the preferred language of the participant. I conducted most interviews in English and worked with a research assistant who translated the interview questions and responses for me and the interviewee. Interviews lasted from ninety minutes to three hours.

Semi-structured interviews provide an opportunity for more detailed questioning, and promote dialogue on specific areas of interest. Semi-structured interviews are a standard ethnographic method for gathering information in an open-ended format, where the interviewer guides the participant (Bernard 2006). These

interviews helped to provide insight into the nature of vulnerability of Greenlandic Inuit individuals, families, and communities to climate change related risks and identify the processes by which individuals, families, and communities responded to injury related to changing sea ice conditions. Although a fixed list of questions was used, effort was made to avoid leading questions, because Inuit often will not disagree with an opinion out of respect, even if they do not share it (Ferguson and Messier 2000).

Life Histories

I conducted two life histories, one with a male and one with a female elder, to learn how Inuit elders view the changes in climate and sea ice conditions over time and risks and injuries related to the changes. These perspectives helped me to understand what historical economic, political and cultural dynamics influenced how Inuit responded to varying environmental conditions and related risks over time.

Key Informants

This research involved semi-structured, open-ended interviews with seven key informants. Key informants included members of the organizations with whom I interacted, doctors in Uummannaq, Ilulissat and Nuuk, as well as land and resource managers, professors, engineers, and researchers in Nuuk who have experience in Greenland. I chose this method because it encouraged a broader survey of individuals' knowledge of topics being reviewed and allowed the discussion of other topics that I did not anticipate. In this way, the interaction took the form of flowing discussions rather than question-and-answer sessions. Questions asked during these interviews varied depending on context, but were generally aimed to identify community vulnerabilities

and processes shaping vulnerability. I also compared my interview findings with personal observations and with secondary sources.

Limitations to the Research

Although my experience with field research was positive and most people seemed genuinely interested with this topic, there were limitations to the study. For instance, the majority of people I interviewed were men because they are the ones doing most of the hunting and fishing. While I did interview women who travel on sea ice, I feel that women's perspectives are not fully represented in this study.

Summary

The observations, experiences, and traditional and local knowledge of Inuit are central to assessing injury vulnerability related to climate change in Greenland. This information can be used to help identify events and conditions that represent exposures, which can lead to accidents or injury-risk, and provide insights into the resource options and risk management strategies that are used to prepare for, avoid or moderate and recover from such exposure. This knowledge can be obtained through ethnographic techniques. This study used a review of the literature, participant-observation, semi-structured interviews, life history interviews, and interviews with key informants because these methods allow for the generation of in-depth information with regard to an individual's experience and perspective, they uncover and describe indigenous observations of environmental conditions and change, and they provide detailed examples and rich narratives. In the following chapter, I will review the history and culture of Greenland as it relates to health care for Inuit people.

CHAPTER 3

GREENLAND: HISTORY, CULTURE, and HEALTH CARE

Introduction

The ways in which the Inuit interact with their environment, and the ways that their historical and cultural experience shape this relationship, are important to understanding the contemporary issues faced in the Arctic. This chapter looks at the history and culture of Greenland and how these factors have shaped the interaction of Inuit people with their environment and shaped contemporary health and wellness for Inuit people. Because injury is one focus of this thesis, this chapter also discusses the health care infrastructure in Greenland and the extent to which Inuit have access to health care. In doing so, it will provide a general overview of the backdrop of the issues addressed in chapters four, five, and six.

The Arctic Region

The Inuit comprise the majority of the population of the circumpolar North. There is evidence that human occupation of the Arctic regions began between 8,000 to 15,000 years ago (Bandi 1969), and in Greenland specifically, approximately 5,000 years ago (Bethelsen et al. 1993). The Inuit refer to Greenland as Kalaallitt Nunaat – White Earth (Caulfield 1997). Ninety-five percent of the island is covered with ice and the majority of it lies above the Arctic Circle (Bethelsen et al. 1993). Snow has been accumulating on the dome of the ice cap for so long that the summit has grown to 11,000

feet and the bulk has pushed the land beneath to 1,180 feet below sea level (Bethelsen et al. 1993). The extreme cold of the Arctic does not offer a support base for an abundance of plant and animal life, which is reflected in the low density of human populations in the area. Extreme and prolonged cold temperatures result in largely inedible tundra vegetation, causing Inuit to rely primarily on the consumption of animals (Bethelsen et al. 1993).

The “Arctic region” is typically characterized as latitude 55 degrees North (Bethelsen et al. 1993). Temperatures are often the defining characteristic of Arctic tundra regions, with a mean temperature of -20 degrees Fahrenheit (Piantadosi 2003). Greenland, the world’s largest island, lies northeast of the Canadian Arctic. The coastline is heavily indented by fjords, which carve inland and offer the most habitable regions. Greenland’s population currently numbers some 56,000 people, living in 18 towns and more than 100 smaller settlements, and the largest present-day settlement is Greenland’s capital, Nuuk, with a population of over 15,000. Greenland, however, has no national network of roads or railways for transport; travel is by sea, air, or dogsled. Although there are some cars on the island, dogsleds always have the right of way (Caulfield 1997). Until recently, the Inuit were considered both genetically and geographically isolated people (Bethelsen et al. 1993).

Danish Colonization and Greenland Home Rule Government

Greenland was colonized by Denmark in 1721, and most of the population was converted to Christianity by Lutherans from Scandinavia (Caulfield 1997). Intermarriage was a common tool for assimilation, and though the population of Greenland is 85 percent Inuit, there is little pure blood left (Nuttall 1998). Currently, a large majority of

the population recognize themselves as ethnic Greenlanders, and although there is no concise definition for this term, for statistical and administrative purposes, birthplace has been the official criterion (Bethelsen et al. 1993). The far northern half of the island remained largely unaffected by Europeanization for another 200 years (Caulfield 1997).

Before colonization, the Greenlandic system of sharing and exchange was based on reciprocity, and the extended bilateral family groups were self-reliant (Caulfield 1997; McElroy et al. 1979; Nuttall 1998). After the connection between Denmark and Greenland was established in 1721, the Royal Greenland Trade Department, with its trade monopoly established in 1776, became the basis of the colonial relationship (Caulfield 1997). With the creation of an Inuit advisory council in 1862, a new era was established in the form of a committee of stewards appointed for each community (Caulfield 1997). Elected local and regional councils followed in 1911, which gave Greenlanders some elements of local government (Caulfield 1997). In 1953, the Danish constitution was amended to give Greenland two seats in the Danish parliament, considering Greenland a county of Denmark and marked the end of the formal colonial relationship with Denmark (Caulfield 1997). Colonization was abolished in 1953 (Caulfield 1997; Nuttall 1998), and by 1979, Greenland gained limited independence, and is currently governed by Home Rule (Caulfield 1997; Nuttall 1998). Home Rule resulted from Greenlanders' persistent work for liberation after more than 250 years of colonial status (Caulfield 1997; Nuttall 1998). This local indigenous government assumes control over most internal matters, such as fisheries management, education and health services, and development of economic infrastructure (Caulfield 1997). Under Home Rule, the Danish state retains authority over foreign policy, monetary policy and the justice system (Caulfield 1997).

Greenland and Denmark share authority over management of nonrenewable resources, such as mineral exploration and development (Caulfield 1997). Danish subsidies are tied to specific services, such as the health care system, which was handed over by the Danish government to the Home Rule government (Caulfield 1997). Greenland is not a nation-state, but a partial structure, in that it is still dependent on Denmark for economic support (Dahl 2000).

Inuit Hunting Culture

Inuit culture is based on communal hunting and fishing that requires long trips using kayaks or dogsleds, and importantly, all food is shared (Caulfield 1997; McElroy et al. 1979). Hunting serves complex integrative functions because the social organization that surrounds these activities remains closely tied to kinship (Caulfield 1997; McElroy et al. 1979). When extended family members participate in collective hunts, they strengthen the bonds of kinship through the shared experience and a collective identity (Caulfield 1997; McElroy et al. 1979). Hunting and fishing as occupations are sources of prestige and economic security for men and for their families, and they contribute to the Greenlandic national identity (Caulfield 1997; Nuttall 1998). Women's participation in hunting and fishing activities is typically recreational, and very rarely does an Inuit woman take on these occupational roles. These activities provide a sense of continuity and an affirmation of what it means to be a Greenlander, as a man, (Caulfield 1997; Nuttall 1998) and will be discussed throughout the thesis.

Development in Greenland

Until the 1920s, the majority of Greenlanders lived in very small communities located along the coast, from the 83 degree North latitude in Northern Greenland to the

59 degree latitude in the South, with the majority on the West Coast (Caulfield 1997). Concurrent with the development of commercial fishing during the 1950s as a main source of livelihood, the population has increasingly moved to larger fishing settlements and towns (Nuttall 1998, 2000). Many reports suggest that 1950 was a turning point in the development of the Greenland society with the expansion of commercial fisheries (Bethelsen et al. 1993; Bjerregaard and Young 1998; Caulfield 1997; Dahl 1986; Nuttall 1998, 2000).

The policy of the Danish government concerning Greenland changed drastically in 1950, stimulated by claims and wishes from Greenlandic politicians into a policy of social and economic reforms, and assimilation of the Danish language and cultural norms in the Greenlandic population (Nuttall 1998, 2000). Simultaneous with the introduction of the reform policy, there has been a marked increase in the total population and a concentration of the population in towns (Nuttall 1998, 2000). Objectives of administrative policies in the reform period encouraged a transition from kayak to dinghy and motorboat fishing, and the “improvement” of the housing conditions from self-built stone and turf huts to fabricated houses, which required recently introduced government loans (Nuttall 1992). These loan arrangements, combined with administrative decisions to remove older parts of towns, have made it necessary for some families to move into the new fabricated houses (Nuttall 1992).

This change in traditional housing generated a new type of economic obligation for family heads, who must get support from other gainfully employed members of the household to assist with repayment of loans as well as interest (Nuttall 1992). At the same time, opportunities for paid employment have increased in the towns where the

fishing industry has been built by or supported by the government (Nuttall 1992). These changes in occupational distribution and economic activity have altered subsistence strategies and distribution of households in order to manage the new economic burden (Nuttall 1992).

Today, there are approximately 2,500 commercial hunters and over 9,000 non-commercial hunters in Greenland, according to a member of the Ministry of Environment and Nature, Home Rule government. New forms of employment include government positions and tourism-related jobs, such as guiding, cooking and cleaning at new, local hotels and retail services. However, most of these jobs are only available in specific areas, so one must relocate either temporarily or permanently to a new town to obtain salaried or waged work.

Health Care in Greenland

Traditional Inuit Health Practices

One way that contemporary Inuit deal with injury and other health issues is to turn to Western biomedical care. Prior to colonization, however, traditional indigenous health systems included an *angakkoq*, or shaman, who was believed to have special powers and a relationship with the supernatural world of spirits (Maurie 1985). Maurie (1985) describes the role of these healers, and explains that an *angakkoq* was responsible for maintaining the health of the community as well as restoring the health of individuals. *Angakkoq* were called on to communicate with the spirit world in order to cure illness or injury. Every person was believed to have several souls, and illness or injury meant that one of the souls had left the person's body. The task of the *angakkoq* was to coax it back with songs, prayers and rituals. Spiritual healing was prominent, but surgical procedures,

such as operations for cataracts, were also known. Compared with cultures in warmer climates, the use of herbal medicines was limited. During the colonization and Christianization period, the *angakkoq*'s séances were forbidden and considered heathen; instead, life, health and death were to be left in the hands of the colonizers' God.

Traditional health care is currently uncommon among Greenlanders. Some elders continue to use local wild plants both internally and externally, such as labrador tea and roseroot to heal mild ailments, including wounds, urinary infections and colds; but other than during the months of June, July and August, it is difficult to find plants. In addition to these remedies, a number of Greenlanders mentioned that they rely on traditional food such as seal meat and blubber to maintain health. However, after so many years of colonialism and Lutheranism, there are very few, if any, shamans left in Greenland. Instead, today most Inuit go to the local clinic or hospital and rely on biomedical health care.

Contemporary Health Care

Administratively, Greenland is divided into 18 municipalities of varying size, 16 of which have a small hospital or health post staffed by at least one physician, as well as a nurse and health aides (Bjerregaard and Young 1998). The hospital in Nuuk is the central hospital for the whole country, and each settlement on the coast has a small clinic staffed with one to four general practitioners and usually includes an outpatient clinic, emergency unit, maternity unit, x-ray facilities, dentist and a laboratory (Bjerregaard and Young 1998). In settlements with more than 300 inhabitants, there is a nursing station, in smaller villages a health aide, and in very small villages with less than 70 inhabitants there is only an untrained person who is authorized to dispense certain drugs after

consultation with the physicians (Bjerregaard and Young 1998). Specialists from the hospital in Nuuk and from Denmark visit the settlements along the coast once or twice a year. Travel is usually by boat, helicopter or dogsled. The health service in Greenland is publicly funded and no doctors work in Greenland on a private basis (Bjerregaard and Young 1998). The Danish government gives the Greenlandic Home Rule a budget for all health services, including transportation from a smaller settlement to a large town with a hospital that provides services that a patient may need.

Mental Health

In pre-colonial Inuit society, mental illnesses were regarded as indications of possessions of the soul (Maurie 1985). When possible, order was reestablished by the *angakok* with participation of the whole community (Maurie 1985). If the soul-possessed was too disturbed and dangerous it was the duty of the relatives to pacify, or, if necessary, kill him (Maurie 1985).

The Inuit are subject to immense psychosocial stress as their communities undergo profound and rapid social and cultural changes (Bjerregaard and Curtis 2002; Lynge 1994; McElroy et al. 1979; Rode and Shephard 1996). In most Inuit communities, the last 50 years marked a time when traditional life was replaced by Western lifestyles (Bjerregaard and Curtis 2002; McElroy et al. 1979; Rode and Shephard 1996). Throughout the circumpolar countries, the Inuit are now firmly incorporated into modern, Western culture (Rode and Shephard 1996). After World War II, the poor physical health status of many Inuit groups became apparent and massive efforts by European outsiders were initiated to eradicate tuberculosis and improve the quality of housing, sanitation education, and health care (McElroy et al. 1979; Rode and Shephard 1996). Along with

their skills, they also brought a lifestyle and culture that profoundly changed the lives of the Inuit, with often-negative results, such as alcohol abuse, sexually transmitted diseases and a decreasing disrespect for traditional ways of life (Bjerregaard and Curtis 2002; Rode and Shephard 1996). As a cash economy replaced the subsistence economy, it became increasingly difficult to maintain a livelihood from hunting or fishing (McElroy et al. 1979; Rode and Shephard 1996). Formal education became necessary in order to succeed and traditional virtues appeared irrelevant (Lynge 1994; Rode and Shephard 1996). All of these factors contribute to the development of mental health problems such as suicide and alcohol abuse, especially in men (Bjerregaard and Curtis 2002; Lynge 1994; Rode and Shephard 1996).

Psychosocial stress is reflected in the incidence of social problems seen in many Arctic communities today (Bjerregaard and Young 1998). Where alcohol abuse in Western societies is usually characterized by an increasing daily consumption over many years, it is the occasional, sometimes regular drinking spree or binge drinking that creates problems in Arctic communities (Bjerregaard and Young 1998). The most important health implications of these events are injuries that derive from accidents and violence (Bjerregaard and Young 1998). Prevention of mental disorders is a task not only for the health service, but for the society as a whole, and could involve schools and social institutions.

Suicide

Traditionally, mainly the elderly members of the family and community who were no longer economically productive practiced suicide (Maurie 1985). Suicides were carefully considered acts, and carried out after extensive consultation with the family

(Malaurie 1985). This pattern is in sharp contrast to the now-prevalent pattern of adolescent suicide (Bjerregaard and Curtis 2002; Lynge 1994; Thorslund 1990).

Contemporary Inuit suicide practice is notable for rapidly increasing rates, the magnitude of the rates, and the fact that the rates are highest among young people (Bjerregaard and Curtis 2002; Lynge 1994; Thorslund 1990). Results of a socio-psychological study on suicides in young Greenlanders show that the suicide rates are highest in the less developed towns, where hunting and fishing remains the main livelihood, or where unemployment rates are high (Thorslund 1990). Thorslund (1990) argues that this is the result of social changes not happening fast enough to meet the expectations of the young people. Lynge (1994), by contrast, argues that the traditional Inuit upbringing encourages independence and autonomy, which can result in young people experiencing rejection and conflict.

A population survey of adults in Greenland shows significant associations between suicidal thoughts and a number of social and cultural factors, the most important determinants being the occurrence of alcohol problems and sexual violence during childhood (Bjerregaard 2001). Because the suicide rate amongst men is much higher than that amongst women, it has been argued that women in the Arctic have more successfully responded to social change (Bjerregaard 2001). While women have been able to continue their traditional role as care-givers, both in the family and the labor market, the transition from hunter to wage-earner in a subordinate position or to being unemployed has been a difficult transition for many Arctic males (Bjerregaard 2001; Bjerregaard and Young 1998; Rode and Shephard 1995). On the other hand, studies

indicate that women have suicidal thoughts and mental health problems more often than men (Bjerregaard and Curtis 2002).

Substance Abuse

Alcohol in Greenland was not sold to the Inuit during colonial times; instead, it was distributed as a “special reward” (Bjerregaard and Young 1998). After World War II, restrictions on the sale of alcohol were eased, and the consumption by Inuit as well as Danes living in Greenland soared (Bjerregaard and Young 1998). Alcohol abuse currently creates major health and social problems in all Inuit areas (Bjerregaard and Young 1998; McElroy et al. 1979; Rode and Shephard 1995, 1996) and various types of regulation of the use of alcohol have been introduced (Bjerregaard and Young 1998). For instance, in certain districts in Greenland, from 1979 to 1982 there was a general restriction on the amount of alcohol that each person could purchase (Bjerregaard and Young 1998).

Misuse of alcohol has many effects on Inuit health, such as drunkenness leading to accidents and violence resulting in cuts, bruises, fractures and head injuries; drowning; falls; frostbite; burns; pneumonia; and suicide (Bjerregaard and Young 1998). Excessive drinking also leads to social problems at home, such as spouse and child abuse, or family breakup, and to economic problems and loss of work (Bjerregaard and Young 1998). Finally, fetal alcohol syndrome is a serious condition of infants whose mothers have consumed large amounts of alcohol during pregnancy (Bjerregaard and Young 1998). Although there is much debate about whether or not alcoholism has any genetic basis, Bjerregaard and Young (1998) maintain that it is more important to understand the social

and cultural determinants for alcohol misuse because they are more likely to be modifiable than genetic factors.

Challenges to Health Care Delivery

Health care delivery in Greenland poses special problems because of the conditions of climate and geography, lack of staff, and language barriers. The distance between remote hunting locations on the ice and the nearest clinic, the lack of roads in general, and limited air services throughout Greenland, for example, restrict accessibility to care. Although hospitals and clinics receive funding that includes a transportation budget, this funding is limited. Many patients are on waiting lists for operations, such as knee surgery or chronic problems, and they must often wait for three to five years because it costs so much for transportation to Nuuk for the surgery. If the patient is required to lie down on the flight to Nuuk, payment for six seats in the airplane is required, and air travel is very expensive in Greenland. An “ambulance airplane” is used for transporting very sick people and, depending on the weather, can fly anywhere in Greenland. However, this is also very expensive and one flight can deplete the majority of the annual transportation fund for the local clinic. There are no roads between towns or villages in Greenland, the terrain prevents the construction of airstrips, helicopters are not stationed in all towns, and flying depends on weather conditions. Accordingly, local emergency treatment is often necessary. A nurse in Ilulissat summarized the emergency medical transportation situation for me:

If you are coming from a village or settlement, you must first get off the ice and back to the settlement, then you must go to the clinic, then you must take a helicopter, then you can get on a plane. The hospital has to borrow the plane from Air Greenland and pay for it before the patient can get on it. Then they can get to Ilulissat, then Nuuk. If the weather is really bad, and they can't get to Nuuk, then we try to do

everything we can here or Kangerlussuaq, but if we can't, then the patient dies.

If a hunter is traveling on the ice with dogsled and he is injured or becomes ill, the dogs will return home, with the hunter on the sled, whether or not he is conscious. People are always looking out for each other and if a dog team comes back to town, others will see it and help. In addition, people often travel together so if someone is injured, their travel companions will help them, or others will know where they are and come to their aid, if needed. In winter, when the weather is worse, it is even more difficult to transport a patient to Nuuk. Specialist doctors in Nuuk will work with doctors in Ilulissat and talk them through an operation if necessary. In the past two years, the physicians at the hospital in Ilulissat were “talked through” several appendectomies, bleeding ulcers, and cesarean sections. The physicians are often general practitioners, but must be prepared to manage any conceivable emergency related to surgery, obstetrics, internal medicine, pediatrics, eye diseases, etc.

One of the major problems in Greenland's health care services is the unstable staff situation with both physicians and nurses. There are often very few applicants to any given post and vacancies may remain unfilled for months. This places additional stress on those who remain. Most of the health professionals in Greenland are from Denmark, Norway and Sweden working on short assignments, though some have settled permanently. They are required to speak a Scandinavian language in order to work in Greenland. This is also a problem, according to all of the medical care staff that I spoke with, because it limits qualified people from other countries to work as doctors throughout Greenland. There are presently 15 Inuit doctors and, at best, 65 non-Inuit

doctors total working throughout Greenland. By contrast, there are 73 positions for physicians. While medical training for Greenlanders is free, students must attend medical school in Denmark, where they typically relocate after their education is complete. Very few return to Greenland to practice medicine, and if they do, they stay in Nuuk.

Another major problem is the language barriers between hospital staff and patients. It is uncommon for the temporary health care practitioners to learn Greenlandic. However, the only doctor in Uummannaq, a French woman who has spent seven years working at that hospital, has learned the local language because she observes that, “it’s important to the patient if you can speak their language.” The doctors who are on temporary assignments always require a translator, and, although “it is difficult to find a good translator, there is no other solution.” According to the doctor in Uummannaq, one solution to improving communication, as well as increasing the number of available doctors, is to allow English-speaking doctors to practice health care in Greenland.

At the same time, it is becoming increasingly difficult to recruit physicians from Denmark to work in Greenland. This is due to the fact that salaries for health professionals in Greenland are lower than in Denmark, and Danish doctors find it difficult to temporarily leave their own practices. The same is generally true for nurses; however, there are now more Greenlandic Inuit working as nurses, and the health aides are all indigenous. The Home Rule Government has established a nursing school in Nuuk and the first graduating class was in 1997.

Although there is an increasing understanding of Inuit health issues among researchers, the literature on the topic remains limited. This may be due in part to the remote location of the country and difficult access to many communities not served by

roads and isolated by the high costs of travel. A small number of Danish biological anthropologists and biomedical health care practitioners have collected much of the data, with little regard to locals' perceptions of how outside political and economic forces of development may or may not have influenced their health or health care system. Finally, none of these studies addresses local concerns regarding new risks or health hazards related to climate change.

Summary

To understand how changing climate conditions are increasing Inuit exposure to risk, it is necessary to understand the history, culture, and political dynamics of Greenland. These factors have shaped the infrastructure, development, and resource use that are currently employed by the Inuit. Because my thesis deals with issues related to injury, of particular importance are the status of healthcare in Greenland, and the extent to which it can provide for Inuit facing increased risks of injury in a changing environment. It is also necessary to understand the nature of the changing environment, and how the Inuit and the international community perceive that environment. The following chapter addresses the latter topic.

CHAPTER 4

INUIT PERCEPTIONS OF CLIMATE CHANGE

Introduction

The Arctic is currently experiencing changing climatic conditions. These changes have increased the amount and rate of hazardous conditions faced by people living in that environment (Krupnik and Jolly 2002). Although there seems to be agreement that the climate in the Arctic is changing, and that the people are affected as a result of these changes, there are many different lenses through which these problems are viewed. The ways that climate change is evaluated and addressed vary across communities and cultures. In this chapter, I compare the traditional indigenous ecological knowledge of the Inuit with the more empirical, scientific-based western approach. I discuss how indigenous knowledge has largely been omitted from the western, science-based approach to policy and resource management. The contentious issues surrounding climate change and resource management have created tensions between the Inuit, who depend on these resources for survival, and the international communities who strive to protect Arctic lands and animals from climate change and overharvesting. The fact that non-Inuit voices seem to dominate this agenda ultimately increases risks for the Inuit.

The Hunters

In order to discuss how Inuit hunters view the world around them, it is useful to describe the hunters themselves. Most of the Inuit hunters are short and stocky. They

still wear traditional polar bear pants and mittens, and colorful anoraks (jackets), and their boots are still often made of sealskin, but the Sorrel brand boots are becoming more common. They wear hand-crocheted hats that have the year of their birth or their name crocheted into the pattern. They make numerous trips to the local grocery store each day to talk to other hunters, where they drink coffee out of paper cups on plastic benches. This is where they exchange information on where the safest hunting areas are and compare notes on sea ice conditions.

They are usually married, have children, and they all have at least nine dogs (and as many as 25). In winter, the dogs are always kept chained out on the sea ice just outside of town. The hunters make trips at least twice a day to check on the dogs and feed them. In summer, the dogs are kept in town in open areas or in communal areas at the edge of town. The Inuit men try to get out to hunt or fish every day. They all chain-smoke filterless cigarettes. They fiddle around with the dogs' lines that are always tangled up before driving the dog teams across the ice, and have to make multiple stops to untangle them. To get the dog teams started, they walk in front of the dogs, with the dogs following behind. They then walk alongside the dogs, which are arranged in a fan pattern, rather than in lines. They arrange the dogs this way so that each dog can negotiate the ice conditions independently, and if one goes through the ice, the other dogs can keep going and pull that dog out. When the team is moving, the hunters jump sideways or side-saddle onto the sled and kick back in a reclining position, calling out commands to the dogs for right and left or slow or fast, then light a cigarette and call out commands to the dogs as needed. Inuit shuffle along instead of taking large striding

steps so they do not slip on the ice. When the hunters are riding on the dogsled and get cold, they run alongside of the sled to warm up, and then jump back on the sled.

The hunters mostly speak Greenlandic, sometimes Danish, but almost never English. Their faces are weathered and most of them look older than they are. The ratio of hunters to fishermen varies by region; there are more hunters in Uummannaq than Ilulissat, and more fishermen in Ilulissat than Uummannaq. One difference between the two groups is that the hunters and fishermen in Ilulissat, the larger of the two towns, all wear sunglasses and usually have nicer boots than in those Uummannaq. In Uummannaq and north of Ilulissat, they are much more traditional in appearance and lifestyle.

Climate Change in Greenland

Changing ice conditions in Greenland leads to unpredictable and unsafe conditions. The effects of climate change are particularly evident in relation to safety while hunting and traveling, especially during the times of sea ice freeze and break-up (Krupnik and Jolly 2002). For example, as Fox (2004) has observed in the Canadian Arctic, before hunters go out, they look at the clouds, and take note of height, type, and the direction of cloud movement. This information, along with other environmental conditions, is used to forecast the weather, decide if it is safe to go out, and also to identify potential hazards. The Inuit draw on past experiences and knowledge passed down from elders and other hunters to establish their own knowledge base for evaluating the current environmental conditions and predicting hazards. For the Inuit, such prediction is very important because the ability to anticipate changes in the weather and sea ice, and be able to respond to dangers, is critical for safe travel (Ford 2004). For example, strong winds can be dangerous while boating on open water in summer, can

cause whiteout conditions in winter, and can quickly disintegrate the sea-ice (Ford 2004). The traditional knowledge used to make predictions, however, has become less reliable as the result of changing climatic conditions and this has made hunting more dangerous (Ford 2004).

Throughout the circumpolar region, access to local hunting areas is also affected by changing climatic conditions (Krupnik and Jolly 2002). Access to hunting areas from October to July depends on the state of the sea ice and snow, from June to November on the condition of inland trails, and throughout the year on the ability to use boats (Krupnik and Jolly 2002).

In the Canadian Arctic, Ford (2004) has observed that thin snow cover on the ground in winter is restricting access to inland caribou hunting by snowmobile. Hunters have damaged snowmobiles and sleds while traveling on trails where snow was thin (Ford 2004). Later ice freeze up is changing the timing at which harvesting of seal and fish can take place (Ford 2004). Harpoon seal hunters and ice fishermen now have to wait longer during the winter season than they had in the past before they are able to travel on the ice (Ford 2004). Stronger and more unpredictable winds are also limiting access to hunting grounds by boat in summer because the boats used locally do not offer protection in rough water (Ford 2004). These changes in accessibility to hunting locations have important ramifications for the community because locally harvested animals have significant social, cultural and economic importance (Krupnik and Jolly 2002; Ford 2004). Seal hunting, for example, not only provides food, but also is a way of life, an occupation, and a symbolic part of Inuit culture (Furgal 2002).

Resource Co-management

People interact with the natural world based largely on their perceptions of that world, and different cultures perceive their environments differently. Likewise, knowledge within a community and the ways it is transmitted and passed along are culturally-dependent. There is thus a rift between the ways in which the Inuit perceive and interact with the environment in Greenland and the ways in which the rest of the world views them.

There are also issues of power and authority behind the ways that indigenous knowledge is transmitted within communities and the ways that knowledge is depicted to the international community. Pottier et al. (2003) note that knowledge transfer is shaped by power relations both within and across cultures. This is important for scholars, including anthropologists, to recognize when studying indigenous groups and intersecting local and global processes related to climate change and development. Pottier (2003: 3) stated that “there are implications here for anthropology’s role...an empirically grounded understanding of how knowledge(s) is (are) produced through the mediation of unequal power relations and processes of translation is a prerequisite for any serious attempt to instigate dialogue and make *all* stakeholders benefit from development initiatives.”

In Greenlandic Inuit culture, several factors shape the production of knowledge and its transmission within Inuit communities and externally to the international community. First and foremost, knowledge is a reflection of the societies in which it is generated and passed on. In Greenland, the economic and political concerns of the Inuit villages directly shape and inform traditional ecological knowledge (TEK). Within those Inuit communities, there exist social, political, and economic hierarchies. Certain

members of those communities stand to benefit from the creation and dissemination of particular kinds of knowledge, including TEK. Analyzing these power structures and social relationships is important in performing anthropological field work because it uncovers the basis for much of what a community considers to be inherent knowledge within that community.

This same reasoning applies to the ways that the international community perceives the climate changes in Greenland and seeks to respond to those changes. The power relationships in the agencies and governments that aim to ameliorate the problems faced by the Inuit are important in determining the origins of the recommended policy measures. International interpretations of climate change are also increasing pressure on local governments to implement quota systems for hunting, and compound the difficulties faced by contemporary Inuit. Limiting the number of animals that can be caught during certain times of the year reduces flexibility for hunters as a coping strategy in response to climate change. This can lead to food insecurity and increased risk for hunting during dangerous times or in high-risk areas. For these reasons, it is important that communities, scientists and government work together to co-manage wildlife resources.

There are a number of considerations for anthropologists when approaching local knowledge and science. Most anthropologists are advocates of basing their research and aligning their perspectives with local knowledge. Those researchers normally sympathize with the groups and cultures they study, adapting their perspectives. They argue that using indigenous knowledge will likely facilitate more successful interventions and lead to more effective policy recommendations (Sillitoe 2007).

For anthropologists and researchers basing their perspectives on local knowledge, it is important to take a more holistic approach to and understanding of knowledge systems, to contextualize the ways that the culture in question accumulates and disseminates knowledge. Local knowledge of the type employed by subsistence hunters may not be based on a framework and set of scientific principles (*e.g.*, Newtonian physics or Euclidian geometry) that serve as the starting points for Western knowledge. Instead, the state of current knowledge in an indigenous community represents the accumulation of past experiences and trials in the elements where the communities are located. In this sense, they lack a formal hypothesis and universally recognized trials to test them. The knowledge is gained as they continually experiment with hunting methods and negotiate the elements. With this experience, the community gains exposure to an array of real-world test conditions and a wealth of information is generated for the community. This information and knowledge is then passed on to future generations, whether formally or informally. It is formalized to varying extents in cultural heritage (Sillitoe 2007).

Sociologists argue that science is prejudiced by and dependent on social factors such as worldview, language, oral tradition, and shared practices. Instead of utilizing a strictly scientific approach to understanding and addressing climate change, a more holistic approach asserts that local knowledge and global science can complement each other. Some scientists might treat one view as superior to another. However, researchers drawing on a holistic approach would lend approximately equal credence to multiple perspectives and treat contrasting approaches as different worldviews and epistemologies complementing each other in the same space (Sillitoe 2007).

Sable et al. (2007) illustrate the holistic approach in their report on The Canadian foundation of the Innu Environmental Guardians Program. That course is driven by Innu values, and seeks to redress the European education system's effects on indigenous cultures in Canada. It also aims to empower the Innu to be better served by Canadian government agencies. The program is determined, in part, by input from Innu elders, who also serve alongside lecturers in Western environmental science as course instructors. This program is a prime example of a policy prescription based on components of both local knowledge and global science.

In discussing the project, Sable et al. (2007) note the important role that politics play in holistic analysis. The authors describe the balance struck when Innu input is factored into political processes. For example, Innu participants often define the agenda of program sections, which requires that they demonstrate to the government their credentials as environmental guardians. Here, Innu representatives are required to show a sophisticated understanding of the science on which the federal government bases its policies, but the program also encourages the incorporation of Innu knowledge.

That program illustrates another important point concerning power and authority and the control and dissemination of knowledge. Within communities, different individuals or groups have varying degrees of access to knowledge and the means to transmit that knowledge. As noted earlier, the power dynamics associated with information and knowledge are important to consider when using holistic approaches. In short, knowledge, whether scientific or indigenous, does not exist in a vacuum.

Different Ways of Knowing

While the Inuit have accumulated a base of shared knowledge passed on through generations of hunters, their perspective on ice and climate conditions is not universal. Similarly, their source of knowledge differs from the science on which western knowledge draws. Scientists who study the physical, chemical and biological properties of the Arctic environment understand that environment differently than do the Inuit. While the former use advanced scientific methods in their research, the latter rely on TEK. The two groups' observations and perceptions vary in part due to the fact that they are not experiencing the environment in the same way, and because they are considering different factors when going out into the environment. Scientists are gathering data in order to answer specific questions about the environment, such as understanding the physical process of how the sea ice is changing in response to global climate change. Inuit hunters, on the other hand, are interested in what those changes are and how to navigate new changes in the local sea ice conditions. Scientists typically gather data at a fixed point, accumulating limited snapshots of information that they then use to model a larger picture. By contrast, Inuit understand the environment in terms of nuanced variation that can create hazards, or not. Combining these two seemingly divergent ways of knowing can assist *co-management* of natural resources, as well as inform scientific studies. Co-management allows users, resource managers, and other stakeholders to share power in managing shared resources, such as whales (Berkes et al. 1999). It can include a variety of institutional practices at various levels designed to ensure sustainable use of renewable resources (Berkes et al. 1999). It often involves combining Western

science and indigenous knowledge in developing effective management systems (Berkes et al. 1999).

Often, scientific knowledge informs policy that determines the number of animals indigenous communities can catch, without the input of the environmental knowledge of those communities affected by the policies. This can result in cultural or political conflicts emerging over the most appropriate way to manage responses to climate change. These conflicts illustrate and underscore the differences between Inuit and western knowledge and the basis for that knowledge. Inuit TEK should be included in scientific understanding of the Arctic environment and co-management of natural resources. This contribution will ultimately help Inuit hunters and fishermen stay safe while traveling on the sea ice or land because their local knowledge can help to provide a more broad perspective of the local environment and how it has changed over time. Inuit hunters and fishermen can provide observations of local environmental phenomena that have not been captured with scientific instruments. Some social and physical scientists have begun to incorporate indigenous environmental knowledge into their research projects and data analysis.

Social scientists advocate the inclusion of indigenous knowledge and participation in the co-management of natural resources. Kofinas (2002), for instance, worked with caribou hunters in Alaska to understand the dilemmas and dynamics of power sharing and helped to develop a strategy that included knowledge from biologists and local indigenous hunters. One of the goals for Kofinas was to understand the conflict between the various stakeholders, which included oil industries, protectors of the Arctic Refuge, local indigenous communities, and researchers. He found that the community had a

negative response to researchers based on an unhealthy history wherein the locals felt that researchers disrespected them and their land. However, Kofinas, local indigenous hunters, and researchers together eventually established a co-operative in northern Alaska that focuses on combining TEK with modern science to try to understand which environmental factors are changing and why.

Similarly, in Greenland, researchers are working with Inuit hunters on an interdisciplinary and international collaborative project that examines sea ice called *Siku-Inuit-Hila* (Sea Ice-People-Weather) (Gearheard 2007). This project combines community-based sea ice observations with data collected from monitoring stations in the area. Local Inuit residents are also employed to install the monitoring systems. Their knowledge is incorporated into the design of the monitoring program, which ensures that the studies are relevant to the needs of the community.

These collaborative efforts could help to inform large, influential organizations in decision-making processes that lead to the development of productive and effective hunting regulations and quotas in Arctic regions (Gearheard 2007). A more comprehensive approach to regulations that directly influence Inuit hunters and fishermen can ultimately lead to safer hunting practices and travel on sea ice by facilitating the flexibility that hunters and fishermen require in order to stay safe.

The interplay between modern science and TEK is illustrated by the status of whale hunting in the Arctic region, and the negotiations and compromises involved embody the conflict among stakeholders in the Arctic region. Whale hunting regulations currently fall under the International Whaling Commission's (IWC) "aboriginal whaling subsistence" management regime. To achieve a balanced policy that would serve both

the indigenous hunters as well as protect the species, the belief systems of indigenous populations were initially taken into account. Hunters' relationship with whales includes spiritual and cultural elements. Additionally, the numbers of whales harvested by the relatively small population of hunters in Greenland has had little effect on the overall status of whale populations. Because of the established symbiosis between whale populations and the ways in which the Inuit hunters viewed them culturally, sharp restrictions were avoided. The Inuit respect for the whales precluded any notion of formalized regulatory framework regarding hunting of the animals. In that case, the foreign scientific community recognized that the Inuit relationship with the whales was two-fold; that is, the hunters derived food from the whales, while the whales served as powerful spiritual symbols to the Inuit.

By contrast, the hunting practices of European whalers proved to be far more damaging to whale populations. These practices had pronounced impacts on Greenlandic whaling and the regulations that apply to it. As Caulfield (1997) observes, the Europeans' exploitive hunting practices gave rise to increased international oversight on whaling. In 1946, a number of nations signed the International Convention for the Regulation of Whaling (ICRW), which serves as the basis for international management of large whales today. Initially, the ICRW accounted for the different use of this animal resource between groups; while it was more restrictive on European practices, it enabled aboriginal people to catch whales for consumption, even where commercial whaling was prohibited. Over time, the ICRW became known as the International Whaling Commission (IWC).

While the ICW did contain provisions to protect the food sources of many indigenous people, many Inuit found their stipulations to be overly restrictive. Many Inuit hunters were adversely affected, for example, when the IWC completely banned the hunting of humpback whales. Inuit whalers continued to face strong opposition from anti-whaling groups, who challenged Greenlandic whaling on the basis that the use of modern technology such as harpoon cannons made it non-traditional (Caulfield 1997).

Today, the dynamics of the whaling debate continue to illustrate how the various stakeholders influence policy important to the Inuit. Multiple stakeholders have an interest in issues that affect the economic livelihood of Inuit hunters, including the IWC, the Danish government, international and domestic nongovernmental organizations (NGOs), Home Rule government and local hunters. In general, the IWC sets quotas for certain whales, but the regulation, monitoring and enforcement is done by the Home Rule government. The ultimate regulatory authority overseeing whaling is unclear, and the ambiguity also creates a less certain regulatory environment. However, despite the regulatory environment and the contrasting interests of the various stakeholders, many observers are optimistic that the Inuit concerns will gain prominence in this area. For example, Caulfield (1997) argues that Greenland's whaling regime is increasingly effective in responding to both global concerns about the viability of whaling stocks and to the needs of local communities. It incorporates indigenous knowledge and practice in management and has buffered hunters from extraordinary political pressures surrounding whaling issues on the international level (Caulfield 1997). Many hunters believe that the IWC is dominated by anti-whaling forces. Some advocate that Greenland withdraw from the organization, believing that hunters' interests are in conflict with those of the Danish

government. Some hunters are even distrustful of Home Rule government. Although these voices remain a minority, they illustrate the ongoing contradictions within Greenland's whale hunting management strategies and the challenges facing Greenlandic society in carrying out whaling sustainability. As policy related to hunting whales is influenced by their shifting migration and population patterns resulting from climate change, it becomes increasingly important for Inuit perspectives to be included as policy determines hunting quotas.

Perceptions of Climate Change

The Inuit of Northwest Greenland have been experiencing changes in local weather patterns, sea ice, and wildlife over the past ten years. Although everyone I spoke with for this study is unanimous that such changes are occurring, their explanations regarding the root causes of the changes vary. For instance, approximately 80 percent (28 out of 35 total) of the people I spoke with are in agreement that the reason for shorter, warmer winters is "climate change" or "global warming."

However, about 10 percent (4 out of 35 total) claim that they "don't know why it's happening, if it's climate change or just many bad seasons in a row." One hunter in Uummannaq feels that variation in local weather patterns is "normal" and "nothing unusual" because his parents and grandparents told stories about years that were "not so cold."

Another hunter shared his perspective of change:

I see that there are many changes in the weather over the years and the sea ice and the clouds are different and the wind. I don't know why it is happening, if it is "climate change" or just many bad seasons that will soon go back to normal. But I see the changes that are around Uummannaq fjord and I hear about other changes that are different in different parts of the world, so it is not only happening here.

For the Inuit, the process of understanding changing climatic conditions, such as sea ice variation, unpredictable weather, and changes in wildlife patterns is culturally, not scientifically, constructed. They learn to discern ice behavior and other environmental conditions in order to manage hazardous situations while maintaining occupations as hunters and fishermen. This information is passed on from father to son at a very young age and ultimately a collective knowledge of local hunting areas is passed on for generations. As environmental changes occur, many Inuit perceive current conditions based on what previous generations experienced.

Another perception of climate change and its root causes can be found in anthropological analyses. For example, Baer and Singer (2009) argue that global capitalism is the underlying cause for what they refer to as “global warming.” They maintain that the capitalist system’s emphasis on profit-driven production is destructive to the environment. Baer and Singer point to resource waste and overconsumption that lead to ecological damage, such as deforestation and excessive carbon emissions, as examples of anthropogenic sources that contribute to global warming. As industrial capitalism expanded from Europe to incorporate developing societies, exchange within the world capitalist system has been unequal. Environmental damage and the marginalization of many indigenous peoples as labor result from capitalist efforts and must be understood as related issues (Baer and Singer 2009). I will return to further address the issue of capitalism again in later chapters of this thesis. In this chapter, I will focus on Inuit perceptions of environmental and climate change. Their perceptions of change are directly related to potential dangers while travelling on sea ice for hunting or fishing.

Arctic Sea Ice

Sea ice is found in the polar oceans and covers the majority of the Arctic environment for much of the year. Sea ice is an important element of the global ecosystem because it influences climate, wildlife, and people who live in the Arctic. Even though sea ice is mainly found in the Polar Regions, it influences the climate of the entire world. As I discussed earlier, the surface of sea ice is bright; so much of the sunlight that hits it is reflected back into space. The reflective properties of sea ice results in relatively cooler temperatures in the Polar Regions because these areas absorb less solar energy and remain relatively cool. If gradually warming temperatures melt sea ice over time, there will be fewer bright surfaces available to reflect sunlight back into space, so more solar energy will be absorbed at the surface, and temperatures will continue to rise. This sequence starts a cycle of warming and melting that slows during the dark days of the polar winter, and then resumes again the following spring. Even a small increase in temperature can lead to greater warming over time, making the Polar Regions the most sensitive areas to climate change on Earth (Serreze et al. 2007).

The strength, thickness and structural integrity of sea ice vary depending on local weather conditions, as well as longer-term climate change. The Inuit experience these variations intimately. In Northwest Greenland, the Inuit spend as much time as possible on the sea ice, traveling and hunting, so they are very familiar with its characteristics, how it is formed, and how it changes. For example, *landfast ice*, which is ice that stays attached to the land, is the first to form in bays and interior inlets early in the winter and can reach a thickness of six feet (Aporta 2002). Today, in Uummannaq Bay, the landfast ice forms later and breaks up earlier, which affects the availability and distribution of

marine mammals and determines when and where the Inuit can hunt and travel. As Henshaw (2009) observes, mobility of the Inuit people influences how they experience and learn about the environment. As the sea ice environment becomes less accessible and less predictable, new risks and dangers emerge for Inuit who travel on the ice.

Those who spend a substantial amount of time on the ice are also interested in the processes of how the ice is formed and how it changes. For example, when describing unsafe ice in the area, one hunter told me that, “when the ice is here it will look very strong from the top, but it is melting from underneath. In the old days, they said it was *Arnaqassuaq* – an old woman that lived under the ice, but now we know it is just warmer water from the South coast that makes the ice melt.” Many other hunters and fishermen have also discussed this process of ice melting from underneath and the dangers associated with the difficulty of detecting the depth of that ice.

An experienced hunter from Uummannaq claims that changing wind and snow patterns have created rough conditions that make it more difficult to travel across the ice:

The winds are stronger and even though the air is warmer the winds are colder when they come from the East, from the inland ice. When the strong winds come, they break up the ice faster. And the water is warmer, so when the ice breaks it melts faster and has a harder time growing back. The ice comes slower and leaves sooner, so the time we can travel is short. The ice season is shorter – it forms later and melts faster. There are new areas that are no longer safe to travel to and they are changing very often. Even if the air is cold, the water is warmer, so it melts the ice faster. It’s thinner now too, about half as thin as it used to be. It is more dangerous to travel on the ice now – you have to be so much more careful, even though there are always dangers with hunting.

Additionally, as an elder from the same area explains, the sea ice that is forming now is not as solid or as thick, making travel especially dangerous:

In most places, the ice is less than one foot now. The way the ice is “born” today is very different than old days. Then, it was established as a thin surface with no moisture on it so it could grow to be thicker. But now, there is moisture on the surface, condensation or rime “*kaneq*” builds on the ice. The “*kaneq*” comes because the water from below is warmer than it used to be, so ice below can’t get thick. And it insulates the ice from the top to keep the ice warm. And the water is warmer, making the ice warmer too. It is very dangerous to be a hunter. To travel in winter there is always danger. And now it is worse because the ice is bad.

These observations illustrate the changing environment in Greenland and the ways that Inuit perceive the changes.

Sea ice thickness has shown a substantial decline in recent years (Meier et al. 2006; Rothrock et al. 1999 and Serreze et al. 2007). Satellite data and earlier observations from ice charts and other sources show a trend since the early 1900s that indicate that Arctic sea ice has been declining since at least the early 1950s, and that since 1979, winter Arctic ice extent has decreased about 4.2 percent per decade (Meier et al. 2006). Long-term satellite records dating back to the 1950s show that spring melt seasons have started earlier and continued for a longer period throughout the year (Serreze et al. 2007). Data from submarine cruises show that at the end of the melt season, Arctic sea ice has decreased by about 1.3 meters between the 1950s and the 1990s (Rothrock et al. 1999). These changes in Arctic sea ice, as well as in the climate or environment, can have significant impact on those whose lives depend on local natural resources. Inuit communities pay close attention to the quality of sea ice, particularly in spring for fishing or hunting. When sea ice in the spring melts too rapidly, it shortens the hunting season. Inuit elders point to the last decade as a period of considerable change. For example, in Ilulissat, looking out over an open, black sea studded with a few icebergs and an island off in the distance during the winter, an Inuit elder told me, “I used to travel on the ice,

but there is always open water now. It's strange to see open water and not ice." The Inuit determine the safety conditions of travel on sea ice and predict weather using traditional indicators such as clouds, wind, and ocean currents. Reductions in sea ice during the last several years have impacted Arctic indigenous people by forcing them to change their hunting strategies, and by posing serious safety concerns.

Local Weather Patterns

Variation in local weather patterns, such as an increase in precipitation and fog, has been observed by most of the people I spoke with throughout Greenland, particularly among communities along the Northwest coast. Many Inuit have noticed that large storms develop at an increasing rate, which they believe is a result of diminishing sea ice. When there is less sea ice, more moisture moves from the ocean to the atmosphere, which increases the amount of precipitation and strong storms. Increased precipitation is felt in terms of humidity, the air feeling colder, and temperatures fluctuating. As one hunter observes, "There are very many changes now – not just the temperature. The winds are stronger and it is more windy now. And even though there are stronger winds, it is snowing more, but the winds blow it away quickly, so it doesn't usually stay on the ice for very long. The ice is very different now." These environmental changes influence daily life regarding travel and livelihood, as another hunter stated, "The ice and bad storms and fog make it harder to hunt, not impossible, but there are some differences in how we are travelling. It is already getting more difficult to live as a hunter, not like the old days, when you could live as a hunter." Changes in sea ice conditions are felt by the Inuit in economic terms. Because the ice is changing, travel is less safe, making it more difficult if not impossible to hunt or fish for a living or to supplement an income.

Wildlife

Changes in sea ice also affect the marine wildlife that the Inuit typically hunt and fish. For instance, many fishermen observe that halibut is being replaced by cod, which is unusual but not surprising considering that cod is a warmer water fish than halibut. In addition, there are fewer fish in general. Others report that there are more pilot whales and killer whales in Uummannaq and an increased number of humpback and narwhal whales in Ilulissat. This is because the whales are moving north in search of colder water. Such an increased whale population is disruptive for hunters, but especially for fishermen because the whales destroy the fishing lines, eat bait off of the fishing lines, and create increased hazards when they come into contact with boats.

Summary

Changes in migration patterns and availability of marine mammals and fish, as well as reduced access to some species because of unsafe ice, are creating challenges to food and economic security for the Inuit. Changes in sea ice, such as thinning, unusual cracks, and changes in the timing of breakup and freeze are impacting travel safety. Accidents on the sea ice are increasing due to unusual conditions, resulting in injuries and death, loss of equipment, and expensive rescues. There is little disagreement that the changing climate and environmental conditions are creating new hazards for Inuit hunters in Greenland. However, there are different perspectives on the problem and different knowledge bases that inform those perspectives. On the one hand, the Inuit use experience, oral tradition, and community as the basis of TEK. On the other, the international community largely used western science. In addressing climate change in Greenland, the western voices are more prominent on the international level and the

science-approach tends to dominate discussions of how best to address the problems faced by the Inuit. While the inclusion of TEK is very important to the process of addressing climate change in Greenland, as will be discussed in more detail in later chapters, Inuit people have found that TEK is not as reliable in rapidly changing environmental conditions. The following chapter will focus on Inuit perceptions of risk, as well as new dangers and hazards that are related to their observations of the environmental and climate change discussed in this chapter.

CHAPTER 5

MULTIPLE PERSPECTIVES of RISK

Introduction

Injury and death while hunting are facts of life for the Inuit. One Inuit elder told me that “there have always been lots of injuries and death while hunting.” Many injuries that Inuit hunters experience are so common that they are acceptable, such as frostbite. However, as sea ice conditions and local weather become increasingly unpredictable due to global climate change, Inuit hunters and fishermen who spend a considerable amount of time on the ice have observed that there are more hazards that can lead to injury. This same elder observed that “there are more accidents on the ice, more people having problems when they are out. There is always danger when you are out on the ice, but now you must be more careful, because it is harder to do things, harder to be patient when there are not as many days to go hunt or even fish.” The purpose of this chapter is to explore the literature on risk perception and exposure and relate it to Inuit experiences of new risk and hazard while travelling on sea ice during hunting and fishing activities.

Risk Perception Research

The idea of risk has been considered in relation to gambling and economics, with a focus on the probabilities of loss, looking at how people decide which risks are worth taking and who is prepared to gamble, with what, and to what extent (Lowrance 1980). Other research focuses on the risk situations, assuming that people make rational

decisions about particular risks. For instance, Kasper (1980) observes that decision makers seek objective risk assessments to decide on the best actions in relation to situations such as safe levels of toxic exposure. However, such objective assessments and the decisions based on them overlook the relationship between the hazard and perceptions of acceptable risk.

Experts in fields such as environmental and occupational hazards try to define objective criteria for risk identification and magnitude based on exposure to hazards and negative health outcomes (Lupton 1995). Lupton cautions against simply labeling particular groups that appear to have greater risk factors as high risk, which implies that the people themselves pose a threat. According to Lupton, subjective interpretations of risk have been often ignored, at least in most public health risk discourse. In trying to understand risk decision making, it is also important to look at the result, because different results may affect the cost-benefit calculations that an individual makes when he or she is trying to decide. For example, many Inuit find that losing a finger is common and therefore an acceptable risk: as one of my female interview subjects stated, “I don’t know – frostbite is always happening, people go through the ice, most hunters I know are missing a finger – the usual.” One hunter claims that while losing the occasional finger is an acceptable risk among the Inuit, climate change is influencing other injuries inadvertently:

Because of climate change, hunters are having more frustrations about things so they do things the wrong way. Indirectly – if they have to wait so long, then they go anyway because they *have* to – it’s just daily life. They aren’t good at waiting. They go out when they know it’s dangerous, which is more indirect. Many problems occur during the boating time in autumn when it’s windy, waves can capsize a boat. The boat rises high with the swell. Many fishermen are missing fingers from fishing lines or dog lines getting wrapped around their

finger and then pulls it off – lost fingers. The season starts later, so you get frustrated because of the waiting to try to get dogs in good shape in shorter time, so they take more chances and have more injuries.

The sociocultural context within which notions of risk are constructed also varies (Drake 1991; Kleinhesselink and Rose 1991; Lupton 1995; Vaughan and Nordenstam 1991). Vaughan and Nordenstam (1991) suggest that meaning systems are derived from culture and worldview. These systems form the foundation for the interpretation of events and risks by individuals and groups within particular environments and resources. In occupational health and safety, risk perception research has found variations in risk evaluations by different groups, such as employers and employees (Holmes and Gifford 1997), or community members and expert officials (Auer 1989). Rohrman (1994) found that people's value orientations also affected risk appraisals, causing social position and personal value orientations to affect the judgment of the riskiness of situations and behaviors. According to Haavelsrud (1996), even the ways in which media reports are written can affect individual evaluations of their potential threat.

From Risk Perception to Risk Exposure

Much of the research on risk perception focuses on the differences between objective and subjective assessments of risk, and the search for the factors that affect individual and group judgments. Holmes and Gifford (1997) observe that the way that information is presented can affect judgments, and that personal attributes, such as social class, can contribute to a different risk assessment. Characteristics such as familiarity, control, catastrophic potential, and level of knowledge seem to influence relationships between perceived risk, perceived benefit, and risk acceptance (Slovic 1987). Although there are a number of studies that include different variables that are considered

important to risk perception, there is no clear model to link the different elements of risk perception. The processes of decision-making and action in relation to risk perception are even less well understood. Understanding how risk perception is related to behavior toward particular risks remains speculative. It is important to consider risk perception as part of the complex process of decision-making and action in relation to potential hazards.

A growing number of risk theorists, such as anthropologists and sociologists, suggest that perceptions of and responses to risk are fundamentally shaped by our cultural conditions. For instance, according to anthropologist Mary Douglas (1985), most people tend to accept risks that help reinforce the social solidarity of their institutions, and to reject those that do not. For Douglas (1985), the selection of dangers and the choice of social organization go “hand in hand,” so community perception of risk and its acceptable levels are seen as collective constructs.

“Rational risk assessment” is the idea that we make choices based on our least dangerous alternative (Douglas 1985). Douglas (1985) observes that most people tend to focus attention on the middle range of possibilities, overlooking high-probability dangers. Douglas goes on to describe the way in which individuals judge familiar activities as being relatively safe, in what she refers to as “subjective immunity.” The resulting overconfidence from these perceptions of probable risk has the potential to produce what Douglas argues is a “dangerous lack of focus.” Importantly, this decision-making process is based on cultural values, social structures and power relations (Douglas 1985).

Building on Douglas’s idea of subjective immunity, environmental sociologist Elaine Vaughan (1993) also points out that the frequency of exposure to a hazard and the

immediacy of the onset of negative outcomes are important factors in the assessment of risk. Discounting of future consequences or evaluating an individual's present state to indicate future vulnerability may become important in making decisions about taking risks, especially when situational factors of risk are not obvious. Vaughan argues that the sense of risk is reduced when the risk is familiar, negative effects are not immediate, and consequences are viewed as common and relatively mild.

In Inuit communities, people often rely on an empirical process to assess the value or danger of travel on sea ice. Individuals make judgments about risks based on previous experiences - both their own and those of others around them. Experience can affect risk perception in two distinct ways. On one hand, when people observe serious consequences of a behavior, they may perceive it as dangerous and avoid it. For example, I found that many Inuit would avoid a previously safe and successful seal hunting area only after they learned that another hunter recently went through the ice in that area. On the other hand, when someone's experience shows that exposure leads only to brief and superficial consequences, the perception that there is no real need for special precautionary measures is reinforced. For instance, a "close-call," such as swiftly crossing an open crack in the ice, where only one dog goes through the ice and is pulled back out by the rest of the dog team, is not enough of a negative outcome to avoid the area. In this way, culturally learned intuition guides individual judgment (Douglas 1985). As culture is something that both constrains and enables perceptions of risk, individual actions are taken in response to collective perceived risk (Douglas 1985).

Inuit Perceptions of Risk

The criteria by which people assess risk, and decisions about risk reduction behaviors, are patterned by the cultural and practical context in which they find themselves (Douglas and Calvez 1990). People tend to minimize possible dangers in familiar activities (Douglas 1985). Such behavior may partially explain the sense of subjectivity the Inuit have in decision making regarding hunting and fishing in areas they know might be dangerous. The following comment by an Inuit hunter expresses this common perception: “we are always on ice or open water or land. We manage what we do by our own experience and by traveling with people with years of experience. We are always learning new things from each other and this is how we avoid danger as much as possible.”

Inuit ideas associated with risk are directly related to “danger,” which, many hunters suggest, can ultimately result in death. *Arsialuttuinnaavoq* is the Inuit term for “danger” and refers to the specific situation, while *navianartoq* is the term for “risk” and refers to the behavior of the person in response to the dangerous situation. Although there are different meanings for each term, they are interpreted by the Inuit as being intertwined. This understanding of risk and danger is culturally constructed. Boys learn how to respond to potentially dangerous hunting or fishing situations that could occur while traveling on the sea ice from their fathers at a very young age. However, as it becomes more difficult for hunters to make a living, as the combined result of their insertion into a global market economy, stricter government hunting restrictions, and increasingly unsafe sea ice conditions, the youth of today spend less time learning what the dangers are and how to avoid them. Instead, many of the younger hunters are

engaging in wage labor outside of their community, as well as buying snowmobiles and traveling on the ice to hunt on their own without the necessary skills. Their understanding of danger is inaccurate, so their judgement regarding risk is lower than the reality of the risk. It is this group of hunters who are at the most vulnerable to risk of injury.

Typically, Inuit children play with puppies and are responsible for their own dog teams at an early age. I attended a dogsled race in Ilulissat where one of the age groups was two to four years old. The children had their own sleds, handled the dog teams, and for the most part, remained in control as they moved across the ice. As they get older, they replace the dogs as needed, build new sleds or repair existing sleds, and spend much of the winter training and exercising the dog teams. Dogs and dog sledding are very much a part of Greenlandic Inuit culture; however, many of the Inuit I spoke with expressed concern that this aspect of their culture will be lost because it is increasingly difficult to keep a dog team if they cannot be exercised due to lack of sea ice. In addition, it is much more risky to use snowmobiles, which I will expand on later.

Perspectives of what risk means to the Inuit vary. Some Inuit perceive risk to entail familiar, acceptable hazards that occur every day and are viewed as “the way we must live.” Conversely, other Inuit claim that “we do not take risks because that is very dangerous.” In general, most Inuit observe that professional hunters and fishermen are skilled and know how to avoid dangerous situations and respond to accidents. However, as sea ice conditions and weather patterns change, they observe that there are more dangers and an increasing number of accidents and injuries. Almost all risks, dangers and accidents observed by the Inuit are in relation to ice and travel on ice. The hunters

and fishermen frequently spoke of thin ice with resignation. Although they were often able to travel safely, they were always prepared to respond to an accident or danger. Many Inuit are frustrated by the increase in danger while traveling on the ice, but they felt nothing could be done about it: as one fisherman told me, “the way fishermen live is very dangerous and we must take risks all the time.” They felt they had no choice but to travel in dangerous areas, regardless of the dangers because there are limited employment options available to them. As another fisherman told me, “we see ice as a risk any time we go on it because it is always very dangerous. Now it is more dangerous, so there are more risks.” At times, some hunters or fishermen are more willing to put themselves in risky situations. For instance, a hunter from Uummannaq told me a story about how he and his dog team went through the ice, but he was wearing a life jacket, knowing that there were poor ice conditions in the area.

Injury and Perceptions

Frequency and Numbers of Injuries

Although there are clear injuries directly associated with the Inuit hunting and fishing activities, determining the rates of occurrence, percentage relative to population, and total numbers is difficult for a variety of reasons. First, the perceptions of what constitutes injury differ from the typical Western standard, and are dependent upon Inuit perceptions of the concept of injury. For example, Inuit hunters do not consider a missing finger to be an injury. Further, most villages do not keep health records; where they are kept, they are incomplete and poor. Finally, most Inuit do not seek medical attention for many “injuries” because they feel that the injuries are not substantial or that

seeking medical treatment would be too burdensome, particularly when they are out in the field most of the time.

Perceptions of risk, which are culturally constructed, can place Inuit hunters and fishermen in situations where they are less safe in light of new hazards related to a changing environment. Greenlandic Inuit are experiencing various changes in the climate, weather and the environment. Similarly, they are experiencing the effects such changes have on their way of life, relationship with the land, and health. According to the World Health Organization (1967), health includes aspects of physical, mental, and social well-being and is not simply the absence of disease. In the holistic Inuit vision of health, the well-being of individuals and communities is tied to the land and sea. While changes in the land, weather, and sea affect individual and community health and well-being in a variety of ways, this study is interested in injury and how to prevent injury-causing events that are related to climate change. In addition, this study seeks to contribute to the growing body of literature that addresses how Arctic communities are responding to climate change.

Predictability of Injuries

Unintentional injuries and some intentional injuries, such as assaults, are often described as “accidents” (Langley 1988). Not all accidents result in injuries and the word “accident” for many people suggests an unpredictable and unpreventable random event or “act of God” (Langley 1988). For Greenlanders, an “accident” can define any event that may include an injury, such as frostbite, and Inuit feel that they are never “injured.” There are two main perceptions of “injury” found among most of the Inuit I spoke with:

- 1) hypothermia and missing fingers are so common that they are not viewed as an

“injury” because they can still work, and 2) for some, the term “injury” typically refers to death. These perceptions are important to note when developing “injury” prevention programs for Inuit in Greenland.

Young Adults and Injury

In many parts of the world, including the Arctic, injuries are the leading cause of death for young adults, adolescents, and children. Castillo et al. (2006) argue that the importance of understanding injuries and injury prevention has increased in developing countries and indigenous communities, and will continue to do so as infectious and degenerative diseases are better controlled. The health impact of injuries and their causes is a relatively new area of study compared to other health conditions. Castillo et al. (2006) suggest that the understanding and control of injuries has been delayed because the causes of injuries are often complex, and because prevention can require multiple interventions.

The sudden loss of a productive young adult due to death or disability can be a serious economic blow to a family and to the community (Barss 1998). Barss (1998) suggests that not only is that person’s potential contribution lost, but also the substantial material and human resources already invested in education and support will not be returned. Injury prevention among young adults in developing countries and indigenous communities has received relatively little attention, despite the fact that the death of a “bread-winner” has far-reaching consequences for dependents, and despite evidence suggesting that many deaths from injury occur so quickly, or the damage from an injury is so severe that death is unlikely to be prevented by treatment (Barss 1998).

Importance of Injuries

For certain individuals within Inuit communities, such as younger Inuit, traditional hunting skills and knowledge have diminished. The traditional mode of teaching and learning by which Inuit develop the skills to hunt safely and successfully no longer functions effectively (Aporta 2004). While subsistence activities remain important to members of the younger generation Inuit, in Greenland fewer are showing the same degree of commitment or interest in harvesting. The comment by one full-time hunter that “the younger generations are not out there hunting,” reflects a common sentiment of many hunters over 35 years old.

The decline in participation and interest in full-time hunting has been attributed to several factors. For instance, boys in their adolescence are no longer becoming physically involved in harvesting because of educational requirements. In addition, other factors include increased dependence on waged employment; language differences between generations; a lack of funds to purchase equipment; competition between hunting and alternative activities, such as playing computer games and watching television; and the desire to follow western social norms observed through technologies such as computers and television. This disconnection from the natural environment has wide-ranging implications. The ways in which TEK is developed and learned require the experience of being out on the sea ice or land and observing others on a regular basis. Few young Inuit are learning TEK in this way. While many younger Inuit hunt on occasion, such infrequent outings are insufficient for learning to travel and hunt safely on the sea ice.

The decreased involvement by Inuit youth in hunting and fishing activities is reinforced by the emergence of segregation between young and older generations. Older generations have an important role in the community – they act as an institutional memory, maintaining and sharing TEK, and taking younger generations out hunting. Interviewees in their 40s and 50s recalled how they went hunting regularly when they were young whether they wanted to or not because their fathers made them. This role is increasingly absent from the reality of younger Inuit. Younger Inuit that I spoke with complained about never being asked or told to go hunting. Reasons for the decline in participation of older generations are varied. For instance, Danish has replaced Kalaallisut, the language of Greenlandic Inuit, as the dominant language among younger generations, so the older and younger Inuit males experience difficulty in communicating with each other. In addition, older generations think that young Inuit are not interested in learning the traditional ways. In some cases, some older Inuit hope that their sons will achieve modern professions through formal education. A fisherman in Ilulissat told me, “My son isn’t interested in fishing – he spends all his time in sports at school. He wants to be a pilot, and I want him to do that. Fishing is too hard now to make a living.”

The shift from the traditional mode of teaching is seen by older hunters as placing younger Inuit at greater risk of accidents while traveling on the sea ice. Certain skills necessary for safe and successful hunting have been lost, including traditional forms of navigation and the ability to make snow shelters. Skills and information on what to do in certain dangerous situations, how to dress appropriately, what to take along on trips, and how to identify potential hazards are not being effectively transferred between generations. This is buffered to a certain extent by inexperienced hunters often opting to

hunt or travel with more experienced people. When younger generations go out on the sea ice without more experienced hunters, however, they are at increased risk for accidents or injuries.

Most injuries are caused by acute exposure to concentrated amounts of various physical agents or energy (Haddon 1980). A basic principle of injury prevention or injury “control” is to keep potentially harmful agents from reaching humans in amounts or at rates that exceed the body’s ability to withstand trauma (Haddon 1980). The concept of injury control helps to emphasize the importance of developing interventions that are designed to prevent injury-causing events, to reduce or prevent injuries during potentially hazardous events that do occur, and to enhance survival and minimize adverse outcomes when injury does occur (Haddon 1980).

Accidents and interpersonal violence are common causes of death and poor health in Inuit communities, particularly among young adult males (Bjerregaard 2001). Accidents have always been a hazard of the extreme natural environment and hunters were often exposed to high risks of accidents in pursuit of game. However, recent sociocultural change and the general availability of alcohol have added other dimensions to accidents and have caused an increase in accidents, violence and homicides (Bjerregaard 2001). Many fatal accidents are now alcohol related, and results of alcohol-related family violence are reflected in the healthcare, social service and criminal justice systems. In Greenland, during the first quarter of last century, accidents were second only to tuberculosis as a cause of death, and three quarters of all fatal accidents occurred among kayak hunters; none of these were alcohol related (Bjerregaard 2001). Other relatively frequent causes of fatal injuries included unintentional shooting and

hypothermia (Bjerregaard 2001). Today, by contrast, subsistence related accidents are still prevalent but excessive use of alcohol has become an important underlying cause. Despite the fact that accidents are an area of considerable public health concern, comparatively little research has been carried out on this topic among the Inuit and there is very little information on non-fatal accidents.

In a study on fatal accidents in Greenland, Danish epidemiologist Peter Bjerregaard (1990) found that mortality from accidents is lowest in Nuuk, somewhat higher in other towns and villages and highest in East Greenland. This geographical pattern is most pronounced for men (Bjerregaard 1990). The population group at the lowest risk is young and middle aged women living in West Greenland and the group at highest risk is that of young men living in East Greenland (Bjerregaard 1990). Compared to Denmark, mortality from fatal accidents is high among the Inuit of Greenland and the accident patterns vary significantly (Bjerregaard 1990). Mortality from falls is more frequent in the older population of Denmark (Bjerregaard 1990). Bjerregaard also observes that each age group has its own accident pattern. Among Greenlandic children, drowning and other accidents related to the traditional lifestyle, such as accidental shooting, fire and hypothermia, account for a majority of fatal accidents (Bjerregaard 1990). Among young adults, drownings are most common, while for the elderly, falls are becoming increasingly common (Bjerregaard 1990). Another pattern observed by Bjerregaard concerns the type of accidents in relation to the season. There is a summer peak for most fatal accidents, and according to Bjerregaard, this is likely due to an increased intensity of outdoor activities. Cold injuries occur most often in winter, and fire injuries show a peak during the last week of December. Bjerregaard suggests this

stems from the traditional use of candles combined with a high consumption of alcohol during the Christmas and New Year holidays. Over the week, fatal accidents are most likely to occur on Saturdays and least likely on Mondays, although the reason for this is unclear (Bjerregaard 1990). Bjerregaard estimates that 23 percent of fatal accidents are alcohol related. The study is based on information on death certificates and is probably a low estimate due to the under-reporting of fatal accidents, by as much as 25 percent. Bjerregaard (1990) concludes that the kinds of accidental deaths commonly experienced by the Inuit, such as hypothermia, animal attacks, drowning, and accidental shooting, are related to the traditional lifestyle of the Inuit and therefore “understandably more common” than in Denmark. One experienced Inuit fisherman that I spoke with shared his opinion of the situation:

Many accidents are from sailing while drunk and not being careful enough. Fishermen are very skilled and very aware of our limitations and when to not go out. If it's not safe, we don't go. If there is bad weather or more wind, we don't go.

This same fisherman goes on to assert that the traditional Inuit lifestyle may not necessarily lead to more injury “understandably,” but rather because of an increase of using new, modern technology, such as snowmobiles and high speed boats:

I would rather go with my dogs only, I don't like to be in a boat and snowmobiles are too dangerous, so I never use them. I think many people in south Greenland are taking risks by using snowmobiles. There are not as many people using snowmobiles this far north. It is much less dangerous to go with dogs. If I can go with my dogs, that is the only way I will go. If I go in a boat, I will go with my brother because he is a good driver. I do not use snowmobiles, but younger people are using snowmobiles more and they are very dangerous. We must continue to use dogs because they know how to avoid the bad ice if we don't see it. If you go through the ice, a snowmobile will be sure death, but dogs will pull you out.

He observes the increased use of snowmobiles by Inuit youth, which is a more risky way to travel across sea ice, and can lead to higher youth vulnerability to injury.

As mentioned earlier, risk-taking behavior can be linked to increased use of other forms of modern technology such as Geographic Positioning Systems (GPS), VHF radios, and the community search-and-rescue groups. While these practices may increase safety in some ways, these technologies may also lead to using less caution and some overconfidence resulting in hunters traveling in conditions that were previously considered dangerous. The use of modern technology does not necessarily reduce risk, and in some cases increases high risk-taking behavior, as some hunters and fishermen may view these technologies as a false sense of security. The introduction of alcohol also has increased accidents and high risk-taking behavior.

Summary

Although Inuit hunters are currently taking precautions to avoid exposure to potential injury-causing events, understanding the underlying reasons for injury provides the knowledge needed for prevention efforts. Some of the most vulnerable individuals in Inuit communities appear to be younger hunters and fishermen, who are travelling on the sea ice without proper knowledge of handling dog teams and understanding the characteristics of ice and weather. Traveling on ice is the single most risky behavior for the Inuit in Greenland. How the Inuit perceive the risks associated with climate change are influenced by cultural conditions, social structures, and power relations, which in turn shape decision-making processes. This information can provide a starting point for local agencies to review their current understanding about potential health impacts of risks, and to orient future resources and efforts on health related issues associated with climate

change. The following chapter will look at how issues of power and inequality influence access to resources and coping strategies for Inuit people.

CHAPTER 6

POLITICIANS, ECOLOGISTS, and HUNTERS

Introduction

Changing sea ice is having pronounced impacts on all aspects of life for the Inuit in Greenland. The livelihoods and identities of Inuit hunters are linked to hunting and traveling on sea ice. Because changing sea ice conditions are putting Inuit hunters at risk for injury, they have modified their subsistence strategies in recent decades. Accordingly, the risks posed by changing sea ice have given rise to new and different risks for many Inuit. They have responded in a variety of ways and with varying degrees of success.

Throughout the first five chapters of this thesis, I have discussed how climate change is affecting the Greenlandic Inuit. Specifically, the Inuit, who rely on the resources of the land and in the sea, and depend on safe travel on the sea ice, have seen an increase in new injury-related risk potential as a result of the changing conditions. In this chapter, I weave my analysis of these shifts and their effects into a discussion of coping strategies. This will include a discussion of the influence of global and local factors on coping strategies, and their effectiveness. I will also analyze both intercommunity and intra-community variation and coping strategies. Within Inuit communities, I will discuss variation in ways in which individuals respond to risk, such

as difference in coping strategies between men and women, between younger and older hunters and fishermen, and between hunters and fishermen.

This chapter explores the questions: how, and to what extent, have the historical political, economic, and cultural factors in contemporary Greenland shaped how the Inuit are able to respond to ongoing changing climate conditions; which Inuit are most vulnerable to increased risk of injury related to climate change; and what types of responses have Inuit made. I argue here that while Greenlandic Inuit are increasingly vulnerable to climate change, most are resilient. Most cope well with new stress that such change brings. However, others do not cope as well and they are more vulnerable to risks resulting from climate change.

In this chapter, I will continue to apply the critical biocultural theoretical approach in medical anthropology to my research on the Greenlandic Inuit response to climate change related risk. Following Leatherman, I specifically seek to shed light on the variation of the Inuit coping strategies through the lens of the critical biocultural approach.

Following a brief recap of this theoretical approach, this chapter discusses elements of the historical, political, economic and cultural factors that shape, and in some cases constrain, coping strategies for the Inuit in Greenland. I then describe the cultural attitudes toward and responses to climate change that I encountered during my field research in Greenland. My research findings take the form of a narrative, incorporating quotes from interview participants to illustrate the complexities involved in the Inuit strategies for coping with climate change. I also include a discussion of the types of reactions to risks resulting from climate change found among local and government

organizations and how these have impacted Inuit people's responses to changing climate conditions. The chapter concludes with some observations concerning the effectiveness of the coping strategies employed by Greenlandic Inuit. I argue here, that although historical political, economic and cultural factors pose limitations on how Inuit are able to respond to new risk, many Inuit are resilient and negotiate the new challenges through a diverse set of responses. In general, hunters and fishermen (irrespective of age) living in remote areas have less access to resources than those living in population centers. Therefore, remote locations pose additional risk of injury and offer fewer resources to adapt to those risks. I also argue that younger traditional Inuit hunters who live in more remote areas of Greenland and who have limited access to resources and diverse responses are the most vulnerable to new injury-related risk that result from climate change.

Theoretical Framework

The critical biocultural theoretical model is critical to my evaluation of how Greenlandic Inuit are responding to climate change related risk. In this section, I briefly review this conceptual framework to answer how it informs the discussion of the problem, and how it offers possible analysis of that problem. As McElroy and Townsend (2003) observe, health and disease are situated within a larger ecosystem which includes physical, biological, and cultural factors. A change to this ecosystem, such as a shift in subsistence patterns, can create an imbalance in the other factors and create new risks. The concept of adaptation is central to the ecological anthropological framework that McElroy and Townsend advocate. McElroy and Townsend (2009:15) define adaptation as "changes, modifications, and variations enabling a person or group to survive in a

given environment,” referring to a changing environment. For the Greenlandic Inuit, climate change has necessitated changes in subsistence strategies. Such changes include traveling on the sea ice with greater numbers of people, rather than solo, or investing in technology that may keep hunters/fishermen safe.

The inclusion of a political-economic approach to this study reveals the social processes and relations of power in historical context that have influenced responses to climate change, which ultimately have had health consequences. In regard to political economy and the biocultural approach, Goodman and Leatherman (1998) observe that previous usage of the concept of adaptation, including McElroy and Townsend’s use of this term in their ecological anthropological framework, has neglected to emphasize intersecting macro and microlevel socioeconomic structures that limit or facilitate people’s capacity to cope. They stress the importance of looking at larger political and economic processes and how they relate to local environments, which shape the conditions to which locals respond (Leatherman 1996). Leatherman (2005) later builds on this perspective of coping capacity as an ongoing process of change. Leatherman’s perspective of adaptation differs from McElroy and Townsend’s by drawing attention to power relationships and who has control over resources and labor. Using Leatherman’s concept of coping capacity as a process, as well as examining political economic structures and how they have changed over time, helps to understand how people currently cope with illness, how class divisions impact people’s health and how these coping responses have changed over time (Leatherman 2005). In this thesis, I am following Leatherman’s approach to understanding coping strategies to meet specific

goals, which consists of examining a variety of coping responses and highlights the social relations that constrain or deny people's access to resources and options.

The specific historical political, economic and cultural factors that underlie, shape and sustain situations that lead to increased injury-related risk associated with climate change are important to my thesis. In discussing the concept of vulnerability, Leatherman (2005) stresses the importance of setting the "contexts of local environments and social relations that structure levels of poverty and marginality, and to frame these local-level realities in broader histories and processes." I hope to illustrate ways in which historically specific politics, economics, geography, and sharing networks have facilitated or limited Inuit access to resources and equipment drawn upon as part of their coping strategies. In the case of the Greenlandic Inuit, the historical context must include discussion of over 200 years of Danish colonization.

Danish Colonial Rule and the Royal Greenlandic Trade Department

Political Economic Shifts

The Danish colonizers of Greenland established a pattern of political domination and social control over the Inuit. These forms of colonial control involved Christian missionary practices. As Comaroff (1991) observes, the activities of Western colonizers blurred the lines between the religious and secular spheres, making missionaries among the most powerful political figures. The missionaries linked to colonial governments used their power to erode the authority of local leaders (Comaroff 1991). Throughout Greenland, Lutheran ministers associated with the colonial administration managed schools, stores, and clinics (Dahl 1986). These new power relationships stratified Inuit

society and shifted the political decision-making power to the Danish colonial administrators.

Danish colonists introduced capitalism with trade and fisheries by way of the Royal Greenlandic Trade Department (RGTD) in 1721 (Dahl 1986). Local Inuit were not generally hired into management positions within the RGTD (Dahl 1986). While missionary activities and trade were integral parts of the colonial system, divergent interests eventually led to conflict between the two sections (Dahl 1986). Dahl observes that missionaries wanted Inuit to live near the mission stations, and the RGTD wanted people to settle near the trading posts.

There are political and economic reasons for the continuation of the power balance established under colonial rule. Since the beginning of the colonial activities, the Danes have created, established, and maintained power structures to exert control over the Inuit. The Danes have maintained these power structures to maximize their political and economic interests in Greenland. This dynamic is illustrated by the creation of fisheries that were originated by the RGTD, and the introduction of a market-based economy. This introduced social roles wherein Inuit serve as hunters and fishermen, and Danes hold administrative and executive positions, which are still maintained today.

Throughout colonial times, the Danes sought to explore, develop, and extract the natural resources of Greenland and they established political and economic systems to maximize the benefit of the relationship in favor of Denmark. This dynamic has taken different forms over time. Originally, the Danes maximized their connection to the fur, fish, and seal trade (*i.e.*, animal-based natural resources). Later, as melting ice exposed more of Greenland's dry land, the emphasis on resource extraction shifted to mines and

mineral extraction. While the resources themselves have changed, the central point is that the Danes have been able to maximize the benefit of Greenland's resources for themselves. The Inuit, meanwhile, were transformed politically and socially. The power structures were established early on and remained throughout Greenland's entire post-colonial existence: Danes have served as administrators, economists, and political officials, while Inuit have provided the labor and services associated with the Danish-led operations.

The emerging social, economic, and political stratification resulting from this power arrangement have had several consequences for the Greenlandic Inuit regardless of their geographic domicile. In general, the Inuit stopped living seasonally nomadic lifestyles and relocated near towns to be able to sell fish to the RGTD, as discussed in chapter three. As the economic systems in the population centers became entrenched, they impacted the coping strategies available to the Inuit over time. Many Inuit have come to rely on the availability of a commercial market for fish products and on salaried employment opportunities that are generated by a global economy.

As discussed by Leatherman (2005), in Greenland, as elsewhere, power relationships describe the processes by which certain individuals or groups assume control over resources and labor, and they can help us to understand how such control affects human health. Leatherman (2005) also points to the importance of historical context in analyzing human-environment interactions in relation to human health. As discussed in chapter three, colonial status affected Inuit lives on many levels. For example, Danish colonists controlled the church, national trade monopoly and schools, and required that local children attend school rather than hunt (Dahl 1986).

The colonists hired Greenlandic Inuit to work in the fisheries and created the infrastructure needed to sustain them, such as housing for local workers (Dahl 1986). This process disrupted the traditional structure of Inuit society and altered the power relationships in that culture. Danish Lutheran ministers and merchants became central religious and political figures and held economic power. Danish merchants were hired to manage stores and fisheries for the RGTD, while local Inuit sold fish and other animal products, such as fur, to the RGTD. Another coping strategy that Inuit employed was to embrace the modern conveniences that resulted from the new economic structure (such as framed houses), but needed to work in the fisheries to afford the houses. Following the colonial period, the impact of the colonists for later generations was at times beneficial, but only for a small group of Inuit in the larger population centers and towns. The majority of the Inuit, who live in remote and smaller areas, did not see a benefit from this diversified economy.

The changes brought by the Danish expanded the economy of the Inuit and introduced economic elements such as currency, capital, lending, and specialization of labor. This broadened economy in turn transformed the survival and subsistence strategies available to Inuit people. On the one hand, the RGTD diversified Greenland's economy by introducing specialized sectors not in existence in pre-colonial times, such as large fisheries, provided new and varied options for employment for Inuit people, and access to credit. These factors eventually allowed Inuit (especially those living in population centers) to create industries, such as markets associated with industrial-scale fishing. As these industries expanded and grew, they provided more efficient means for fishing and additional opportunities for self-sufficiency for many Inuit. On the other

hand, the power imposed on the Inuit political system and economic structure by the Danish proved to be restricting.

The Geography of Colonization

The political and economic aspects discussed above also included a geographic component, which has further shaped the ways in which the Inuit are able to respond to climate change. Political decisions in the 1950s and 1960s distributed significant investments in Greenland to a few major towns where the administrative centers were based, and neglected the smaller, more remote settlements (Dahl 1986). As a result, this geographical distance from administrative centers with infrastructure such as better-equipped hospitals and schools, access to the ferry, and trade placed rural Inuit at a disadvantage because they had fewer opportunities to access health care and better education, or sell fish to the RGTD (Dahl 1986). For contemporary Inuit who hope to find administrative employment with the government, formal education is increasingly important. To receive such education and ultimately employment, one must relocate to larger towns in Greenland or move to Denmark, and give up one's traditional lifestyle and social safety nets. To make this move requires capital, which most rural Inuit do not have. As discussed earlier, biomedical health care has replaced traditional health care methods, such as the role of the shaman. For this reason, medical centers have increased in importance. However, access to such medical centers is limited.

As Leatherman (2005) observes, "...penetration of capitalist relations into rural zones and the consequent rise in markets and commoditization of goods and labor drew rural producers further into a cash economy and significantly altered local social relations of production and reproduction." The global market economy has displaced rural hunters

by replacing traditional social systems based on trade and sharing with wage labor and a cash economy. Negotiating traditional Inuit lifestyles and new capitalist strategies can place hunters at greater risk of injury. As mentioned earlier, this contradiction leads to decision-making about hunting that must accommodate work schedules. This is coupled with increased dangers of unstable sea ice related to a changing environment.

Hunters and fishermen living in the more remote areas are exposed to more climate-change associated risk, and they have less access to the resources needed to combat that risk and adapt to the new conditions. The primary reason for this is the relative scarcity of resources – whether they be economic-, healthcare-, or technology-related - in the remote areas. In addition, hunting and fishing are the most common livelihoods in the remote areas, resulting in Inuit hunters and fishermen in these areas having the most exposure to risks related to climate change. Inuit hunters in the northern, more remote part of Greenland can leave their local villages, where they have social safety nets and family and friends to locate employment. By moving, they lose these safety nets, but they gain access to employment opportunities in the cash economies of the larger population centers. There, Inuit can work for cash in fish factories, work as tourist guides, or perform menial labor as janitors. Moving to the larger towns is costly, however, as the move requires seed money that is often lacking since the remote areas do not have well-established cash economies. In addition, most Inuit from remote regions do not have social connections in the larger towns, and therefore lack the resources those connections provide. Further, living in the larger towns is prohibitive due to higher rent and general higher cost of living, and because most jobs pay too low of a wage to earn a living. Additionally, many who relocate do not have the support of family or friends that

they would in their home towns. These impediments are barriers to entry into employment in larger towns for many rural Inuit, as they pose significant risks to those seeking access to the benefits of the cash economies in these towns. If itinerant Inuit are able to move to a larger town, but are unable to secure work, they often lack the funds to return to their villages. The negative consequences related to moving to urban areas reinforce the greater vulnerability hunters and fishermen living in remote areas have to injury caused by climate change.

The historical developments I have discussed continue to have pronounced effects on the lives of contemporary Inuit and their ability to cope with changing climate conditions. Contemporary Inuit who live in the more remote areas are more susceptible to injury because they rely on traditional subsistence strategies such as hunting and fishing, and have less access to the economic opportunities that exist in the administration centers and larger towns. Inuit in remote areas are therefore more exposed to the negative consequences of climate change (such as weakened sea ice). In addition, they have a harder time accessing health care if they are injured because medical facilities are limited throughout the country. Today, the remote Inuit have less access to hospitals and doctors in their villages. Danish colonial consolidation efforts also applied to schools: increasingly, young Inuit living in remote areas are unable to assist with hunting activities (such as taking care of dogs and hunting and fishing for the family) because much of their time is spent travelling to distant schools. This leads to greater risk of injury with increasing negative consequences of climate change, since many young, rural Inuit turn to hunting and fishing upon graduation from school. In other cases, they attempt to seek

employment in larger towns, with limited success. Finally, many who do secure employment often purchase snowmobiles, which also place them at greater risk of injury.

The impact of the colonial legacy is also evident for contemporary Inuit living in population centers. Although Inuit (almost exclusively those living in larger towns) were incorporated into market relations at the beginning of colonists' trade efforts, the authority of institutional representatives was mainly assumed by Danes or other outsiders (Dahl 1986). According to Dahl, this system remained for much of the two hundred years of colonization and situated many Inuit in roles as hunters or fishermen, rather than management roles. These power relationships continue to this day in part because they have become entrenched in Greenland society.

Culture

There is also a cultural element that influences Inuit options for employment. As discussed earlier, a strong cultural and economic tradition is for Inuit males to be socialized to become hunters and fishermen, and this position carries a high level of social clout and status. Typically, younger hunters are born into families that are poor today, and they remain poor if they try to make a living as a hunter in their village. This is in part because hunting options are limited, especially in areas with weakening sea ice. If hunting is limited, they often still have to try to work in low-wage jobs and hunt on the side as time permits. These limited choices effectively force them into hunting during periods when they know it is not safe, putting them at higher risk of being vulnerable to injury.

The activities of Danish colonists introduced social and economic changes in Greenland that continued through the decades. Locals seeking non-hunting/fishing

employment moved to work in the uranium mines eventually established by the Danish in the 1950s. However, these same people were displaced and out of work when unproductive and unprofitable mines were closed due to lack of profit for the colonists. By the 1970s, the closure of mines and other institutions further uprooted communities when people were forced to leave as services, such as schools and shipping stations, were concurrently shut down.

The legacy of the Danish colonial presence in Greenland has impacted the ways in which the Inuit are able to survive. As described above, the results have been mixed. In many ways, a broadened range of economic options and a system of market-based transactions has increased the choices available to Inuit. However, many Inuit, and in particular those living in remote regions, have seen their options reduced by the combined forces of colonization and changing sea ice. The abilities of the Inuit to then cope and survive in the face of changing climate conditions are shaped by the historical legacy of colonization. The extent to which contemporary Inuit are able to cope and survive also depends, to a large degree, on the types of resources that exist to help them transition. The next section of this chapter addresses these measures.

Home Rule Government

The current home rule Government of Greenland has undertaken several measures to protect its citizens from the effects of climate change. Since so much of the island's economic activity revolves around hunting and fishing, and since those activities are threatened by climate change, the Greenland authorities have tried to provide countermeasures and social safety nets for the Inuit. In this section, I discuss these

measures and analyze their effectiveness in mitigating the risks associated with climate change.

Several Greenlandic programs exist that attempt to address the political and economic issues associated with climate change. I met a fisherman in Ilulissat who broke his leg when his dog sled stuck to warm sticky snow, causing his leg to be pinned under the sled. Although he did not perceive this to be the result of climate change involving warmer temperatures, but rather his own fault, he was nevertheless unaccustomed to the snow conditions. The colder snow would have been more firm and the sled would have moved across the snow more smoothly. Because the injury prevented him from being able to work, he received financial assistance from the government, but he said that the funds were insufficient to cover his expenses and living costs. His understanding of this Government assistance program is as follows:

When there is a period of time of really bad weather you could get help from local authorities, but it is uncommon. If something bad happens, like you lose your boat, you can get some help from the government, not much, just enough to help so you don't have to move out of your house. They think it's good to have this in place and it's been like this since Home Rule started in 1979. Kind of like insurance, but not really, but we have had insurance for 20 years.

To compensate for the shortfall, this fisherman's family had to turn to other coping mechanisms. His wife worked more hours for additional income. When I talked to her about the situation, she told me that it is harder because she cannot spend as much time with their children, and they do not make enough money to cover all the family's expenses.

In addition, Inuit hunters and fishermen will likely lose this economic support system from the government in the face of political change. The Greenland local

government is moving to further separate itself from the Danish Government completely. The autonomy will mean greater political freedom, but it will also mean less access to the resources of the Danish Government. Social welfare programs will likely suffer as a result, thereby reducing available coping mechanisms for injured Inuit and increasing the risks they face. However, political independence from Denmark could mean that the local indigenous government would be more likely to advocate for hunters' and fishermen's rights and hunting and fishing quotas that would be more in line with traditional cultural practices. For instance, Finn Karlen, who is Inuit, and the Minister of Fisheries, Hunting and Agriculture for the current home rule government, attends national and international conferences about international whaling regulations, drafts white papers for publication regarding Inuit cultural importance of hunting and whaling, and advocates for Greenlandic Inuit hunters rights. His goal is to clarify and broaden the issue of sustainable management and utilization of seals in Greenland, while explaining that hunting has always been and is still an important part of Inuit cultural and social identity. Political independence could lead to greater government support of Inuit economic and social needs.

There exist numerous national economic policy responses to the climate change problem, both within Greenland and within countries across the Arctic region. The political response to the economic pressures caused by climate change has largely focused on the broadening of the local economy to expand beyond hunting and fishing. Specifically, government authorities have sought to expand the economic base of Greenland by easing restrictions on foreign mining and oil companies seeking to explore and extract Greenland's natural mineral resources. These measures coincide with

government-imposed restrictions on hunting; while hunting activities become more limited, the government is hoping that economic activity increases in the mining sector.

The local government hopes that rock and mineral exposed by climate change can be mined, providing opportunities for gas and oil exploration, as well as additional farming in south Greenland. The government hopes that these opportunities for natural resource extraction can help compensate for the lack of Danish assistance and facilitate autonomy. However, if this strategy does not eventually pay off, it will remove one of the few safety nets and coping mechanisms available to affected Inuit. Again, there is also a geographic component to the resource extraction strategy: many Inuit in the most remote areas of Greenland will not be able to hunt/fish and they will not have the means, training, location or connections to get cash jobs with these new mining and natural resource extraction jobs, and at the same time will not have access to a safety net since the Danish-provided welfare funds are drying up. Some Inuit perceive mining as a good resource because it can lead to political freedom. Others however, disagree and argue that the towns built specifically for mining are only temporary and those who move into these mining towns will be displaced after the mines close. They also argue that the mines will be owned and operated by foreign companies that will reap the benefits of the mine while they do all of the low-waged work and are left jobless when the mines close down.

The ability of the government to assist Inuit is limited by geography and Inuit culture. The majority of the Greenlandic Inuit were nomadic prior to colonization. The Danish modernized aspects of Greenland's society, culture, and economy. As a result, many previously nomadic Inuit are now confined by the infrastructure of modernized

society, but are not the beneficiaries of the potential advantages of modernization. This situation is described by a hunter from Uummannaq:

A couple of years ago the government admitted that there is [climate] change and they are making a campaign to raise awareness. It doesn't help here, but in big towns. Politicians have taken it up, but they aren't discussing the real cause, but instead that there are new opportunities, like farming. This does no good for Uummannaq. If climate changes are man-made, the rest of the world should try to do something about it. They are only looking at new opportunities for business, and also mining from the outside. ALCOA will start an aluminum mine in Manitsaq and import workers because it's a small town. Tourist organizations are branding Greenland as pure, so conflicting interests make it difficult.⁵

As shown above, in response to climate change, the Greenland Government is directing efforts to farming and mining, and consolidating its administration centers. In so doing, it is overlooking the traditional hunting lifestyle of remote areas of Greenland, and hunters and fishermen feel that they are losing their culture because this traditional subsistence strategy is not the focus of the government.

Settlements such as Uummannaq and Ikerasak, the northern and more remote regions, are the areas that will likely benefit the least from government efforts aimed at mitigating the impacts of climate change. New opportunities are currently arising, but not for the people who live in these regions. The situation is compounded by the fact that, while the people in the northernmost regions are most susceptible to the adverse effects of a changing climate, they also have the least access to measures designed to mitigate the climate change. Accordingly, the most vulnerable among the Inuit are the least likely to be able to cope with the new conditions. By contrast, administrative

⁵ "World of Greenland" is the local Ilulissat tourist monopoly, regulated by the government. They hire local hunters and fishermen to guide tourists in the area.

centers such as Ilulissat and Nuuk will provide greater job opportunities for Inuit living in these towns with respect to Government employment. Rural-to-urban migration is increasing due to these differences in employment opportunities in each area, and this has led to social problems. For instance, rates of violence and homicide are increasing throughout Greenland and are often explained through a discourse that emphasizes the rapid social change that has occurred since the 1950s, with the emergence of urban areas and increasing migration, and its effects on traditional society and culture (Larsen 1996). Larsen (1996) argues that this phenomenon is usually seen as one of many social problems that come from a society out of balance.

Changing Gender and Household Relationships

In addition to economic and geographic determinants, gender also plays a role in Inuit subsistence strategies and diversity in coping responses. Responses to climate change are not limited to individual men, since women and families are also affected. The gender distinctions in employment are noticeable regarding salaried employment, and more women than men attend college in order to obtain administrative positions with the Government as a coping response to modernization. The traditional division of labor was based on gender; men hunted and women divided the catch and made clothing out of the skins (McElroy et al. 1979). Women's contribution was as important to society as men's and they were responsible for processing the hides, sewing and designing waterproof, wind-tight and warm garments, without which human life in the Arctic would not have been possible (McElroy et al. 1979). Rasing (1994) argues that for the Inuit, the contemporary challenge is to "re-embrace" certain positive traditional ways and values

while responding to and proactively creating new ways and values. Changes in female well-being across cultures are linked to changes in the gender balance of power.

Dybbroe (1998) observes that among Greenlandic Inuit, a much larger proportion of employed women (38 percent) than of men (18 percent) are found in salaried jobs. According to Dybbroe, women typify the break with tradition or the cultural changes that have resulted from economic development. Because of women's key role in the family and many women's relation to the labor market, women also represent the "social and economic continuity" of the family (Dybbroe 1998). The increasing social division of labor and stratification by ethnic and class criteria has led to new forms of control of labor and resources, which are rooted in structures outside the household (Dybbroe 1998). Within recent history, the household economy was based on traditional cultural premises of internal self-organization of production, freedom of mobility for members, and close contact with the natural environment (Dybbroe 1998). Yet these cultural values are mainly part of the basis of the traditional male role (Dybbroe 1998).

According to Rasing (1994), the social rules governing gender relations may be suspended out of necessity during a time of crisis, wartime, or for the Inuit, managed development and resettlement. Although this is not necessarily "a time of crisis," adjustments related to climate changes have created a space for women to work outside the home for wage labor. For Greenlandic Inuit, environmental changes that are associated with climate change have altered ways in which hunters and fishermen carry out their work which influence the household. As I stated earlier, Leatherman (2005) observed that capitalist relations have penetrated rural areas, causing families in rural communities to rely more on a cash economy. For Inuit, it has become necessary for

women to work outside of the home more than previously experienced in order to meet the needs of the household. Therefore, an important coping strategy to climate change for women is to work as wage laborers outside of the home.

In contrast to how Inuit men perceive climate change, Inuit women understand climate change as indirect, and having an impact on social change. They pointed to increased domestic violence, drug use and the development of gangs in the capital city of Nuuk as resulting from the way climate change has altered hunting and fishing activities. For instance, one Inuit woman who was raised in Nuuk, but was living in Ilulissat to attend college claimed:

There are many changes coming from climate change, and also from social problems. Some of the social problems come from climate change – it is harder to make a living as a fisherman or hunter because there are less fish or animals and then there are restrictions, and they don't know how else to make money, so they watch TV and drink and get depressed and neglect their families. I've been lucky, but I know that abuse is more common now than in the old days. Children have it the hardest, they don't see hunting as a way of life, but they don't see any other way, so they turn to drugs and video games and in Nuuk there are gangs, like you have in America. Climate change is part of the problem, but it's not what people are talking about. People are talking about limitations and making sure to get their share of fish.

Regarding new dangers or injury that are related to climate change, some women point to outsiders experiencing problems, rather than locals. They feel that because learning to navigate the environment is something the Inuit learn and practice throughout life, they are better suited to stay safe in light of changing environmental conditions than are visitors to their communities. For instance, one woman observes:

I think tourists get too close to the dangerous areas. We are Greenlanders so we grew up knowing how to move around on the land and avoid dangerous places, but tourists come here and they don't know and they go hiking and the weather changes so quickly now when they are out on a walk, but they don't have the gear or

equipment to make themselves safe and they get lost in fog or can't find their way back to Ilulissat and we have to go save them.

Injuries related to climate change that Inuit women have observed include sunburn, snow blindness and headaches. Women's coping responses to these ailments include wearing sunscreen more, telling their children to do the same, and avoiding spending much time outside when it is hot and sunny. Women experience and understand climate change differently than men as they discuss it in terms of larger social implications, or challenges that others, such as tourists or male family members may face. They also have turned to waged or salaried work to contribute to their family's income.

Local Government Responses

The local government's response to climate change has produced mixed results in assisting the Inuit. The programs initiated by the Government are benefitting primarily those Inuit in population centers and those with access to the mineral extraction jobs, but overlooking the majority of Inuit who live in villages and live a traditional lifestyle. In addition to its efforts to broaden Greenland's economic base, the Government of Greenland has taken other steps to address climate change and assist the Inuit. For example, the Government has recently enacted several restrictions on hunting and fishing certain species in specific areas in Greenland in response to changing climate and environmental conditions. Several of these measures directly impact the hunting and fishing communities, and the Greenlandic Inuit way of life. For example, in 2006 the Government implemented a quota on hunting polar bears, which was intended to protect dwindling populations. However, because hunting and fishing are the chief means of

subsistence in Greenland, this response is frequently met with skepticism and cynicism by many Inuit.

My research revealed a general disdain towards government policies that many hunters and fishermen find too confining and limiting. One fisherman told me that “the government tells us that we can’t hunt and fish as much as we need to in order to make a living.” Another mentioned:

I don’t agree with the restrictions and limitations that the government makes on us. The decisions are coming from biologists and not hunters and fishermen. We know how to make our own limitations to keep the populations strong. It is bad for us if we hunt or fish too much, so that is why we do it enough to keep the populations healthy. But now there are too many *narwhal*⁶ and we can’t hunt them.

Just as the Greenland Government has implemented hunting restrictions, international organizations, such as Greenpeace, have likewise tried to address the climate change in Greenland. However, there is widespread disregard for many of the international and national environmental programs implemented in Greenland among the Greenland Inuit. For instance, one hunter described his perspective of how the impact of environmental and government programs make it more difficult to maintain a job as a hunter.

It’s hard to make a living and pay rent, that’s why there are fewer hunters. Also, Greenpeace makes the whole world destroyed – they destroyed our culture. They already decide too much and how and what to hunt. They are too harsh on hunters, I don’t like their rules. The government doesn’t talk to hunters about what decisions to make that are about them. They make stupid decisions. There are more whales now, but we can’t hunt them because of restrictions. It makes it hard to be a hunter as your main job. The whole world is telling Greenland what they can’t hunt.

⁶ A *Narwhal* is “a small arctic whale, about 6 m (20 ft) long, with a spotted body, short flippers, and, in the male, a long twisted ivory tusk. It was formerly hunted for oil and ivory” (Encarta World English Dictionary 2009).

Another hunter expressed his frustrations with the government restrictions:

There are many limitations now on hunting, especially polar bears. The district is only allowed to get a certain amount of animals. They send biologists from Denmark to tell us how many we can get.

In general, these ameliorative programs are met with disdain by Inuit hunters because they have negative effects on the economic livelihoods of the hunters. Many Inuit feel that the programs designed to address climate change (and ostensibly to protect the Inuit) are causing additional hardships. In addition, Inuit people have historically practiced conservation and sustainable resource management as a cultural coping strategy to maintain healthy animal populations (Caulfield 1997). However, this knowledge has been disregarded by government officials and outsiders. The Inuit Circumpolar Council (ICC), an international indigenous organization that represents Inuit people living in Greenland, Canada, the United States, and Russia, advocates the interests of Inuit whaling communities. They work with Greenlandic Inuit to ensure that their voices are heard and respond to environmental organizations and outsiders that impose hunting restrictions without considering the effect on the people living in these areas. Overlooking Inuit traditional ecological knowledge and stewardship and managing resources based on outsiders' understanding of Inuit people's relationship with the environment results in cultural disruption and stress, economic difficulties, and in some cases, ecological imbalance (Caulfield 1997).

Climate change is placing increased pressure on existing quotas in the management of natural resources in Greenland. This is important for Inuit hunters, because as the government increases restrictions on which animals can be hunted and at

what times of the year, flexibility in responses to environmental change is reduced. That is to say, the options for coping strategies available to Inuit diminish further with this type of Government response. Inuit hunters argue that the government does not take local variables into consideration. This can lead to hunting at untraditional times of the year that may be more dangerous, thereby putting them at a greater risk for injury. These hunters feel that they have no choice but to respond to both the changing sea ice as well as the new restrictions. But the regulations limit their access to hunting certain animals at certain times of the year, reducing flexibility. For the Inuit hunters, these regulations are intersecting global and national level influences and exertions of power on local realities, as described by Leatherman (2005).

Local Organizations

All towns and settlements in Greenland have a large number of voluntary organizations. For example, *Kaallit Nunaani Aalisartut Piniartullu Kattuffiat* (KNAPK), the national version of the Hunters' and Fisherman's Organization, is open to anyone who hunts or fishes, not only indigenous hunters and fishermen. At the national level, KNAPK negotiates price trades of animal products with the RGTC and trading conditions are agreed upon by both KNAPK and the RGTC. The Ilulissat branch of KNAPK, for instance, is important for the management of local hunting and fishing issues. Therefore, when serious disagreements arise concerning rules and regulations of beluga hunting and sharing, the matters are discussed at a meeting of KNAPK in the community hall. The meetings can be heated at times, but the decisions made are considered binding to the whole community, not just members of KNAPK. Practical arrangements for allocations

of caribou and whale quotas are made through KNAPK, and besides having a function as regulator of customary rules, the association also exerts a certain authoritative role.

KNAPK members also attend meetings and conferences with the International Whaling Committee (IWC) to express local Inuit perspectives. The chairman of KNAPK has also responded to IWC quotas that are placed on Greenlandic whaling communities through the Government of Greenland, in the Greenlandic press, "...whale hunting has great economic significance for Greenland's population. Anyone with knowledge of whales or who follows these issues cannot help but recognize that the stock of whales, and especially the larger whales, has clearly grown in recent years. We will urge Denmark to leave the IWC, because these demands cannot be accepted..." (Caulfield 1997).

Many hunters and fishermen see KNAPK as having a role in implementing and mediating the Government's policies in response to climate change, and most hunters view KNAPK as working in the interest of the majority of Inuit. For many Inuit hunters, KNAPK represents a vehicle for political and economic discourse and action. It serves as a bridge between the loosely-organized groups of hunters and the Government agencies located in the population centers, and is the most direct and cohesive political organization available to the Inuit. Through KNAPK, the Inuit are able to direct policy and trade practices in ways that most favor their economic and political interests. Organizations such as KNAPK have therefore eased the burden as the Inuit have adjusted to climate change and economic hardship. For those that benefit from its practices, the union has proved a valuable tool in modifying subsistence strategies.

Ecologists in Greenland and abroad have also influenced and initiated policy aimed to address climate change in Greenland. Measures such as restricting whaling of non-indigenous groups, and those who do not hold a full-time hunting and fishing license have seen moderate success in curbing certain practices associated with accelerated climate change, but they have not always helped the Inuit.

Inuit Responses to a Changing Environment

In addition to local and ‘outside’ organizations, such as national and international NGOs, the Inuit themselves are modifying their behavior in an attempt to subsist and survive in a changed Greenland. Regarding coping responses, hunters are making additional preparations before hunting excursions to mediate the increasing risk of getting injured or stranded (Krupnik and Jolly 2002). Many hunters and fishermen now take extra food, gas, and supplies, as well as identify safe areas where they can get shelter during summer boating (Krupnik and Jolly 2002).

Other coping responses seek to reduce the likelihood that dangerous conditions will be encountered while hunting. People are becoming more “risk-averse,” avoiding traveling on the land or water if they have reason to believe the weather is going to be bad, avoiding dangerous areas, avoiding traveling at dangerous times of the year, returning quickly when weather conditions turn, and generally being more cautious when engaged in day-to-day activities (Fox 2004). Modifying hunting practices according to hazards posed by changing sea ice allows the Inuit hunters to mitigate risk and cope with environmental hazards in their daily lives.

These responses are mainly initiated by more experienced hunters who encounter changing climatic conditions through experience. They share this knowledge through

informal means with young or inexperienced hunters who travel with or seek advice from these local experts before hunting. This kind of information is also communicated through radio communications, at grocery stores, and verbally among friends and family.

The Inuit engage in a variety of other responses in coping with climate change. For example, hunters, who used to travel solo, now often travel in groups because weakened sea ice calls for additional navigation and safety roles. Through practices such as these, self-sufficiency has given way to a reliance on intra-communal resources. One hunter with whom I spoke had lost his team of dogs to a break in the sea ice. Unable to hunt on his own, he sought out another former hunter who owned a fishing boat, and by hunting with his friend, he was able to keep working. This hunter believed that if his friend did not have a boat, his only other option for work would be to move to Nuuk to work as a janitor for (low) wages.

Those who can afford them are making technological adjustments (Ford 2004). For example, GPS devices allow hunters to detect movement in the ice while hunting on the edge of *ice floes*⁷. This technique allows them to track the distance travelled and navigate through an ice pack or across open water. The more widespread use of VHF radio, even on short trips, allows the community to be contacted in emergency situations. The posting of satellite images of the sea ice in the local town offices alerts hunters to possible dangerous areas (Ford 2004). Equipment used during hunting and fishing has also been modified. For instance, more powerful outboard boat engines, which allow for less time spent on exposed water, are being used. Hunters are also taking along small rowboats to safeguard against the risk of being stranded on drifting ice (Ford 2004).

⁷ Ice floe: “A sheet of floating ice” (Encarta World English Dictionary 2009)

While procurement-based responses prove to be quite effective in mitigating a more dangerous environment, they are insufficient as a larger coping response.

Moreover, procurement as a coping response costs money, and many hunters and fishermen lack access to savings or earning potential. For those individuals, their economic situation renders them increasingly vulnerable and unable to cope well.

For many Inuit, TEK provides a base of knowledge that can be a resource and coping mechanism in the face of a changing environment. Knowledge about ice, weather, and hunting techniques has served as the Inuit blueprint for survival in a harsh arctic environment for generations. Inuit hunters and fishermen have relied – and expanded – upon this knowledge base, and it has become an integral part of Inuit culture in Greenland. However, for some Inuit communities, TEK has been eroded in recent decades. Many young hunters turn to technology that essentially replaces TEK; for example, they use snowmobiles for travel on the ice, and lose the knowledge of how to effectively and safely travel via dogsled. Many of these younger hunters believe that TEK no longer applies, at least in whole, since the environment has changed so drastically in recent years. For many younger Inuit, TEK is not as effective a coping strategy. Thus there have arisen divisions within the Inuit communities regarding the effectiveness of TEK in contemporary Greenland. Since the use of TEK as an effective and reliable coping response has been inconsistent because of rapidly changing environmental conditions, local communities will need to address these changes and continue to develop their knowledge of the environment and climate conditions in relation to climate change.

The fact that multiple and varied factors influence the coping strategies available to the Greenlandic Inuit is evidenced by two individuals I interviewed during my research. Their experiences underscore how multiple variables determine the options available for them to cope with climate change and its associated risks.

The first individual, a hunter in remote Uummannaq named Jacob, explained how an incident on weak sea ice caused him to lose his entire dog team. After weakened ice rendered his familiar hunting locations unsafe, Jacob was hunting in an unfamiliar area when his dog team and sled broke through the ice. Because he did not have a radio, rescue was unavailable and he lost everything in the incident. After the incident, Jacob was forced to rely on his community for food while he worked for two years to rebuild his team and purchase a new sled. Because he re-built his dog team from scratch, his dogs were all young and inexperienced, and posed more risk than an experienced or mixed team would. To rebuild his team, Jacob turned to fishing to earn cash and relied on other hunters to take him out hunting. In Jacob's case, there was no physical injury caused by the incident that took his team. However, there was a good deal of psychological trauma and economic repercussions caused by the incident. In addition, Jacob's geographical location in the comparatively remote northern town of Uummannaq further limited his options for recovering from the accident. Greenlandic political arrangements further impacted Jacob's available coping strategies: the Government is consolidating its administrative centers throughout the country (from fourteen to four), thereby reducing access to the services available to people like Jacob. In addition, this new administrative arrangement has stopped the supply ships that used to provide towns in the north with goods. Jacob's case shows how a wide range of factors determined the

options and coping strategies available to the Inuit following a climate change-related incident.

Another example concerns an Ilulissat fisherman named Carl. Compared to Uummannaq, Ilulissat is a larger town, with established tourism and research industries. While Carl and his crew were fishing in a fjord, an iceberg halved and crushed Carl's boat. He and his crew escaped, and because Carl had a High Frequency (HF) radio, he was able to call for a helicopter rescue from Ilulissat. After his boat was destroyed, Carl resorted to fishing only in areas accessed by dogsled. However, because fishing by boat can be more efficient than fishing by dog sled, losing his boat posed significant economic hardships on Carl. Like Jacob, Carl was not physically injured in the incident caused by climate change-induced risks. However, these cases illustrate the numerous secondary risks associated with a climate change-incited incident. It is evident that risks are present in all stages of existence for Greenlandic Inuit, even when physical injury is not present.

While Greenlandic Inuit people's responses to basic subsistence strategies are designed to mitigate the risks associated with climate change, the strategies themselves frequently pose new risks and hazards (Leatherman 2005), including economic difficulties, for hunters and fishermen. These risks are often most pronounced in the economic lives of Greenlandic Inuit. For example, many of the responses to changing climate conditions require cash. Because many Greenlandic Inuit subsistence hunters and fishermen do not have reserve money, they are forced to work as wage laborers. Wage paying jobs are limited in scope and supply, and interfere with the traditional subsistence practices of hunting and fishing.

In addition to the economic risks, coping strategies also pose physical and psychological risks for many Inuit. For example, changing sea ice conditions might require fishermen to fish in new and unfamiliar areas, which are in many cases far from their homes. Traveling long distances for fishing/hunting separates people from their families and communities, and in turn may lead to social problems, such as violence or alcoholism. Some fishermen I interviewed, who do not own boats, spoke of having to use another fisherman's boat in cases where weak sea ice rendered dogsled travel unsafe. While seeking a boat in this case is a coping response, the situation itself posed several new hazards to the fishermen: they can become further indebted, become reliant on another fisherman's schedule, subject to the risks inherent with boat travel, such as the risk of an accident with the boat, and subject to the time requirements of that form of fishing. There are also instances where fishermen do not have the necessary skills to manage boats. This lack of experience can lead to additional risk.

Although most Inuit are affected by climate change, different groups are affected in different ways. Earlier I assessed ways that Inuit women's experiences and understandings of climate change differ from Inuit men's. Below, I illustrate this point by briefly discussing how climate change is experienced differently by older Inuit as opposed to younger members of that society, and by hunters as opposed to fishermen. Just as these groups are affected differently, so too do they respond and cope differently.

Age: Younger and Older Inuit

Chapter Five discussed the varying ways in which the Inuit perceive climate change and its associated risks. That section alluded to several internal divisions within Greenlandic Inuit culture on the issue. Climate change affects both young and old in

Greenland, but age groups respond to its effects in different ways. Older hunters and fishermen rely more heavily on traditional ecological knowledge than do younger hunters and fishermen. In general, younger hunters and fishermen are at greater risk because they do not rely as heavily on traditional ecological knowledge. Accordingly, older people's depth of traditional knowledge is an asset in coping to climate change, since the knowledge can be applied to new lifestyles in a changing environment. Younger Inuit have an advantage in that they appear to be more adept than older hunters at implementing new technologies such as snowmobiles and GPS. However, since these require cash, they are not always available to either hunters or fishermen. In addition, as mentioned earlier, the use of new, modern technologies can cause increased risk with more risky behaviors related to over-confidence in the equipment. There are also different risks associated with various methods of travel on the ice, and this factor has an age dimension as well. Younger hunters are more inclined to use snowmobiles, but they are not always familiar with a technology that is relatively new to many Inuit. Older hunters, on the other hand, tend to rely more on dog sleds, which is a more proven (and often safer) mode of travel on the ice.

The degree to which Inuit hunters are able to access resources for adapting to climate change is also divided by age. Young hunters, by and large, lack access to resources that might help prevent injury. Conversely, older hunters have greater access to these resources (including TEK, as mentioned above, but also deeper and broader family networks).

Youth living in remote areas and having limited access to resources influences and increases their vulnerability to risk and limits their ability to respond to climate

change related risks. These factors, along with having limited knowledge and skills related to hunting and fishing, make them the most vulnerable to new injury-related risk that result from climate change.

Occupation: Hunters and Fishermen

Both fishermen and hunters are adversely affected by climate change, which by definition alters the environment in which they earn their livelihoods. There are important differences in the coping strategies and responses used between these groups, however. Fishermen rely more on sharing boats or using larger boats. Sharing boats is risky if the new users are not familiar with the boat. Likewise, using larger boats is risky as well since fishermen are more likely to pilot them further out to sea where icebergs become more of a present danger. In addition, larger boats tend to venture out into open waters, increasing the likelihood of getting stranded in the event of storms or mechanical failures. Larger boats tend to be riskier because they lend users a false sense of security. Hunters, by contrast, tend to travel farther to new and unfamiliar areas by dog sled, rather than switch from dog sled to using boats.

One fisherman from Uummannaq discussed how a changing economic landscape and changing sea ice has caused him to modify his behavior.

It's more difficult now to be a fisherman and hunter for the main occupation now. You can't earn enough money to make a living – we have to pay rent now. So we are fishing less in the last ten years. For ice fishing, this winter is almost normal and there are more fish now, but we catch between 20 and 30 percent fewer fish during the sea ice season and the rest is not from ice fishing, but from a boat. So we are mostly fishing from a boat anymore. I have a pretty big boat. But the even bigger boats are owned by more than one fisherman. Then you have to earn more money now to keep it going. Sharing a boat changes the way we fish or hunt because then you are business partners and share a business, instead of hunting for subsistence. There is no motivation to get a bigger boat because you work more,

but not for more money. The fishing rules are dictated by the EU saying how we can fish or hunt – it has nothing to do with the climate changes, but with hygiene. They're the ones buying the fish.

As observed by this fisherman, economic and lifestyle shifts, such as paying cash for rent in houses and purchasing and sharing larger boats with multiple fishermen has increased the challenges of everyday life for Inuit who work as full-time hunters and fishermen.

There is also a degree of interplay between hunters and fishermen that illuminates many of the different challenges each group faces. Hunters who wish to continue to hunt for their occupation must now contend with increased dangers due to weakened sea ice. This leads them to hunt in new and unfamiliar areas, which in turn increases the likelihood of hazards. To mitigate such hazards, these hunters are frequently turning to fishing to make money as their hunting becomes more dangerous. The hunters previously hunted largely for subsistence; now, faced with shrinking hunting grounds, they frequently turn to fishing. For those hunters, fishing provides a source of income as well as a source of food. The hunters are using dogs less frequently since they have less areas to run sleds. Instead, they often rely on boats, a practice which also poses new risks and hazards. The above represent coping strategies that hunters employ, and also show how behavioral modifications as coping responses often lead to new hazards.

Interestingly, different men have different responses to climate change and their motivations for their chosen coping responses vary. Some hunters fish more so they can earn cash, as fish have far greater resale value (particularly in export markets). Some fishermen fish less and pursue other options for income because they only have dogs and

a sled, but no ice on which to travel. Since they cannot afford boats, they often quit hunting or fishing and seek employment in the population centers.

Resource Use Diversity and Flexibility

Regardless of age, gender, or occupation (*i.e.*, hunter or fisherman), it is clear that Inuit survival will depend on the use of diverse coping responses and flexibility with natural resource use. These are widely recognized strategies for managing risk (Adger 2000). Although coping responses frequently introduce new risks to the Inuit, they also are often effective at thriving in spite of the conditions of climate change. The tendency of Arctic environments to fluctuate has caused many Inuit to employ diverse hunting skills (Krupnik 1993; Berkes and Jolly 2002). Balikci (1968), for example, demonstrates how, during periods of ecological pressure, the Netsilik Eskimos would use alternative hunting strategies. Sabo (1991) has shown how Inuit on South Baffin Island coped with environmental stresses of the Little Ice Age by rescheduling their hunting excursions. Changes in livelihoods and subsistence strategies vary among Arctic communities. For example, different animals will be hunted at different times of the year depending on a community's knowledge of the environment, their past experience, time constraints and access to technology (Krupnik and Jolly 2002). These are a few examples of how TEK is continually shaped in relation to changing climatic conditions. What remains a challenge is keeping up with the rapid pace of the changes that are occurring.

The more diverse responses to risk a hunter or fisherman makes use of, the less vulnerable that person is to the risks. As mentioned earlier, diversity in responses to climate change related risk is influenced by social processes, political and economic conditions, including access to resources, and geographic location. Those who are the

most vulnerable are those who live in the most remote settlements, those who are poor, and are younger hunters and fishermen because they have less access to skills or technology or the combination of both to allow for diversity and flexibility. Those who live in remote areas are the most vulnerable to injury related to climate change because they have less access to resources to prevent or respond to new risks. For instance, as discussed earlier, there are fewer options for wage labor in remote areas that could provide Inuit with the cash needed to purchase new technology, such as GPS units or HF radio that they could use to avoid dangerous areas. Inuit people living in remote areas are also farther from health care services, so responding to an injury may be delayed, which could exacerbate the situation. The following observations illustrate the importance of diversity and flexibility in contemporary Inuit subsistence strategies. One individual commented on environmental and economic fluctuations that make flexibility necessary:

I don't think the biologists know that Greenland is a very big country and how the animals travel looking for more ice. If they aren't here, they are somewhere else, looking for cooler water and for ice. When it gets cooler here, they come back. It has been like this before. The animals know where to go and we know how they behave. But now it is more difficult for us. Sealskin was worth more money until the 1970s. Most people could be hunters then. Now most of the money we can make comes from fishing. Seal prices went down, so now we fish more. In the 60s we could sell sealskins and blubber from seal and oily liver from sharks to Royal Danish Trading Company, (since the 1750s), and we could sell catfish skin for shoes. Modern times came later to Uummannaq, Upernavik and East Greenland. We have been selling cod since 1929. Now it is harder to make enough money to live.

Another hunter discussed the ways in which he has modified his subsistence strategies according to changing conditions. This individual's experience illustrates the ways that

variables such as geography, access to resources, and availability of community networks dictate economic behavior:

I fish more now than I used to so I can make more money. Then I have to travel in a boat; sometimes I can fish with my dogs, but usually if the ice is good enough for dogs, then I am hunting, not fishing. But if the ice isn't good enough for dogs and my brother is going out in his boat, I will go with him and fish. Sometimes I have to travel with my brother in his boat for fishing when I have not made enough money from hunting from the winter. Now there are restrictions for how much you can hunt, so if I make the limit, I must fish. It is no good this way.

The case studies above show the ways in which the Inuit are coping with climate and political-economic change in Greenland. The diversity of responses, whether successful or not, is indicative of the struggle faced by the Inuit in Greenland.

In this paper, I have argued that the best chance for survival in many Inuit communities is the utilization of a diversity of coping responses to ameliorate climate-change induced stresses. A wide array of coping responses, in general, helped Inuit hunters to avoid the injuries associated with climate change. However, in many instances, the responses employed to avoid injury do not necessarily benefit the Inuit economically or socially. Consequently, at times Inuit efforts to avoid injury do not correspond to an improvement in the overall well-being of the communities or the individuals in those communities. In those situations, the diversity of responses to possible injury might weaken the group or individual's ability to thrive in a larger economic sense. As BurnSilver's (2007) research showed, the stress caused by employing a diverse set of coping responses does not necessarily enhance the group or individual's economic position; in fact, at times it might serve to weaken it.

BurnSilver's (2007) work in Africa applies to my analysis of the Greenlandic Inuit. She found that populations in a given tribe share many of the same social traits and tendencies, but they are not homogenous (especially in terms of coping responses). BurnSilver found that within Maasai populations, different individuals have access to different resources, and this range manifests itself in the ways that individuals are able to address changes in their environment. In addition to varying within the community, BurnSilver found that the diversity of coping responses changed over time and were dependent on a variety of external factors. For example, trends towards privatization of land decreased the Maasai patterns of mobility. Although the privatized land appeared to create a coping response, the sedentarization that accompanied it caused unanticipated economic and social stress.

My research showed this dynamic play out in many Inuit communities. Moving to larger towns is one coping response used when life in remote locations becomes too risky. Inuit hunters who leave their communities to look for work in larger population centers leave behind social networks that provide them with food, housing, and work. Moving to towns like Nuuk can provide new economic opportunities, but it also poses new risks and may actually result in worse overall conditions. In larger towns, hunters from remote locations often do not know anybody, and therefore do not have access to the social networks and the resources those networks provide. Moving to new towns also increases the negative consequences if hunters are unable to find work or if the work they find is insufficiently lucrative. The economic consequences become more pronounced if they cannot pay to live in the larger towns and they are unable to compensate financially for the loss of the social safety net provided by their village networks. In these instances,

employing a diverse response to climate-change associated risk can lead to unforeseen stress, and might actually pose new economic, financial, and social risks.

Summary

Throughout this chapter, I have shown the ways in which the historical political, economic, and cultural conditions in Greenland have shaped the lives of the Inuit. As climate change has accelerated in the Arctic region, these factors have come into sharper focus. These elements determine the range of responses available to the Inuit in struggling to cope with changing climate conditions.

Flexibility is the key in negotiating climate change related risk for those Inuit who successfully cope with the new conditions. In essence, there is a direct correlation between the array of responses available to individuals and the likelihood that an Inuit person will cope well and thrive. Those responses available to Inuit individuals are, in turn, directly determined by the historical, cultural, economic, and geographical factors discussed in this thesis. They are also influenced by age, gender, economic status, and type of livelihood activity.

The Inuit, faced with a worsening climate change scenario, are constrained by historical changes that have occurred in their communities and geography in terms of the ways in which they respond to their changing environment. Those who live in more remote villages are more vulnerable to injury related to climate change. This is because hunting and fishing are the most common livelihoods in those areas, with the most exposure to risks related to climate change. Limited access to health care, education and alternative economic activities can also place Inuit living in more remote areas at greater risk.

As Greenland's climate and land change, geography becomes more important in determining how Inuit are able to modify their behavior and respond, and my research showed clear intercommunity variables (especially between small towns and larger population centers). The towns where Inuit live play a role in the degrees to which coping responses are successful. For the most part, larger towns offer greater opportunities for Inuit, particularly in terms of alternative employment options. The larger population centers also offer more resources, and thus a wider array of coping strategies, than do smaller towns, which frequently pose additional challenges for Inuit wishing to remain there.

Within Inuit communities, I found variable responses to coping with climate change among men and women. Inuit women today experience climate change – and respond to its effects – differently than do men. For instance, there has been a break in tradition in that women are working outside of the household more frequently. As noted earlier in this chapter, more women than men are coping with climate change by attending college in order to obtain administrative positions with the Government.

In addition, I found intra-community differences in the responses between older and younger Inuit. Historically, the use of TEK has been an important coping response for Inuit hunters and fishermen. This knowledge is not stagnant, and in order to continue to be effective, TEK must continue to transform in response to the rapid changes in the environment that Inuit are experiencing. While older Inuit are more likely to use and implement TEK in their hunting strategies, younger Inuit are more likely to eschew TEK in favor of newer technologies. For instance, older hunters continue to use traditional methods of travel, such as dog sled. By contrast, younger Inuit hunters are more likely to

use snowmobiles. The hazards associated with the former are more widely known in Inuit communities, whereas the newer technologies favored by younger hunters often pose greater and less understood risks. In addition, older hunters tend to have greater access to resources that can be employed in adapting to climate change than do their younger counterparts. In sum, differences in age were as prevalent as those in gender.

As Greenland continues its break from Denmark, and as climate change accelerates, these factors will become more and more pronounced. The Inuit will increasingly rely on the Home Rule Government and internal organizations such as KNAPK to provide the services and political infrastructure once administered by the Danes. As we have seen, this experiment is producing mixed results. For those Inuit living in population centers, a broadened range of economic activity and increased political autonomy provide an increased range of economic and political options, and therefore more numerous coping responses to climate change.

For the Inuit left out of this transformation (in particular, those living in remote areas), however, the options are less plentiful. The traditional hunters and fishermen in small villages continue to rely on hunting and fishing in areas rendered more dangerous by weakened sea ice. Those hunters and fishermen also lack access to the resources needed to respond to the changing climate conditions, such as alternative economic possibilities, new technologies, and comprehensive healthcare. Younger traditional Inuit hunters, who live in more remote areas of Greenland and who have limited access to resources and knowledge and skills related to hunting and fishing, are the most vulnerable to new injury-related risks that result from climate change. In the process of political transition to independence, local indigenous communities and the organizations

developed therein take on critical roles as coping mechanisms. For those people, their immediate social networks will gain importance. In addition, they will have to rely on individual and social behavioral coping strategies in order to survive in a changing landscape.

For many Inuit individuals, adjusting to a changing climate requires the implementation of a diverse and broad set of coping responses. This does not apply equally among all Inuit communities, though, and does not apply universally to all individuals within a community. Due to social and economic hierarchies within and across communities, resource allocation and political power are unequal attributes, and those individuals with the most power and resources are more likely to benefit from diverse resource use. In some instances, Inuit who employ a diverse set of coping responses may experience unanticipated additional social or economic stresses.

CHAPTER 7

CONCLUSION

Consequences of Climate Change

Climate change and its related effects are currently impacting Inuit lives throughout the Arctic. The Arctic has a history of being particularly susceptible and vulnerable to climate change. This is disrupting the migration routes of caribou, seals, whales and fish, which has affected the hunting and fishing economies of many small, remote Arctic settlements. The effects are more pronounced in small settlements than in larger Arctic communities, where mixed economies can act as somewhat of a buffer.

As the climate changes, the Arctic's indigenous peoples are facing specific challenges, most notably in their abilities to harvest food resources. The social, cultural and economic importance of traditional food for many Inuit makes them sensitive to changes in the abundance and distribution of animals important in subsistence activities (Caulfield 1997). Hunting and fishing are integral components of the Greenlandic national identity. Although scientific projections suggest there will be significant changes in the climate of the Arctic, very few studies have paid attention to understanding the impacts of changes in the climate of the Arctic on the relative collective health and degree of risk of physical injury of indigenous communities in relation to indigenous peoples' cultures and societies. This thesis is an investigation of the relationship between climate change in Arctic Greenland and the Inuit who depend on

the environment for their survival. The changing climate influences vulnerability to injury, and I explore the dynamics of the coping responses necessary for survival. The following section summarizes my research and analysis.

This study identifies climate-related conditions that represent hazards for Inuit who hunt and fish on ice. The new hazards pose risk for greater occurrence and greater severity of injuries. Additionally, increased awareness of the changing ice conditions within Inuit communities may lead to decreased injuries within those communities. Climate-related changes in sea ice conditions increase vulnerability to potential injury events during travel on sea ice for Greenlandic Inuit hunters and fishermen, particularly among those who live in remote areas. Local hunters value modern technology and traditional ecological knowledge for managing injury-related risks while travelling on sea ice.

All Inuit are impacted by the social, political, and economic circumstances that grew out of Danish colonialism in Greenland. Those factors shape the political and economic landscape that contemporary Inuit must navigate as climate change threatens the environment, and, in turn, traditional Inuit subsistence lifestyles. This effect may be the most severe and have the most pronounced results in the more remote regions of the country, where isolation not only creates a more hazardous environment, but offers fewer choices to remedy and address hazards. While many Inuit hunters demonstrate the ability to cope with varied exposures to changing environmental conditions associated with hunting, coping strategies are determined by a variety of social, economic, and political factors, and consequently not all members of these communities have equal access to such responses. Economic resources, institutional arrangements, and sharing networks

can facilitate or limit access to equipment and resources, which can lead to variation within and between communities. Power and inequality involved in human-environment interactions intersect at the global and local levels. Although my research showed a number of circumstances where individuals employing a wide range of coping responses successfully navigated the environmental changes occurring in Greenland, this is not always the case. In some cases, the fact that such a diverse array of responses was employed was, in itself, a source of stress.

The theoretical framework of this study includes an anthropological political-economic analysis with a biocultural perspective to address the roles of unequal class and ethnic social relationships on patterns and contexts of risk. Much of this perspective was informed by the seminal work of Leatherman, who stressed concepts such as power, the political economy of risk, social inequality, and the role of culture in the critical biocultural medical anthropology perspective. Following this model, this thesis has emphasized the intersection of global and local perspectives to gain an understanding of the social and cultural influences on the biological components of health and illness. In addition, Leatherman advocates historical and global perspectives, and as such I devote space to addressing historical global and local political and economic factors that influence injury-related behaviors as they pertain to climate change. My aim in doing so is to illustrate ways in which historical structures of power, economic resources, and sharing networks have affected access to resources for coping strategies.

To gauge Inuit coping responses to the changing conditions in Greenland, the concept of resilience is also important in analyzing my research. Because coping with change is a central theme of this thesis, I observed ways in which Inuit hunters employ

coping mechanisms with the unknown while maintaining traditional survival strategies. Although Greenlandic Inuit are made increasingly vulnerable to climate change, their social resilience helps some to cope with new stress that such change brings, thereby aiding their chances for survival. However, there are other variables apart from climate change that affect Inuit resilience and inform the need for coping strategies. Climate change by itself is not an insurmountable obstacle for Inuit survival. When combined with other factors, such as economic opportunity, family and community networks, and cultural background, the concept of resilience becomes much more complicated. For this reason, I sought to show how the historical legacy of colonialism and the culture of the Inuit add additional variables to the resilience equation.

The significance of my thesis is to draw attention to local sociocultural dimensions of climate change within the broader context of global influences and describe how this relationship affects Inuit coping strategies. Macroeconomic variables, such as transnational capitalism, shape local social and economic inequalities. For this reason, such factors are considered in the context of increased exposure to risk.

The application of field research methods was invaluable to this work. Interviews with Inuit hunters/fishermen revealed the concerns, problems, and creative coping strategies that are the essence of this paper. Involving members of Greenlandic Inuit communities in the planning stages of my research enabled me to tailor my approach in such a way as to most benefit those communities.

Because much of this work involves the ways in which the Inuit are able to utilize their current resources in an effort to cope with climate change, I have paid particular attention to the factors that have shaped and informed those resources. To capture this

dynamic, I devote much of chapters three and five to the politics, economics, and history of Greenland. The current plight of the Inuit cannot be viewed in isolation from these factors, and analysis of them was therefore essential in drawing conclusions. Greenland's colonial experience with Denmark, and the Lutheran missionaries that controlled much activity in the wake of colonization, are still shaping the lives of the Inuit today. The subsequent development of a Home Rule government allowed for increased political options and self determination, but the tenuous political infrastructure has been less than reliable as a means for addressing climate change-related problems for Inuit people. Further, the activities of the RGTD shaped the economic landscape in Greenland. Its legacy still informs the economic options available to Inuit.

Given that much of this thesis concerns matters of human health and well-being, I devote sections of Chapter three to a discussion of health care in Greenland. The distance between remote hunting locations on the ice and the nearest clinic, the lack of roads in general, and limited air services throughout Greenland, for example, restrict accessibility to care. In short, the health care system in place is inadequate for addressing the larger likelihood of injury caused by climate change.

Because so much of Inuit livelihood is directly linked to the environment, ecological knowledge that is passed down from generation to generation is critically important. Western scientific analysis of climate change in Greenland has often times ignored the factors considered to be part of TEK, and has consequently resulted in policies that impose restrictions on Inuit hunting practices. Compared to the Inuit perspectives on environment and climate change, the western, science-based approach has dominated policy prescriptions posed for Greenland. Perceptions vary by culture,

and the Inuit perspective has largely been omitted from the international dialogue on addressing these issues. Inuit TEK can be used to inform western scientific knowledge about the changing environment and can influence international and local policy on, for example, whaling quotas. Incorporating the Inuit perspective into policy decisions can ultimately lead to safer hunting practices for the Inuit because it could allow for more flexibility in when and what they hunt. Indigenous knowledge is a valuable part of the equation, and a more comprehensive approach to addressing the plight of the Inuit would be well-served by incorporating elements of TEK. In sum, adherence to TEK can assist in increasing resilience for the Inuit while decreasing exposure and vulnerability. However, many younger Inuit have not embraced TEK, and that has caused the effectiveness of TEK as coping strategy to weaken in some communities. To address this problem, Inuit hunters and fishermen must act in response to changing climatic conditions and continue to develop TEK; however, this is difficult because the pace of change is occurring so fast.

For generations, Inuit boys learned hunting tactics from their fathers at a very young age. However, combined with other factors, the recent environmental changes to Greenland's hunting grounds have made hunting less attractive to many younger Inuit males. Instead, many of these boys seek alternative forms of employment in the population centers. This pattern poses a risk to the continuation of TEK and effective and flexible coping responses, however; the youth of today spend less time learning what the dangers are and how to avoid them. Instead, many younger Inuit hunters purchase snowmobiles and travel on the ice to hunt on their own without the necessary skills. As discussed earlier, it is the younger traditional Inuit hunters, who live in more remote areas of Greenland and who have limited access to resources and knowledge and skills related

to hunting and fishing, who are the most vulnerable to new injury-related risks that result from climate change. It is this group of hunters who are the most vulnerable to risk of injury. For these young hunters, access to resources that might help prevent or ameliorate injury is more limited than for their counterparts in population centers. The remote areas have weaker networks, less access to technology and jobs for earning income. Accordingly, their geographic location increases their vulnerability to exposure and climate change-related hazards.

Political, economic, and geographic factors shape how Inuit are able to respond to climate change. Specifically, the colonial legacy of Denmark and the RTGD has impacted the coping strategies available to the Inuit. The responses available to hunters and fishermen are determined by a wide array of other factors as well, ranging from the local, such as social status, to the global, such as global economic conditions and external political forces. In addition to issues derived from climate change, such as accidents and injuries, Inuit people are addressing other problems that are unrelated to climate change. When considering Inuit resilience, we must recognize that climate change never acts alone. Economic and social challenges derived from many other historical and contemporary changes arise which Inuit people must address that affect their lives in the broader context of climate change. Among the recent challenges Inuit people have faced are the shift to a new autonomous government, distant locations of and limited access to health care, and the rise of suicide among younger Inuit.

While government assistance programs and new economic opportunities exist, they are limited in terms of resources, application, and effectiveness. Inuit coping strategies, such as modifying TEK to account for a rapidly changing environment and

purchasing new equipment, are oftentimes effective supplements to many of the government programs. In addition, the Inuit response to climate change is not a unified one, and varies according to gender, age, and occupation. For example, women play important roles in the economic functioning of Inuit society, particularly in households. However, Inuit women are found more frequently than men in salaried positions, and this dynamic shows the diversity of roles women play in contemporary Greenland. Inuit survival will ultimately depend on the use of diverse coping responses and flexibility with natural resource use.

Future Research

My approach to this project was to apply my review of the literature to my field research in Greenland with Inuit people. Balancing the empirical and theoretical enabled me to gain insight into the problems faced by the Inuit, as well as the academic perspectives on the issues. However, that approach was limited by both the scope of the thesis and time constraints. Accordingly, the types of issues discussed in this thesis are deserving of ongoing monitoring, exploration, and discussion. I see this thesis as a starting point for additional research. For example, more research focusing on how women are affected by these processes is needed.

The Future of the Inuit in Greenland

Climate change is putting stress on the lives of the Inuit in Greenland. Policy has the potential of softening the blow, but political uncertainties both in Greenland and the international community render any one political solution incomplete and inadequate. Ultimately, combined with government action, policy and local organizations, the extent

to which the Inuit are to survive in a changing climate will depend on employing multiple coping mechanisms that include modern technologies and traditional strategies.

My research indicates that the ability to deal or cope with these climate and environmental changes will vary among different groups, and among individuals. For example, experienced hunters with economic resources have considerable capacity to cope well. They draw on traditional Inuit knowledge to manage routine events and respond creatively to novel events, use a diverse array of hunting strategies to ensure successful hunting, and have a strong sense of collective responsibility. This can lead to safer hunting with regard to more hazardous conditions and reduced access. Potential limitations stem from a lack of monetary resources to purchase equipment necessary to access hunting areas and to hunt safely taking into consideration changing conditions.

However, while the future depends on diversity and flexibility of coping strategies, there are limitations on the ways that the Inuit are able to respond. The social, cultural, and economic factors associated with Inuit livelihoods have undermined the coping capacity of certain groups in the community. The break-down of knowledge transfer and learning traditional skills, for example, has been particularly pronounced among younger generations, who have limited ability to deal with current risks. Social networks have also been weakened by rising inequality of access to resources associated with the development of a wage-based economy and the external imposition of harvesting quotas. The response to future climate change will be facilitated and constrained by similar factors that have influenced past and present exposures and capacity to cope. Analysis of current vulnerability indicates that future vulnerability will continue to differ between groups, will be affected by social, cultural, and economic conditions and

processes, and according to the nature of climate change. Climate change may increase the consequences of a lack of knowledge and more risk-taking behavior. Emphasizing cultural values may counter the erosion of traditional knowledge. The economic means and equality of access to resources are also fundamental to influencing coping strategies for younger generations.

Although injuries appear to be responsible for a relatively small proportion of the potential health impacts of global warming, climate change and the imperative to reduce energy use will set the policy context for future injury control efforts. As climate change is a risk factor for unintentional injury, and because mitigating climate change provides possibilities for the promotion of health, it should be a focus of policy for the injury control community. This should include further discussion of the links between climate change and injury occurrence, research relevant to, and advocacy for, a low-carbon society, and the identification of strategies to mitigate any adverse injury impacts that such a collective change will entail. Although the high-income, energy-wasteful countries have been responsible for most greenhouse gas emissions, it will be the most disadvantaged populations of the world, those living in low income, energy thrifty countries who will suffer most of the adverse health related impacts of climate change.

Injury prevention programs can use anthropological studies such as this to understand the differences between Western and non-Western cultural perceptions of injuries. Using that type of analysis as a basis for injury prevention programs will likely yield greater results and would improve programs based solely on Western perceptions of the issues faced by the Inuit. In addition, if the programs that are implemented in Inuit

communities incorporate these varied perceptions, they will likely be more successful than policy based exclusively on foreign perception.

REFERENCES

- Adger, W.N.
2000 Social and Ecological Resilience: Are They Related? *Progress in Human Geography*. 24:347-364.
- Adger, W.N., P.M. Kelly, and N.H. Ninh (eds.)
2001 *Living with Environmental Change: Social Resilience, Adaptation and Vulnerability in Vietnam*. London: Routledge.
- Adger, W.N. and P.M. Kelly
1999 Social Vulnerability to Climate Change and the Architecture of Entitlements. *Mitigation and Adaptation Strategies for Global Change*. 4:253-266.
- Aporta, C.
2002 Life on the Ice: Understanding the Codes of a Changing Environment. *Polar Record*. 38:341-354.
- Auer, J.
1989 Assessing Environmental Health: Some Problems and Strategies. *Community Health Studies*. 13:441-448.
- Balikci, A.
1968 The Netsilik Eskimo: Adaptive Processes. In *Man the Hunter*. R. Lee, and I. Devore (eds.) Chicago: Aldine Publishing Company. Pp. 78-82.
- Bandi, H.G.
1969 *Eskimo Prehistory*. London: Methuen.
- Baer, H. and M. Singer
2009 *Global Warming and the Political Ecology of Health: Emerging Crises and Systematic Solutions*. Walnut Creek: Left Coast Press, Inc.
- Barss, P.
1998 Drownings, Near-Drownings, and other Water-Related Injuries. In *For the Safety of Canadian Children and Youth: From Data to Prevention Measures*. Ottawa: Health Canada. Pp. 184-196.

- Berkes, F.
1999 *Sacred Ecology: Traditional Ecological Knowledge and Resource Management*. London: Taylor and Francis.
- Berkes, F. and D. Jolly
2002 Adapting to Climate Change: Social-Ecological Resilience in a Canadian Western Arctic Community. *Ecology and Society*. 2002:5 (1-15) <http://consecol.org/vol5/iss2> [January 15, 2005].
- Bernard, R.
2006 *Research Methods in Anthropology: Qualitative and Quantitative Approaches*. New York: AltaMira Press.
- Bethelsen, C., I. Mortensen and E. Mortensen
1993 *Kalaallit Nunaat Greenland Atlas*. Atuakkiorfik: Greenland Home Rule Government.
- Bjerregaard, P.
1990 Disease Patterns in Greenland: Studies on Morbidity in Upernavik 1979 – 1980 and Mortality in Greenland 1968 – 1985. *Arctic Medical Research*. 50:1-62.
- Bjerregaard, P.
2001 Rapid Socio-cultural Change and Health in the Arctic. *International Journal of Circumpolar Health*. 60:102-111.
- Bjerregaard, P. and T. Curtis
2002 Cultural Change and Mental Health in Greenland: the Association of Childhood Conditions, Language, and Urbanization with Mental Health and Suicidal Thoughts among the Inuit of Greenland. *Social Science and Medicine*. 54:33-48.
- Bjerregaard, P. and T.K. Young
1998 *The Circumpolar Inuit – Health of a Population in Transition*. Copenhagen: Munksgaard.
- Blaikie, P. and H. Brookfield
1987 *Land Degradation and Society*. London: Meuthen.
- Bohle, H., T. Downing, and M. Watts
1994 Climate Change and Social Vulnerability: Toward a Sociology and Geography of Food Insecurity. *Global Environmental Change*. 4(1):37-48.
- Brewer, J.
2000 *Ethnography*. Buckingham: Open University Press.

BurnSilver, S.

2007 Pathways of Continuity and Change: Diversification, Intensification and Mobility in Maasailand, Kenya. PhD Dissertation, Colorado State University, Fort Collins.

Castillo, D.N., T.J. Pizatella, and N.A. Stout

2006 Injuries. In *Occupational and Environmental Health: Recognizing and Preventing Disease and Injury*. B. Levy, D. Wigham, S. Baron, and R. Sokas (eds.) Philadelphia: Lippincott, Williams and Wilkins Publishers. Pp. 315-334.

Caulfield, R.

1997 *Greenlanders, Whales, and Whaling*. Hanover: Dartmouth College.

Chambers, R.

1989 Vulnerability, Coping and Policy. *IDS Bulletin*. 20(2):1-7.

Comaroff, J and J. Comaroff

1991 *Of Revelation and Revolution: Christianity, Colonialism, and Consciousness in South Africa*. (vol.1). Chicago: The University of Chicago Press.

Cutter, S.L.

2003 The Vulnerability of Science and the Science of Vulnerability. *Annals of the Association of American Geographers*. 90(4):713-737.

Dahl, J.

2000 Greenland: Political Structure of Self-Government. *Arctic Anthropology*. 23:315-324.

Douglas, M.

1985 *Risk Acceptability According to the Social Sciences*. New York: Russell Sage Foundation.

Douglas, M. and M. Calvez

1990 The Self as Risk Taker: A Cultural Theory of Contagion in Relation to AIDS. *Sociological Review*. 38:445-464.

Drake, K.

1991 Orienting Dispositions in the Perceptions of Risk: An Analysis of Contemporary Worldviews and Cultural Biases. *Journal of Cross-Cultural Psychology*. 22:61-82.

Dybbroe, S.

1998 Participation and Control: Issues in the Debate on Women and Development. *Folk*. 30:111-132.

Ferguson, M. and F. Messier

2000 Mass Emigration of Arctic Tundra Caribou from a Traditional Winter Range: Population Dynamics and Physical Condition. *Journal of Wildlife Management*. 64(1):168-178.

Ford, J.

2005 Living with Change in the Arctic. *World-Watch*. September/October 18-21.

Ford, J. and B. Smit

2004 A Framework for Assessing the Vulnerability of Communities in the Canadian Arctic to Risks Associated with Climate Change. *Arctic*. 57:389-400.

Fox, S.

2004 When the Weather is Uggianaqtuq: Linking Inuit and Scientific Observations of Recent Environmental Changes in Nunavut, Canada. Unpublished PhD Thesis, University of Colorado, Boulder.

Furgal, C.

2002 Inuit Spring Hunting Techniques and Local Knowledge of the Ringed Seal in Arctic Bay (Ikpiarjuk), Nunavut. *Polar Research*. 21:1-16.

Gearheard, S.

2009 Sea Ice Thickness Measurements from a Community-Based Observing Network. *American Meteorological Society*. 3:370-377.

Goodman, A. and T. Leatherman

1998 Traversing the Chasm between Biology and Culture: An Introduction. In *Building a New Biocultural Synthesis: Political-Economic Perspectives on Human Biology*. A. Goodman and T. Leatherman (eds.) Ann Arbor: The University of Michigan Press. Pp. 3-42.

Gould, S.J. and R. Lewontin

1979 The Spandrels of San Marcos and the Panglossian Paradigm: A Critique of the Adaptationist Programme. *Proceedings of the Royal Society of London, Series B*. 205:581-589.

Haavelsrud, M.

1996 On Inclusion and Exclusion. In *Three Decades of Peace Education Around the World*. R. Burns and R. Aspeslagh (eds.) New York: Garland. Pp. 97-112.

Haddon, W., Jr.

1980 Advances in Epidemiology of Injuries as a Basis for Public Policy. *Public Health Report*. 95(5):411-421.

- Harvey, L.D.D.
1998 On the Role of High Latitude Ice, Snow and Vegetation Feedbacks in the Climate Response to External Forcing Changes. *Climate Change*. 10:191-224.
- Henshaw, A.
2009 Sea Ice: The Sociocultural Dimensions of a Melting Environment in the Arctic. In *Anthropology and Climate Change: From Encounters to Action*. S. Crate and M. Nuttall (eds.) New York: Left Coast Press. Pp. 153-165.
- Holling, C.S.
1973 Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics*. 4:1-23.
- Holmes, N. and S.M. Gifford
1997 Narratives of Risk in Occupational Health and Safety: Why the “Good” Boss Blames His Tradesman and the “Good” Tradesman Blames His Tools. *Australian and New Zealand Journal of Public Health*. 21:11-16.
- Huntington, H.P.
1992 *Wildlife Management and Subsistence Hunting in Northern Alaska*. London: Bellhaven Press.
- Kasper, R.G.
1980 Perceptions of Risk and Their Effects on Decision Making. In *Societal Risk Assessment: How Safe is Safe Enough?* R.C. Schwing and W.A. Albers, Jr. (eds.) New York: Plenum Press. Pp. 71-84.
- Kleinhesselink, R.R. and E.A. Rose
1991 Cognitive Representation of Risk Perceptions. A Comparison of Japan and the United States. *Journal of Cross-Cultural Psychology*. 22:11-28.
- Kofinas, G. with Old Crow, Aklavik, Fort McPherson and Arctic Village
2002 Community Contributions to Ecological Monitoring: Knowledge Co-Production in the US-Canada Arctic Borderlands. In *Frontiers in Polar Science – Indigenous Observations of Environmental Change*. I. Krupnik and D. Dyanna (eds.) ARCUS. Pp. 54-92.
- Kofinas, G.
2004 A Research Plan for the Study of Rapid Change, Resilience, and Vulnerability in Social-Ecological Systems of the Arctic. *The Common Property Resource Digest*. 73:1-10.
- Krupnik, I.
1993 *Arctic Adaptation: Native Whalers and Reindeer Herders of Northern Eurasia*. Hanover: University Press of New England.

Krupnik, I. and D. Jolly

2002 *The Earth is Faster Now: Indigenous Observations of Arctic Environmental Change*. Fairbanks: Arctic Research Consortium of the United States.

Langley, J.

1988 The Need to Discontinue the Use of the Term "Accident" When Referring to Unintentional Injury Events. *Accident Prevention*. 20:1-8.

Larsen, F.B.

1996 Interpersonal Violence among Greenlandic Inuit. In *Crime, Law and Justice in Greenland*. H.G. Jensen and T. Agersnap (eds.) Copenhagen: New Social Science Monographs. Pp. 47-69.

Leatherman, T.

2005 A Space of Vulnerability in Poverty and Health: Political-Ecology and Biocultural Analysis. *Ethos*. 33(1):46-70.

1996 A Biocultural Perspective on Health and Household Economy in Southern Peru. *Medical Anthropology Quarterly*. 10(4):476-495.

Leighton, A.H.

1959 Mental Illness and Acculturation. In *Medicine and Anthropology*. I. Galdston (ed.) New York: International Universities Press. Pp. 108-128.

Lowrance, W.W.

1980 The Nature of Risk. In *Societal Risk Assessment: How Safe is Safe Enough?* Schwing, R.C. and W.A. Albers, Jr. (eds.) New York: Plenum Press. Pp. 5-18.

Lupton, D.

1995 Risk as a Sociocultural Construct. *In Touch. Public Health Association Newsletter Series*. 12:1-4.

Lynge, I.

1994 Suicide in Greenland. In *Circumpolar Health 93: Proceedings of the 9th International Congress on Circumpolar Health*. G. Petursdottir, S.B. Sigurdsson, M.M. Karlson, and J. Axelsson (eds.) Arctic Medical Research. 53(2):551-554.

Malaurie, J.

1985 *The Last Kings of Thule*. Chicago: The University of Chicago Press.

Maslanik, J.A., M.C. Serreze, and T. Agnew

1999 On the Record Reduction in 1998 Western Arctic Sea Ice Cover. *Journal of Geophysical Research*. 26(13):1905-1908.

- Mazess, R.B.
1975 Biological Adaptation: Aptitudes and Acclimatization. In *Biosocial Interactions in Population Adaptation*. E.S. Watts, F.E. Johnston, and G.W. Lasker (eds.) Hague: Mouton. Pp. 1-17.
- McElroy, A. and P.K. Townsend
1979 *Medical Anthropology*. Massachusetts: Duxbury Press.
- 2003 *Medical Anthropology in Ecological Perspective*. (4th ed.) Boulder: Westview Press.
- 2009 *Medical Anthropology in Ecological Perspective*. (5th ed.) Boulder: Westview Press.
- Meier, W.N. and M. Dai
2006 High Resolution Sea Ice Motions from AMSR-E Imagery. *Annals of Glaciology*. 44(1):352-356.
- Moran, S.B., N.R. Bates, D.A. Hansell and J.T. Mathis
2006 An increasing CO₂ Sink in the Arctic Ocean due to Sea Ice Loss. *Geophysical Research Letters*. 33:1-7.
- Norton, D.W.
2002 Coastal Sea Ice Watch: Private Confessions of a Convert to Indigenous Knowledge. In *The Earth is Faster Now: Indigenous Observations of Arctic Environmental Change*. I. Krupnik and D. Jolly (eds.) Fairbanks: Arctic Research Consortium of the United States. Pp. 126-155.
- Nuttall, M. and T.V. Callaghan
2000 *The Arctic: Environment, People Policy*. Singapore: Harwood Academic Publishers.
- Nuttall, M.
1998 *Protecting the Arctic: Indigenous Peoples and Cultural Survival*. Amsterdam: Harwood Academic Publishers.
- 1992 *Arctic Homeland: Kinship, Community and Development in Northwest Greenland*. Toronto: University of Toronto Press.
- Oozeva, C., C. Noongwook, G. Noongwook, C. Alowa, and I. Krupnik
2004 *Watching Ice and Weather Our Way*. Washington D.C.: Arctic Studies Center, Smithsonian.
- Peterson, D.L. and D.R. Johnson
1995 *Human Ecology and Climate Change: People and Resources in the Far North*. Washington: Francis and Taylor.

- Piantadosi, C.
2003 *The Biology of Human Survival: Life and Death in Extreme Environments*. Durham: Oxford University Press.
- Pottier, J.
2003 Negotiating Local Knowledge: An Introduction. In *Negotiating Local Knowledge: Power and Identity in Development*. J. Pottier, A. Bicker, and P. Sillitoe (eds.) London: Pluto Press. Pp. 1-29.
- Rasing, W.
1994 *Too Many People: Order and Non-conformity in Ighulingmiut Social Processes*. Nijmegen: Recht and Samenleving, Inc.
- Reilinger, D.
2001 Responding to Climate Change in Northern Communities: Impacts and Adaptations. *Arctic*. 54:96-98.
- Rode, A. and R.J. Shephard
1996 *The Health Consequences of "Modernization": Evidence from Circumpolar Peoples*. Cambridge: Cambridge University Press.
- Rode, A. and R.J. Shephard
1995 Modernization of Lifestyle, Body Fat Content and Body Fat Distribution – A Comparison of Igloodik-Inuit and Volochanka-Nganasan. *International Journal of Obesity*. 19(10):709-716.
- Rohrman, B.
1994 Risk Perception of Different Social Groups: Findings and Cross-National Comparisons. *Australian Journal of Psychology*. 46:150-163.
- Rothrock, D.A., Y. Yu and G.A. Maykut
1999 Thinning of the Arctic Sea Ice Cover. *Geophysical Research Letters*. (26)23:3469-3472.
- Sabo, G.
1991 *Long-term Adaptations among Arctic Hunter-Gatherers*. London: Garland Publishing.
- Sable, T., Howell, G., Wilson, D., and Penashue, P.
2007 The Ashuki Project: Linking Western Science and Innu Environmental Knowledge in Creating a Sustainable Environment. In *Local Science vs. Global Science: Approaches to Indigenous Knowledge in International Development*. P. Sillitoe (ed.) New York: Berghahn Books. Pp. 109-128.

- Sen, A.
1999 Food Economics and Entitlements. In *The Political Economy of Hunger*. J. Dreze, and A. Sen (eds.) Oxford: Clarendon Press. Pp. 34-50.
- Serreze, M.C., J. Walsh, F.S. Chapin, T. Osterkamp, M. Dyurgerov, V. Romanovsky, W.C. Ochel, and R. Barry
2007 Observational Evidence of Recent Change in the Northern High Latitude Environment. *Climatic Change*. 46:159-207.
- Siegert, M.J. and J.A. Dowdeswell
2000 Geophysical Investigations of Ice Sheet Layering and Deformation in the Dome C Region of Central East Antarctica. *Journal of Glaciology*. 46:161-166.
- Sillitoe, P. (ed.)
2007 *Local Science vs. Global Science Approaches to Indigenous Knowledge in International Development*. New York: Berghahn Books.
- Singer, M.
1989 The Limitations of Medical Ecology: the Concept of Adaptation in the Context of Social Stratification. *Medical Anthropology*. 10:223-234.
- Singer, M. and H. Baer
2007 *Introducing Medical Anthropology: A Discipline in Action*. Lanham: Altamira Press.
- Slovic, P.
1987 Perception of Risk. *Science*. 236:280-285.
- Smit, B. and O. Pilifosova
2003 From Adaptation to Adaptive Capacity and Vulnerability Reduction. In *Climate Change, Adaptive Capacity, and Development*. J. Smith, R.T.J. Klein, and S. Huq (eds.) London: Imperial College Press. Pp. 9-28.
- Thomas, R., T.B. Gage, and M.A. Little
1979 Reflections on Adaptive and Ecological Models. In *Human Population Biology: A Transdisciplinary Perspective*. M. Little and J. Haas (eds.) Oxford: Oxford University Press. Pp. 296-319.
- Thorslund, J.
1990 Inuit Suicides in Greenland. *Arctic Medical Research*. 49(1):25-33.
- Turner, B., R.E. Kasperson, P.A. Matson, J. McCarthy, R. Corell, L. Christensen, N. Eckly, J.X. Kasperson, A. Leurs, and M.L. Polsky
2003 A Framework for Vulnerability Analysis in Sustainability Science. *Proceedings of the National Academy of Sciences*. 100:8074-8079.

- Usher, P.J.
2000 Traditional Ecological Knowledge in Environmental Assessment and Management. *Arctic*. 53:183-193.
- Vaughan, E.
1993 Individual and Cultural Differences in Adaptation to Environmental Risks. *American Psychologist*. 48:673-680.
- Vaughan, E. and B. Nordenstam
1991 The Perception of Environmental Risks among Ethnically Diverse Groups. *Journal of Cross-Cultural Psychology*. 22:29-60.
- Watts, M.J. and H.G. Bohle
1993 The Space of Vulnerability: The Causal Structure of Hunger and Famine. *Progress in Human Geography*. 17(1):43-67.
- Weller, G.
2000 Impacts of Global Climate Change in the Arctic Regions. In *International Arctic Science Committee, Center for Global Change and Arctic System Research*. M. Lange and G. Weller (eds.) Fairbanks: University of Alaska Press. Pp. 40-47.
- Wiley, Andrea
2004 *An Ecology of High-Altitude Infancy: A Biocultural Perspective*. New York: Cambridge University Press.
- Wiley, A. and J. Allen
2009 *Medical Anthropology: A Biocultural Approach*. New York: Oxford University Press.
- World Health Organization (WHO)
1967 The Constitution of the World Health Organization. *WHO Chronicle* 1967. 1:29.