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Vulnerability and adaptive capacity of Inuit women to climate change: A case study from Iqaluit, Nunavut

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Abstract

Climate change impacts in the Arctic will be differentiated by gender, yet few empirical studies have investigated how. We use a case study from the Inuit community of Iqaluit, Nunavut, to identify and characterize vulnerability and adaptive capacity of Inuit women to changing climatic conditions. Interviews were conducted with 42 Inuit women, and were complimented with focus group discussions and participant observation to examine how women have experienced and responded to changes in climate already observed. Three key traditional activities were identified as being exposed and sensitive to changing conditions: berry picking, sewing, and the amount of time spent on the land. Several coping mechanisms were described to help women manage these exposure-sensitivities, such as altering the timing and location of berry picking, and importing seal skins for sewing. The adaptive capacity to employ these mechanisms differed among participants, however, a function of mental health, physical health, traditional/western education, access to country food and store bought foods, access to financial resources, social networks, and connection to Inuit identity. The study finds that gender roles result in different pathways through which changing climatic conditions affect people locally, although the broad determinants of vulnerability and adaptive capacity for women are consistent with those identified for men in the scholarship more broadly.

Key words: climate change, Inuit, women, adaptation, vulnerability, gender, Nunavut

1. Introduction

The impacts of climate change will not be gender neutral. Culturally defined gender roles influence human-environment interactions, creating different pathways through which climate change will affect livelihoods and well-being, while the consequences of climate change have the potential to exacerbate differentiated vulnerability by gender (Alston 2014; Sultana 2014; Dankelman 2010; Denton 2002). Although the literature on climate change and gender is expanding, it remains broadly focused and generalized, with few studies actually examining how gender influences the experience and response to climate change in different geographic contexts (Arora-Jonsson 2011; Bunce and Ford, 2015; Loevbrand et al. 2015). This gap is particularly noticeable in high income nations, with a recent review indicating that only seven studies focus explicitly on the gendered nature of climate change impacts in North America and eight in Europe (Bunce and Ford, 2015). By comparison, the gender and climate

scholarship is more advanced in Sub-Saharan Africa and emerging rapidly in Asia (Bunce and Ford, 2015).

One region of particular interest for studying the gendered nature of climate change impacts is the Arctic, which is experiencing the most rapid climate change globally (Larsen et al. 2014). Here, gendered roles in Indigenous communities are expected to result in quite different vulnerabilities among men and women (Ford 2012). Among Inuit communities, for example, research has identified heightened susceptibility to climate change impacts for those engaged in traditionally male dominated land based activities such as hunting, fishing, and trapping (Cunsolo Willox et al. 2012; Ford et al. 2010; Furgal and Seguin 2006; Ford et al. 2010; Pearce et al. 2011). The climate change experiences of women has been largely overlooked, although there is a small but substantive body of work examining the interactions between climate change and health, food systems, and documenting observations of change (Beaumier et al. 2014; Beaumier and Ford 2010; Dowsley et al. 2010; Owens 2005). Although the climate change experiences of Inuit women have been largely absent, Arctic research is increasingly applying a gender lens when analyzing environmental risks more generally (Durkalec 2013; Durkhalec et al. 2014; Kukarenko 2011; Jardine et al. 2009).

Traditionally, female roles in Inuit society were largely focused on providing for the family through activities surrounding the home (e.g. caring for children, processing food, making clothing) (Billson and Mancini 2007). Many of these activities remain important, and have expanded in light of sweeping socio-cultural changes affecting Inuit communities since the 1950s/60s to include engagement in waged employment (Billson and Mancini 2007; Chabot 2003). Indeed, in many households, Inuit women are often the main income earners; a role that often underpins household harvesting activities by providing access to financial resources but also reduces the amount of time women have for engaging themselves in traditional activities (Billson and Mancini 2007; Wenzel 2000; Duhaime and Edouard 2015). Reflecting these roles, it has been suggested that women might be less affected by climate change impacts than men, although, as noted above, few studies have explicitly examined the female experience of climate change in Inuit communities or explored their potential vulnerabilities in light of projected future change.

In response to this gap in understanding, we examine the current vulnerability and adaptive capacity of Inuit women to climatic change, drawing upon a community case study from Iqaluit, Nunavut. Structuring the research using a 'vulnerability approach,' we document the observations of environmental change noted by Inuit women, and examine how these changes, in combination with socio-economic conditions and processes, are affecting livelihoods and well-being.

2. Methodology

2.1 Vulnerability Approach

This research uses a 'vulnerability approach' to identify and characterize how Inuit women experience and respond to climate change impacts in the context of multiple stresses. Vulnerability can be defined as the capacity to be wounded, and is derived from the Latin verb *vulnerare,* meaning "to wound" (Smit and Wandel 2006). Consistent with the literature, we view vulnerability as a function of both exposure and sensitivity to

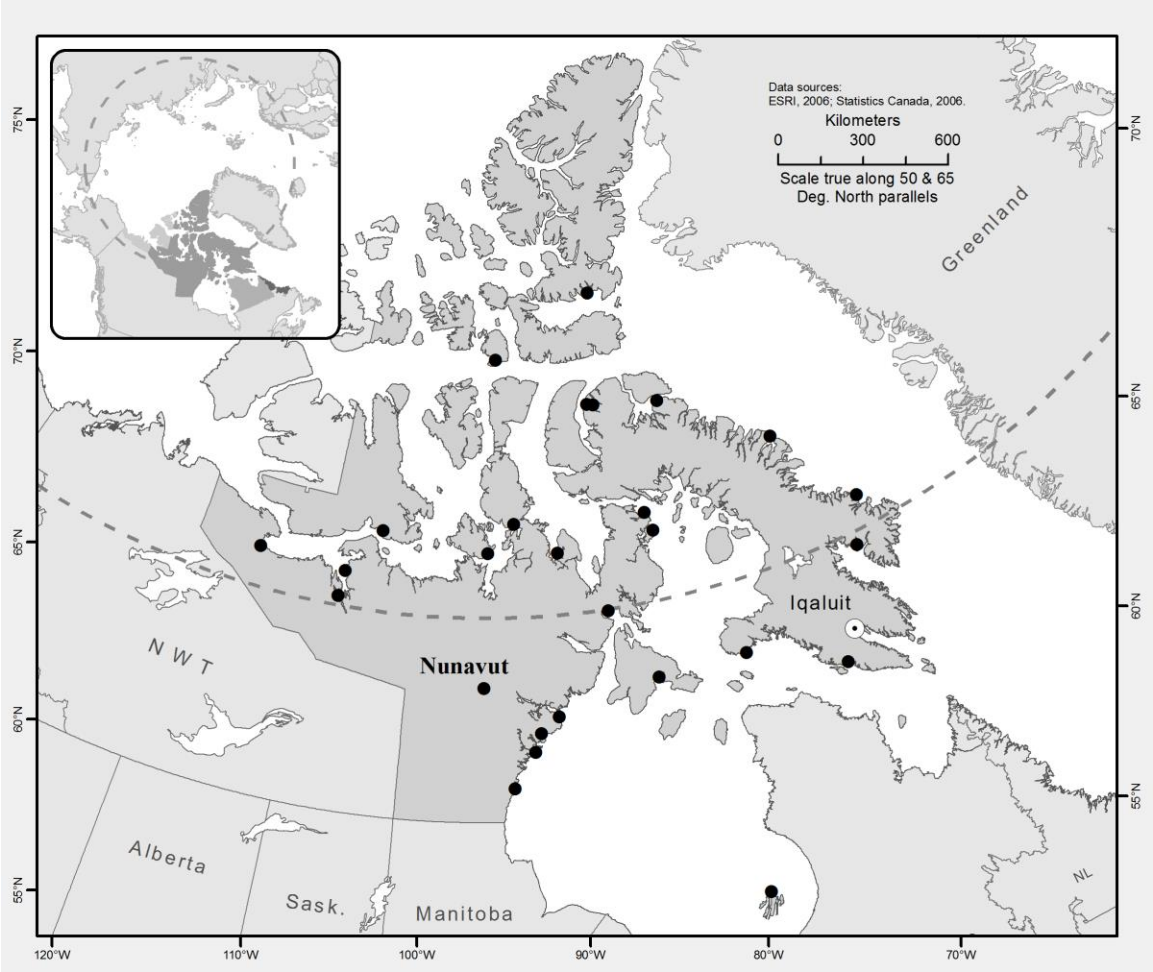
climate change impacts, and adaptive capacity to manage these impacts (Adger 2006; Ford and Smit 2004; Smit and Wandel 2006; O'Brien et al. 2007). In the context of the focus on Inuit women here, *exposure* can be understood as the nature of climate-related risks that directly or indirectly affect the lives of women (e.g. magnitude, frequency, spatial extent, timing etc. of climate-related risks). *Sensitivity* captures the factors which differentiate susceptibility to exposures among women depending on livelihood conditions and strategies, gender roles, and household and community characteristics, and determines the pathways through which exposure will affect women (Ebi et al. 2006; Ford et al. 2010; Sherman et al. 2015). Exposure and sensitivity are inextricably linked (Smit and Wandel, 2006), and are thus combined in the study here. *Adaptive capacity* captures the ability to manage and respond to climate-related exposure sensitivities, including the ability to take advantage of new opportunities (Ford and Smit 2004; Smit and Wandel 2006).

The recognition of the role of adaptive capacity and sensitivity expands the scope of vulnerability studies to consider the role and importance of non-climatic factors in amplifying or attenuating vulnerability (Ford et al. 2010). Vulnerability is more than a simple function of how the climate will change; vulnerability is affected by social, economic, cultural, and political conditions and processes operating at multiple scales over time and space (Turner et al. 2003; Ford et al. 2013; Fazey et al. 2010). While critiqued by some to imply a focus on negative impacts or for establishing people as passive victims (e.g. Cameron 2012; Haalboom and Natcher 2012), we note that vulnerability approaches focus attention on the complex interaction between human and biophysical factors which affect how climate change interacts with human systems, drawing upon a long history of vulnerability research in the natural hazards field (Pearce et al. 2015; Ribot, 2014). Indeed, the use of a vulnerability approach does not imply an *a priori* focus on the negative, with many studies using a vulnerability approach indicating significant resilience and agency at a community level.

This study focuses specifically on identifying and characterizing the current vulnerability of Inuit women in Iqaluit, Nunavut, to changes in climate already experienced. This can help us develop an understanding of how social and biophysical processes shape vulnerability, and establish a range of possible societal responses to future change (Fazey et al. 2009, 2015; Ford et al. 2010; McLeman and Hunter 2010; Sherman et al. 2015). Examining future vulnerability in light of projected climate change, however, is beyond the scope of the paper, and will be the focus of future work.

2.2 Iqaluit case study

Figure 1. Iqaluit, Nunavut



Iqaluit is located in the Qikiqtaaluk region of the Canadian territory of Nunavut (Figure 1). Since becoming the territorial capital in 1999, the community has experienced significant growth in terms of population and infrastructure (Table 1) (Searles 2010; Government of Canada 2013). As the largest community in Nunavut, Iqaluit has a large non-Inuit population (41% non Inuit, 59% Inuit), a hospital, and a diversity of other social services; as such, the community is quite different than smaller Inuit communities where much of the human dimensions of climate change research has been conducted (Searles 2010; Ford et al. 2012; Harper et al. 2015a; Harper et al. 2015b). Inhabitants come from diverse backgrounds and geographical locations, often moving to Iqaluit for economic or social reasons (Searles 2010). While much of the community is engaged in some form of wage work, harvesting activities remain a key part of community life (Ford et al. 2012). Women in the community are highly engaged in the labour force both formally in the service industry and in Iqaluit's large government sector, and informally through providing childcare or earning an income through traditional art and craftwork. Many women engage in their community through volunteer work and there is a growing number of Inuit women entering the political sphere at all levels of government.

Table 1. Community and Territorial characteristics based on 2011 census data

	Iqaluit	Nunavut

Population		
Population	6,699	31,906
Female Population	3,150	16,395
Percentage of population who identify as Inuit	59.1%	85.4%
Median Age of Population	30.0	24.1
Economy		
Total Population age 15 and over in the labour force	3,925	13,485
Population age 15 and over without income or income less than $27,815	35.5%	55.5%
Percentage of population that rents their home	76.7%	79.0%
Education		
Percentage of population with no educational certificate, diploma, or degree	25.7%	48.1%
Percentage of population with a high school diploma	15.4%	11.7%
Percentage of population with a postsecondary diploma, certificate, or degree	58.7%	40.2%
Percentage of population with a university degree	25.4%	12.6%

196
197 **2.3 Data Collection**
198 A mixed methods approach was employed to incorporate the knowledge and
199 observations of female Inuit residents in Iqaluit and key informants to document and
200 characterize current exposure, sensitivity, and adaptive capacity.
201
202 **2.3.1 Positionality**
203 Given the gendered nature and cultural focus of this research, the positionality of
204 the lead author (AB), who conducted the research, holds a particular weight. While AB is
205 female, she is non-Indigenous and had been raised and educated in Southern Canada.
206 That said, her strong educational background in anthropology, indigenous relations, and
207 international development, coupled with over three months spent in Iqaluit prior to
208 beginning this work, has developed a strong understanding of and respect for Inuit culture
209 and belief systems. AB was in her mid-twenties and childless at the time of the
210 interviews, she was much younger than the median age of those interviewed and lacked
211 the experience of motherhood which the majority of the interviewees had experienced.
212 This, along with her non-indigenous status, will have impacted the research. It is
213 noteworthy that due to previous time spent in the community working closely with 25
214 local Inuit surveyors on another research project, AB had already formed close
215 relationships and gained the trust of many community members which positively
216 impacted her ability to carry out this research. The two Inuit research assistants and
217 translators working with the lead author are both well respected members in the
218 community who are mothers and were in their thirties at the time of the research. Their
219 presence may have helped mitigate hesitations interviewees might have had surrounding
220 the lead researchers age, childlessness, and non-indigenous status.
221
222 **2.3.2. Interviews with Iqalummiut women**
223 Semi-structured interviews (n=42) were conducted with Inuit women who were
224 currently living in Iqaluit in June of 2015 (Iqaluit residents are known as ‘Iqalummiut’).
225 Interviewees were recruited using a snowball sampling method, aimed at recruiting Inuit

women who had lived in Iqaluit for at least 5 years and who had a hunter in their family. The focus on households with a hunter reflected interest of the researchers and community collaborators on vulnerabilities specifically around harvesting activities, and belief that it is through such activities that households will be most affected by climate change (Berkes and Jolly 2002; Furgal and Seguin 2006). Including women that had lived in Iqaluit for a minimum of five years ensured their observations reflected what was occurring in Iqaluit, and not another community. Research assistants, stakeholders and other community members recommended women who in turn recommended other potential participants.

Ranging in age from 24 to over 80, with a median age of 39, the women interviewed were comprised of a diverse range of life experiences. The majority of interviewees were working (61% or n=25) with 72% (n=18) working full time. Closely reflecting territory wide trends shown in Table 1, 80% (n=34) of women rented their home, and nine interviewees (21%) were currently living in overcrowded homes. Long term residents who had lived in Iqaluit for 20 years or more made up 92% (n= 39) of the individuals interviewed, although many of the participants had lived in other communities, largely in the Qikiqtaaluk region, at some point in their lives. Seventy-seven percent (n=32) of interviewees had children or grandchildren living with them and the majority (82% n=32) were in in a relationship.

An open-ended interview guide structured the interviews, and was pre-tested prior to use. The structure and topics of the guide were informed by the vulnerability framework, and sought to: i) document observed changes in climate, the environment, livelihoods, and culture (exposure); ii) examine implications of these changes on community life and well-being, and identify factors resulting in differential impact (sensitivity); iii) identify and characterize strategies and coping mechanisms used to plan for, adapt to, and manage these changes (adaptive capacity); and, iv) identify potential future impacts of climate change. Participants were encouraged to reflect not only upon these questions from their own personal experiences and recollections, but also from the perspectives of previous generations (mothers, aunts, and grandmothers).

All interviews were conducted by the lead author and, if preferred by the interviewee, a research assistant was present to provide in person consecutive Inuktitut-English translation. Interviews were audio recorded with the participant's consent and hand written notes were taken by the interviewer for the three participants who did not wish to be audio recorded. After 42 interviews averaging XX minutes in length saturation was reached. These interviews provided the majority of the data for this research and all quotes in this paper come from interviewees.

2.3.3 Participant Observation

Informal discussions and participant observation were undertaken by the lead author to provide insight into how environmental and social changes impact the ways in which Inuit women experience their gender in contemporary Iqaluit. Spending time in the community for ~5 months and forming close relationships with a variety of women in the community allowed for particular insights into the dynamics of spousal relationships, childrearing practices, and the triumphs and struggles of being a working mother in the community. This provided important contextual information on how daily life is affected

by environmental and social change. Experiences and observations were recorded in a field notebook.

2.3.3 Focus Groups

Two stakeholder focus group sessions were held in June of 2015 and attended by thirteen federal, provincial and municipal government employees from a variety of sectors, along with employees of Northern science organizations and Indigenous organizations to whom this work was relevant. Each group had a diverse representation of age, gender and ethnicity. Both sessions were audio recorded with the consent of all participants and lasted a half hour. In each session the goals of the research were explained and focus group participants were asked to comment on how Iqaluit was changing for women and how environmental changes may be impacting women. These focus groups generated insight into stakeholder priorities and perceptions, provided comparison to the priorities and perceptions of female interviewees, and helped contextualize interview findings. The focus groups are the only time non-Inuit individuals as well as Inuit and non-Inuit men contributed to the project.

2.4 Data Analysis

Interviews and focus group transcripts were analyzed by the lead author using thematic analysis with descriptive and analytic codes used to organize the data (Hay 2000). This process was done using *Atlas TI*, a software program designed for coding qualitative research. Both the interviews and focus groups were transcribed and coded for the same main themes using key quotes and written memos, with master codes following the vulnerability framework. This work was done exclusively by the lead author to ensure consistency. Participant observation notes were re-read and reflected upon using memoing. Overall, data analysis focused on the depth of content. Analysis was validated by research assistants and key stakeholders during a secondary research trip. ~~Some quantitative data was extracted from interviews, such as age, relationship status, current employment, housing status etc. that provided a profile for each interviewee and an overall statistical picture of interview respondents.~~

2.5 Limitations

As this work is a case study, the findings are limited in their relevance to communities outside of Iqaluit, Nunavut. Particularly, given the unique characteristics of Iqaluit, such as it's large size for the territory, high concentration of government jobs, and diverse population, these findings may be less relevant to women living in other Inuit communities across Canada's North. While the participants represented a diverse cross section of the Iqaluit community, there were few interviewees under the age of 30 which may have resulted in missing key generational differences, particularly in a community with such a youthful population.

3. Results and Discussion

3.1 Exposure and Sensitivity

316 Consistent with research across the North, women in Iqaluit are experiencing
317 considerable environmental changes in and around the community. Their exposure to
318 these changes, as well as the exposure of their community at large, has important
319 implications for an increase in climate-related risks. While interviewees did not always
320 explicitly link these changes to longer term climate change, many of the observed
321 changes are consistent with those identified as symptomatic of longer term climate
322 change in the scientific literature. Ten changes were reported by more than one
323 participant, with declining caribou populations the most frequently reported (reported by
324 33/42 interviews)). Women expressed that particularly since 2000, there are significantly
325 fewer caribou in the surrounding area, consistent with studies which have reported a
326 >95% decline in the South Baffin caribou population in the last 20 years (Jenkins et al.
327 2012). While respondents described caribou populations in Iqaluit to be cyclical, fears
328 were expressed that the current decline could be linked to observed changes in snow and
329 ice regimes as well as increases in resource extraction in the region. As such, the broader
330 scholarship has identified how changes to snow and ice cover, more frequent rain-on-
331 snow events, and mining development can have detrimental long-term impacts of caribou
332 populations (Callaghan et al. 2012; Cameron et al. 2005; Boulanger et al. 2012). After
333 caribou, interviewees most frequently mentioned changes to berries (reported by 23/42
334 interviews), noting they have been smaller, seedier and less abundant since their
335 childhood and particularly in the last three years. Changes to both caribou populations
336 and berries have implications not only for food security in the region but also mental
337 health and well-being. With fewer caribou, access to country food is reduced and
338 Iqalummiut hunters have to travel further afield in potentially unfamiliar terrain of other
339 communities where caribou are available in order to hunt. Interviewees also reported feel
340 a loss at the difficulty of accessing caribou, which is a favoured country food. Berries,
341 and their impact on mental health and food security are discussed in greater detail in
342 section 3.2.1.
343 Sea ice was described as being thinner, with interviewees expressing concern
344 about how fast the ice melts in spring as well as the way in which the ice is melting.
345 Women observed that the ice is melting from below, a phenomenon which was described
346 as new. Thin ice and early break up were described as creating more dangerous travel and
347 reduced time spent on the land. Records of the number of ice free days and stable ice
348 days align closely with these observations; since the early 1980s, the number of ice free
349 days in Iqaluit has steadily increased, while the number of stable ice days has fallen (Ford
350 et al. 2013). Thinner ice creates riskier travel conditions, impacting safety while on the
351 land (where "the land" refers to any travel on sea ice, oceanic, or terrestrial
352 environments). Many participants expressed concern about this increased risk, with some
353 women relaying harrowing stories of their experiences on unexpectedly thin ice.
354 Interviewees often noted changes surrounding seals, particularly regarding their
355 fur and population size. Women reported sealskins to be thinner and with shorter fur.
356 Some interviewees also mentioned that seals now have less fat than in previous decades,
357 and many stated that seals did not seem to be as abundant as they once were. The
358 scientific literature on seal populations in the eastern Arctic suggests that numbers may
359 be in decline due to loss of sea ice, which plays an important role in seal life cycle
360 (Ferguson et al. 2005; Kovacs and Lydersen 2008). One woman linked this population
361 change to increasing numbers of orcas (*Orcinus orca*) in the region, while others

suggested these changes may be related to mining development. Similar observations are evident in other regions: in Hudson Bay, for instance, orca sightings are increasing as the sea ice opens up, allowing orcas to expand their predation range (Higdon and Ferguson 2009; Nancarrow 2010). Seal habitat disturbances related to economic development, such as an increase in shipping or air traffic, have also been found to result in behavioural changes among Arctic seals more generally (Frid and Dill 2002). Fewer seals in the region poses a risk to food security and the diminished quality of sealskins poses a risk to women's engagement and enjoyment of sewing with this traditional material. The relationship between changes to sealskin and sewing are detailed in section 3.2.2.

Increasing temperatures, which have impacted snow and precipitation frequency were mentioned in 10 interviews. These observations are consistent with other studies which have documented a trend of rising average temperatures since the 1980's based on weather station data (Ford et al. 2013). Increased incidences of rain were reported to be associated with changes to berry harvests, as too much rain was explained as having a negative impact on fruiting and flowering cycles. Freezing rain during spring and summer months, a previously rare phenomenon, was also described as becoming more common, an observation also supported by academic literature which has found the frequency of freezing rain increasing across the Canadian Arctic, likely due to rising air temperatures (Hanesiak and Wang 2005). Generally, weather was described as less predictable. Unpredictable weather and temperature change creates a substantive risk to the ability of community members to spend time on the land engaging in traditional activities in a safe manner, which in turn poses a risk to mental health and well-being. The relationship between weather change, time on the land, and well-being are discussed in sections 3.1.3 and 3.1.4.

Five interviewees out of 42 described seeing new species of insects, birds, and plants around Iqaluit. Increasing numbers of mosquitoes were said to be particularly bothersome and discouraged some women from spending time on the land during summer months. While the impact of increased mosquitos had on the time women spent on the land is modest it should not be trivialized. Participants also described seeing mammals that were previously less common in the area, such as polar bears and orcas, more frequently around the mouth of Frobisher Bay. This led to concerns about safety while on the land, as well as the potential effect increased predators in the area could have upon access to preferred country foods such as seal.

Through interactions with the socio-economic realities of contemporary Iqaluit and gender roles of women, the environmental changes documented above are affecting aspects of traditional activities women in the community engage in. Three livelihood activities emerged frequently in interviews as being particularly sensitive: berry picking, sewing, and the amount of time women are able to spend on the land. The mental health impacts of the changes to these three activities is also discussed as a sensitivity of particular importance.

3.1.1 Berry picking

Berry picking is a female dominated activity and the increasing occurrence of poor berry seasons noted by participants had a particular effect on Inuit women in Iqaluit. Women stated they often engage in berry picking while men are hunting and it is an activity well

suited to simultaneously caring for children. Interviewees described berry picking as a widely accessible activity, which gives a quiet space to relax, chat with friends, and de-stress by losing oneself in the repetitive motions of picking. Around Iqaluit, crowberries (*Empetrum nigru*), blueberries (*vaccinium cyanococcus*), and blackberries (*rubus arcticus*) are picked and tend to be eaten on their own after being freshly picked, or mixed with animal fat. Occasionally they will be added to recipes where "southern" berries might be commonly used, such as pancakes, pies, or jam, but more often they are eaten on their own without processing. Berry picking usually takes place within the immediate vicinity of Iqaluit or out on the land, where women either walk to or are taken there via boat or occasionally an ATV. Unlike other land-based activities, such as hunting, berry picking does not necessarily require access to a snowmobile or boat, and does not necessitate taking time off work or conflict with childcare duties. Anyone with a spare hour, a bucket and the ability to walk to a nearby berry picking spot can participate in this activity. However, this accessibility was described to be changing.

When asked how the environment has changed since their childhood, most women (24 out of 42 interviewed) identified berries as having changed. Interviewees explained that "bad" berry years—years when berries were smaller, seedier and scarcer—had become more frequent in the last two decades. "Good" berry picking spots, defined as areas where berries were plentiful and plump, are now harder to find and located further from town. Berries, which fruit in the late summer and early fall, were described as being particularly sensitive to small variations in weather, with too much or too little moisture during the winter months, and too much or too little heat being identified as resulting in "bad" berry years. These observations are well supported by academic literature which also finds that moisture variations during the winter and warm temperatures can impact fruiting and flowering cycles (Cavaliere 2008; Downing and Cuerrier 2011; Kellogg et al. 2010).

"The berries used to be awesome – consistently no problem. Every August, no problem. But in the past years either they're not ready or they're not ripe or not abundant as they used to be in the past. We've been having really strange summers. Either not enough rain or not enough sun." (Middle aged, middle income mother).

Indeed, temperature has been noted to impact the fruiting and flowering cycles of Arctic plants, with studies showing that some species may flower and fruit earlier as a result of warming temperatures (Downing and Cuerrier 2011; Murphy, 2014). Participants identified that high berry yields are also dependent on adequate winter precipitation (in the form of snow), a finding which is supported in other literature (Kellogg et al. 2010). Similar observations have also been made in Nunatsiavut, where community members have found that berries are ripening earlier and rotting quicker due to temperature increases, and in Akutan and Point Hope, Alaska, where the community has noted the quality and abundance of berries to be dependent on climatic fluctuations (Downing and Cuerrier 2011; Kellogg et al. 2010). Many interviewees expressed that some "good" berry picking areas can still be found across Frobisher Bay, although accessing these areas requires access to a boat. A contributing factor to these geographical differences in berries may be related to the slightly warmer micro-climate which occurs on the southern side of Frobisher Bay, which also receives more rain than

454 the area directly surrounding Iqaluit (Hanesiak et al. 2010; M. Thomas personal
455 communication June 20, 2014)
456 Compounding the ecological changes berries are experiencing, many women
457 expressed the loss of good berry picking areas to the expanding infrastructural
458 development of Iqaluit. Many stated that houses or buildings now occupy their favourite
459 berry picking spots, as the Plateau and 'Road to Nowhere' neighbourhoods have
460 expanded. Overall, interviewees expressed great disappointment in the changes occurring
461 in berries. "Last year it was depressing" stated one mother in her early thirties when
462 referencing the previous year's berry harvest, while another woman in her seventies
463 stated that not having berries "made me feel sad".
464
465 **3.1.2 Sewing**
466
467 Largely dominated by women, sewing has historically been important to the survival
468 of Inuit communities in the Arctic (Billson and Mancini 2007; Oakes 1992). Today,
469 sewing remains a key part of Inuit female identity and an activity that contributes to the
470 family in a multiplicity of ways (Billson and Mancini 2007; Issenman 2011; Pearce et al
471 2015). Sewing played a diversity of roles in the lives of the women interviewed,
472 providing for their family using traditional skills, both in terms of physical items and
473 economic gain. Interviewees often sew clothing for their family, largely focusing on
474 outdoor wear such as parkas, *amautis* (traditional coats with space for carrying children
475 on one's back), mitts and *kamiks* (traditional waterproof boots made of sealskin). At the
476 same time, sewing can also provide a noteworthy albeit inconsistent income, as craft
477 items can be sold to other members of the community or people passing through Iqaluit.
478 Beyond sewing's practical provisional role, the majority of women interviewed stated
479 how important sewing is for their mental health and wellbeing as well as strengthening
480 their Inuit identity. Having the knowledge and skills to create clothing for loved ones was
481 reported by many to give considerable confidence and pride while fulfilling traditional
482 Inuit female roles. Women consistently emphasized the important role Iqaluit's
483 Tukisigiarvik Friendship Centre plays in fostering sewing skills in the community
484 through their sewing classes. Interviewees also described the pride and appreciation older
485 women in the community had for women who sew, further cementing the importance and
486 status gained by ones ability to sew.
487 While sewing reinforces Inuit identity it also acts as a method of relaxation and
488 decompression. As one middle aged interviewee described it "[Sewing is] just like
489 meditation. Where you can't think, it's like 'I just want to get this done.' Its like
490 meditation I guess" (Middle aged homeowner). The majority of interviewees who sew
491 echoed this sentiment, with one person stating the important role sewing and learning
492 sewing skills can play in healing trauma.
493 Yet sewing was described as being affected by changing climatic conditions. Some
494 interviewees reported skins being thinner and more prone to ripping than they have been
495 in the past. Furs were described as being more delicate than they once were, with the fur
496 coming loose from the skin more frequently; an observation also made by Dowsley et al.
497 (2010) in their paper on the potential effects of climate change on Inuit women. Thus it
498 was described that while the same time and energy is put into a garment it may not last as
499 long due to the quality of the skin. Studies on seal skins and climatic factors are limited,

although one recent study suggested that disruptions to seal pup development due to sea ice deterioration resulting from warming temperatures may negatively impact the density and length of harp seal fur (*Pagophilus groenlandicus*) (Gmuca et al. 2015). While interviewees mainly sew using ring seal (*Pusa hispida*) pelts, some do use harp sealskin although interviewees never explicitly stated if these changes were being noted across all species or just one type.

Interviewees also reported reduced access to skins. With participants reporting less hunting due to increasing hunting costs, and more dangerous ice conditions, the majority of interviewees that sew described having to order skins from southern furriers or buy them in town from northern suppliers, rather than rely on hunters in the family to provide them. Additionally, only four of the women (two over the age of 70 and two in their early 30s) interviewed knew how to clean skins, and many regretted not having this skillset, and is indicative of the broader social changes affecting the role of Inuit women, and in turn sensitivity to a changing climate. Cleaning skins is a time consuming and physically demanding process that many interviewees reported having not learned, or did not have the time or energy to engage in due to the demands of their roles as providers and caregivers.

3.1.3 Time on the Land

Interviewees consistently expressed a strong desire to spend more time out on the land engaging in land-based activities, repeatedly emphasizing the positive impact these experiences had on their mental health. Of the women interviewed, only 6 reported going on the land three or more times a month, compared to 13 interviewees who had been out only once in the last year, and 9 who reported not going out in over a year.

While the majority of women interviewed preferred to spend time on the land in the spring and summer, any time spent on the land was described as providing space to recalibrate and recharge. One interviewee stated when asked what she liked to do to reduce stress, "[I] really love that. Being away from chaos and craziness, peace and quiet. It really boots [me] up." (Grandmother and elder). Women also expressed a desire to take their children out on the land and cultivate in their children the fond memories they have in relation to the land.

The importance of getting out on the land for mental health and well-being in Inuit communities is increasingly being recognized. Cunsolo-Willox et al.'s work from Nunatsiavut (2012, 2013a, 2013b, 2014), for example, repeatedly highlights how place and interactions with place impact mental health in the context of climate change, while Durkalec et al. (2015) emphasize the key role sea ice plays in Inuit autonomy, health, culture, and knowledge. While time on the land was identified as having mental health benefits, poor physical and mental health can act as a barrier to the amount of time women spend on the land. Many women noted that they had previously spent much more time on the land but a physical injury or chronic health conditions had severely limited their ability to get out.

Weather also impacts the time women spend on the land. Since many women in Iqaluit work, weekends become the most opportune time for trips on the land. If the weather or ice conditions during the weekend are not conducent to travel, weekend trips have to be cancelled or postponed. One woman stated that increases in rain were severely

impacting her and her partner's ability to get out on the land. The impact weather can have on trips out on the land is echoed in similar work looking at male hunting experiences in Iqaluit (Ford et al. 2013). A few interviewees also expressed concern about safety due to changing weather conditions, sharing stories of racing skidoos across thinning ice. These concerns were often relayed with commitments to limit trips on the land to times when weather and ice were seen as more predictable.

In regard to the limited time available for land based activities, two interviewees described the impact their employer had on the amount of time they were able to spend on the land; these employers recognized the importance of hunting and other land based activities and were flexible when it came to booking time off. Due to increasingly unpredictable ice break up times, one interviewee's employer allowed her to start her holidays on the first day it was possible to go boating. In addition to being limited by work commitments, interviewees' roles as mothers and engaged community members further constrained the time available to spend on the land. Many interviewees lamented this and it should be noted that the few women interviewed who regularly hunt do not have children living with them at home, freeing up time.

Despite the increasing numbers of women working, finances remain a substantial barrier to spending time on the land. Access to working equipment such as boats and skidoos had a large impact in whether women were able to get out, and this equipment is expensive to own, use, and maintain. The majority of women did not have access to a snowmobile or boat, with only 18 and 14 interviewees (out of 42) reporting that someone in their household owned a snowmobile or boat respectively. The high cost of equipment must be weighed against other purchasing decisions and with high living costs in the North there is great demand on financial resources. While borrowing equipment is not an uncommon practice, some interviewees expressed hesitation about borrowing, stating they felt shy asking to use equipment or go along on outings.

3.1.4 Mental health and Identity

Mental health and well-being emerged as cross-cutting themes in many of the interviews, around which impacts of changing climatic conditions were often described. Berry picking, sewing and spending time on the land were all described as having positive impacts on the mental health and well-being. From providing meditative spaces, to allowing women to provide for loved ones, to reaffirming Inuit identity, these three traditional activities are important aspects of women's lives. Interviewees expressed frustration, disappointment, sadness, and concern about the limited access to or time available for these traditional activities.

Women also emphasized the impact changing climatic conditions are having on the mental health of those around them. As a result of changes on the land, women reported that the men in their lives were increasingly stressed, which in turn causes stress among other family members. As one interviewee noted when talking about the ripple effect of changes to weather, "He['s] stressed, she['s] stressed" (Older low income grandmother). Interviewees identified these high levels of stress being experienced by men as linked to less time spent on the land. Male stress and frustration with being 'cooped up' were reported as being particularly high during hunting shoulder seasons (ice freeze up and spring break up) when being out on the land is more difficult and dangerous, and work with male hunters in Iqaluit has identified a lengthening of these shoulder seasons (Ford

et al. 2013). Women also identified that men had a harder time managing their stress in comparison to women, with women more likely to talk about their feelings while men, in line with traditional Inuit ideals of masculinity, tend not to readily share their feelings (Collings 2014).

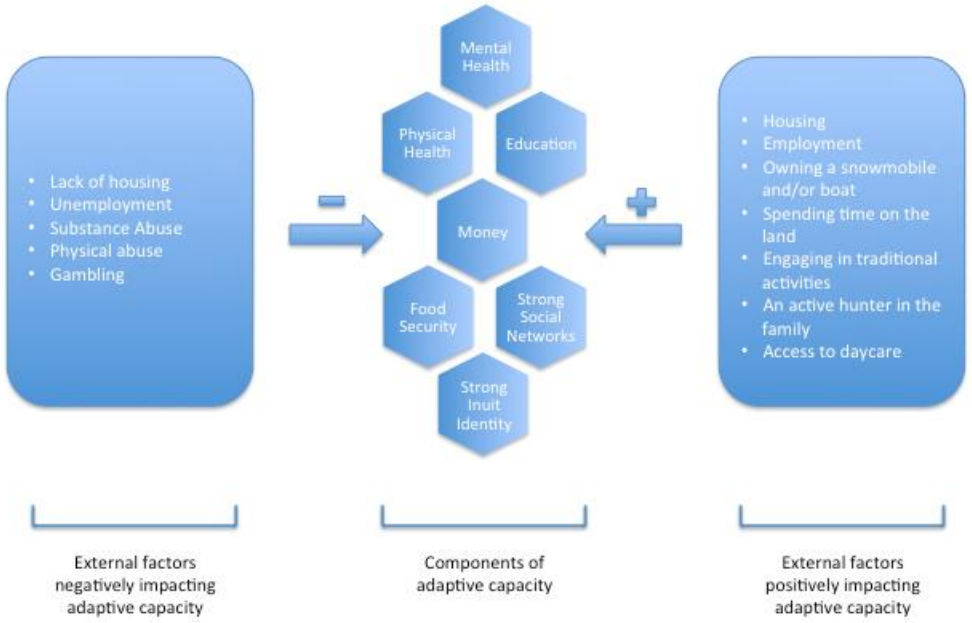
Due to poor ice conditions and unpredictable weather, some women also explained that they worry more when loved ones are out on the land, especially if their loved one is traveling alone. As a result, many women explained that they demand partners and other loved ones travel with at least one other person. Food security also emerged as having an impact on the mental health and well being of those interviewed. Women consistently described "craving" country food and how not having it, or being unable to regularly feed it to their family, made them feel disconnected from their identity. Conversely, women described the joy and satisfaction they felt when they were able to eat country food. The majority of interviewees reported that they ate less country food today than they did during their childhood. Women also expressed concern that environmental changes and economic development were affecting the access and availability of key species.

3.2 Adaptive Capacity

While Iqaluit women face a number of sensitivities to changing climatic conditions, many interviewees also mentioned coping mechanisms they are using to manage them. In response to "bad" berry seasons, women commonly reported going berry picking earlier in the year as they have noticed berries fruiting earlier with warmer temperatures, which cause berries to ripen earlier. Interviewees also reported going to other locations in search of berries, although this was dependent on the accessibility of those areas. Since many of these "good" berry picking spots are located across Frobisher Bay or further from town, access to a boat, all-terrain vehicle (ATV), and/or snowmobile were described as being necessary to get to these sites. Women reported that going earlier and to other areas they had greater success getting berries. In one extreme case an interviewee explained that a friend charters an annual weekend flight to Kimmirut (a 35 minute flight) open to her family and friends for the explicit purpose of going berry picking. While other activities, such as visiting family and friends undoubtedly occur on this trip, the approximately $200 per person chartered flight is organized for the explicit purpose of going berry picking.

Faced with fragile sealskins, interviewees reported being gentler when working with the skins or purchasing skins from furriers in the south. Women also reported that older female family members recommended simply throwing away sealskin that was overly delicate, as this would not make lasting clothing items. Many interviewees were also resigned to the fact that their sewn items may not last as long as they were once expected to. Other responses have involved developing alternative activities. For example, as spending time on the land has become more difficult for women, many described a method of replicating the peaceful atmosphere they experience when out on the land by taking walks around town, or a short distance from town, on the tundra. These short walks were accessible regardless of one's work schedule, family commitments, weather and ice conditions, and did not have the economic barriers associated with going further afield. These walks were not seen as a replacement for time out on the land, although they did allow women to connect with themselves and their environment.

637 Coping strategies documented in light of mental health challenges often reiterated
638 the importance of previously mentioned activities being impacted by change such as
639 spending time on the land, sewing, and engaging in other traditionally female dominated
640 activities, such as berry picking. Going for walks, reconnecting with family and friends
641 were also commonly mentioned, as were less positive coping strategies such as drinking
642 and gambling.
643 Not everyone is equally able to cope with changes being observed, and participants
644 in the study were asked to identify and describe what helped them deal with change and
645 stress in their lives, particularly the impacts of changing climatic conditions. Seven key
646 interacting components were commonly reported to influence adaptive capacity, noting
647 these components also influence sensitivity to changing climatic conditions and overall
648 well-being: mental health, physical wellness, a strong western and/or traditional
649 educational foundation, money, food security, strong social networks, and a connection to
650 Inuit identity (Figure 2). These components, in turn, are affected by the broader external
651 social-economic-political conditions over which households have limited control, and
652 either support or impair adaptive capacity. While some of these external conditions, or
653 factors may have a unidirectional impact on the seven components of adaptive capacity,
654 others can create positive feedback loops: when external factors are positively impacting
655 these seven components it will be easier to access more positive external factors. For
656 example, if a woman is employed she will have greater access to money, which may
657 allow her to support a hunter in her family which could increase her access to country
658 food. Such feedback can also occur with external factors which negatively impact
659 adaptive capacity: an individual may suffer from substance abuse which would hamper
660 their mental and physical health, causing them to struggle to be employed.
661
662 **Figure 2.** Components of adaptive capacity and the interacting positive and negative
663 factors



As highlighted in section 3.3, traditional activities such as berry picking, sewing, and spending time on the land have positive impacts on *mental health*, but these activities are not as accessible as they once were for women in Iqaluit. Women with poor mental health, such as those suffering from depression, were less able to manage changes discussed, with some describing coping mechanisms linked to substance abuse. Similarly to mental health, the *physical wellbeing* of women impacts all aspects of their lives. Poor physical health, especially chronic health conditions, were regularly identified by interviewees as impacting their ability to earn an income, participate in excursions on the land, and engage in traditional activities. Women identified that having adequate housing, appropriate for the size of their family had a positive impact on their mental and physical wellbeing, while those living in overcrowded homes expressed high levels of stress. Substance abuse and domestic abuse was clearly shown to have a detrimental effect on women's adaptive capacity as this puts stress of mental and physical health, financial resources, and social networks (Healey and Meadows 2007). The issue of domestic violence is well recognized throughout Nunavut and has been among the top priority of Pauktuutit, which represents Inuit women in Canada (Pauktuutit 2015).

Interviewees regularly discussed the impact of *education* on their lives. In terms of western education, many interviewees had not graduated high school, describing the frustration they felt having to learn in English when Inuktitut was their mother tongue. High school graduates qualified for a wider variety of jobs, as well as positions with a higher income. However, a western education is not the only signifier of high levels of

adaptive capacity: women with a strong traditional education also showed clear signs of adaptive capacity. These women were able to tap into traditional methods, skills, and activities which could provide income and lead to a variety of opportunities. Having a strong traditional education also resulted in women being more able to engage in traditional activities, subsequently reinforcing mental well being. Women with a strong background in both western and traditional education tended to describe a greater number of alternative methods or solutions when faced with environmental and social changes as a result of their dual understanding of both traditional and western systems.

Financial security in terms of access to cash and credit was important in women's ability to manage the impacts of change. Women reported that financial flexibility allows for greater flexibility in multiple areas of their lives. Having access to financial resources allows women to take advantage of good weather for trips out on the land, with a lack of money for gas, supplies, or equipment often cited as barrier to traditional activities among those on lower income. For example, one interviewee described renting a boat, despite the high cost, to be able to take her family members out clam digging during good weather. Interviewees repeatedly expressed the barrier they faced in spending time on the land if they did not have access to a snowmobile and/or boat. Yet, as described above, time spent on the land has significant mental health benefits for women and women consistently emphasized their desire to spend more time out on the land, illustrating the interrelationship between various determinants of adaptive capacity.

Access to money helps women support the hunting activities of family members, enhances food security through access to both store bought food and the ability to buy country food if needed, and enables them to buy supplies needed for their sewing (e.g. buying skins from furriers) and other craftwork. Other research from Iqaluit has similarly identified limited access to cash resources as making households more sensitive and constraining adaptive capacity to changing environmental conditions (Statham et al. 2015, Ford et al. 2012). One significant threat to women's financial security in Iqaluit is gambling, which commonly manifests among Inuit women as bingo, games of poker, or patii (a card game), and often provides a fun social atmosphere for women, but can become financially damaging (Billson and Mancini 2007). Access to cash and credit is dependent on steady employment of at least one individual in the family, if not the woman herself. Having good mental and physical health, and access to daycare for mothers with young children, was consistently identified as being important to women's ability to earn an income. Employment can also positively reinforce the mental health of working women who were satisfied with their work.

Having a *strong social network* of family and friends to rely on emerged as a key aspect of women's adaptive capacity. Interviewees often spoke of the support they receive from family members and friends with everything from accessing country food, to childcare, to housing. For women who do not own or have access to a snowmobile or boat, social networks played a key role in women's opportunities to spend time on the land. Having family and friends who lent out their equipment or offered to take interviewees and their children out, increased women's ability to take advantage of good weather or access "good" but remote berry picking sites. The importance of social networks in facilitating adaptive capacity to many stressors, both social and biophysical, is well acknowledged, especially among youth and indigenous populations (Petrasek MacDonald et al. 2013; Richmond et al. 2007; Wexler et al. 2014).

Social networks also play a particularly important role for women by filling Iqaluit's daycare gap, with many family members and friends taking care of children in lieu of certified daycares. Gaining access to affordable and adequate daycare is difficult. Despite the large and growing population of children under the age of six, only six licensed daycares currently exist in Iqaluit, all of which have long waiting lists (Omik 2011). As more women are working, or would like to work, the availability of adequate childcare has a substantial impact on both their ability to work, their mental health, and their financial security. Some woman reported that they were unable to work until their children were accepted into a daycare program or started school.

Interviewees repeatedly emphasized the importance of having access not only to *sufficient food*, but also to culturally relevant country foods such as caribou, seal meat, and berries. Having adequate nutritious food leads to better physical and mental health, and if the food is country food, then this was found to reinforce links to culture and mental health. Connected to food security, the presence of an active hunter in the immediate or extended family was also described as increasing the likelihood of regular access to country food, although the hunter still had to have the time, equipment and resources to go hunting.

Having a robust and strong social network allowed women to make use of Inuit sharing systems for both country food and store bought food. The high cost of store bought food was frequently mentioned as impacting both the mental and physical health of women and their families. Access to a snowmobile and/or boat helped support women's access to country food as well as strengthened their cultural identity, both through increased time on the land and consumption of culturally important food.

Women who expressed a strong *connection to Inuit culture* described feeling more able to respond to changes in climate, and more broadly the stresses facing their lives, while interviewees that expressed feeling distant from their Inuit identity reported struggling to cope. This finding mirrors that of Healey and Meadows (2007) who found tradition and culture to be a key determinant for the health of Inuit women. Engaging in traditional activities, such as sewing, spending time on the land, and going berry picking, was consistently reported by interviewees as strengthening their identity as an Inuk woman and their mental health. In some cases, engaging in traditional activities facilitated stronger social networks, opportunities, and financial resources, through the selling of artwork, participation in cultural activities like throat singing, or engagement in Inuit community organizations. In turn, having a strong connection to one's identity was consistently associated with greater confidence in one's abilities and decisions.

It is clear that the seven components of adaptive capacity d

4. Conclusion

Research focusing on the gendered nature of climate change impacts is relatively recent, and studies to-date have largely examined the experiences of women living in the global South (Bunce and Ford, 2015). This work from the global South commonly asserts that women are more vulnerable to climate change than men (Arora-Jonsson 2011; Bunce and Ford, 2015). There is also a common narrative that women's climate change experience is solely mediated through women's relationship to agriculture. The

779 experiences of Inuit women documented here, however, differ from the generalizations
780 found in the scholarship in a number of ways.
781 Firstly, the contemporary gender role of Inuit women typically involves earning a
782 consistent income, with the amount of country food they regularly procure being less than
783 that of men, who typically take on a hunting role. This contrasts to the scholarship from
784 developing countries, where women often have agricultural responsibilities while men in
785 the community migrate to cities in search of work, resulting in women in these
786 communities being directly affected by changes to agricultural systems. Subsequently,
787 the impacts of changing climatic conditions are experienced in a more indirect manner
788 for Inuit women. Indeed, the global narrative of the relationship between women and
789 climate change is seemingly closer aligned with the experience of Inuit men who, in
790 general, spend more time engaging in land based activities procuring food than women
791 and therefore experience climate change impacts in a more direct fashion.
792 While the climate change experience of Inuit women is different from that of
793 men, it is noteworthy that the factors which influence the adaptive capacity of Inuit
794 women are largely consistent with those that have been identified for Inuit communities
795 generally. The importance of access to financial resources, constraints on time, substance
796 abuse, mental and physical health, education, food security, traditional skills, and social
797 networks are well documented (Ford 2009; Ford et al. 2006, 2008; Furgal and Seguin
798 2006; Prno et al. 2011; Pearce et al. 2010, 2011, 2015; Smit and Hovelsrud 2010).
799 Although this scholarship examines the Inuit experience without explicit reference to
800 gender, the male experience is typically central, stemming from the focus on the impact
801 of climate change on harvesting. As a result, it important to note the lack of discussion
802 around sewing, the role of daycare, berry picking, women's desire to spend more time on
803 the land, and the impact of male stress on families in previous work on climate change
804 and Inuit.
805 The study of the relationship between gender and climate change could benefit
806 from further case studies that examine cultures and communities outside the developing
807 world, particularly further study in an Inuit context. Conducting a comparative study of
808 Inuit women living in a smaller Inuit community would provide a more comprehensive
809 understanding of the climate change experiences of Inuit women. Similarly research
810 examining the explicit climate change experiences of men, both those who hunt regularly
811 and those who do not, would provide a useful complement to this work and allow for a
812 more holistic gender analysis.
813 Despite the rapid changes in climatic conditions being observed in Iqaluit—and
814 consistent with changes being documented across the Canadian North—climate change is
815 not the most immediate or pressing issue Inuit women face on a daily basis. In
816 communities experiencing high suicide rates, food insecurity, and housing shortages,
817 climate change is a more distal stress. Yet it is also clear that climate change acts as an
818 exacerbating factor, or a threat multiplier, for many socio-cultural issues facing Canada's
819 North. The intersectionality of these overarching multi-dimensional issues is highlighted
820 by the variety of factors impacting the vulnerability and adaptive capacity of Inuit
821 women. It is noteworthy herein that adaptation efforts in northern communities need to
822 go beyond just focusing on responding to specific impacts, to also consider the broader
823 underlying human determinants of sensitivity and adaptive capacity to climate change.
824

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