Exploring Elders’ and Seniors’ Perceptions of How Climate Change is Impacting Health and Well-being in Rigolet, Nunatsiavut

Joshua Ostapchuk, BSc, MPH Candidate, Columbia University, New York, New York, USA

Sherilee Harper, MSc, PhD, Assistant Professor, University of Guelph, Guelph, Ontario, Canada

Ashlee Cunsolo Willox, PhD, Canada Research Chair in Determinants of Healthy Communities and Assistant Professor in Community Health, Cape Breton University, Sydney, Nova Scotia, Canada

Victoria L. Edge, MSc, PhD, Adjunct Professor, University of Guelph, Guelph, Ontario, Canada

Rigolet Inuit Community Government, Rigolet, Nunatsiavut, Labrador, Canada

ABSTRACT

Climate changes are rapidly intensifying and can lead to adverse global health impacts. Indigenous populations are especially vulnerable to climate change because of their dependence on the environment for cultural activities and subsistence. The voices of Inuit Elders and seniors encompass deep wisdom and history; as such, the goal of this research was to examine the perceived impacts of climate and environmental changes on physical, mental, and emotional health, as observed by Elders and seniors in the Inuit community of Rigolet, Nunatsiavut, Labrador, Canada. A mixed-methods approach was used to gather data capturing these local observations, as well as perceived impacts on community health. A community survey was administered in November 2009 (n = 75) and in-depth interviews were conducted with Elders and seniors from January to October 2010 (n = 22). Survey results indicated that Elders and seniors observing changes in weather patterns, water systems, and wildlife were more likely to perceive climate change impacts on health (p < 0.05). Emergent themes from the interviews included: recurring observations of climate change impacts on health; impacts on physical health, including reduced...
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physical activity levels and poorer nutrition; impacts on mental and emotional health, including feelings of isolation and depression; and an identified need for community-wide adaptation. This research emphasized the importance of understanding Elder-specific perspectives of climate-health relationships in the Canadian North to develop sustainable, culturally relevant adaptation strategies to mitigate health impacts related to climate change.

KEYWORDS

Elders, Inuit, Indigenous, Nunatsiavut, climate change, environmental change, mixed-methods research, well-being, health, adaptation

INTRODUCTION

It has been said that health impacts of climate change will represent the “greatest public health challenge humanity has faced” (Myers & Patz, 2009, p. 223). Human-induced global climate change is now acknowledged as reality within the scientific community (Christensen et al., 2007; Füssel, 2009). Projected increases in regional temperatures—combined with changes in the intensity, duration, and frequency of precipitation and severe storms—are expected to have substantial impacts on physical, mental, and emotional health outcomes, resulting from increased exposure to infectious disease, water and food insecurity, population displacement, conflicts over natural resources, and degradation of landscapes and ecosystems (Christensen et al., 2007; Costello et al., 2009; Fritze, Blashki, Burke, & Wiseman, 2008; Frumkin, Hess, Luben, Malilay, & McGeehin, 2008; Swim et al., 2011). Given
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the increasing rate at which these climatic and environmental changes are occurring, it becomes more important to examine and understand various ways in which climate change affects health. This will help ensure successful implementation of sustainable health adaptation strategies (Ford, 2009; Ford et al., 2010a).

Climate change is expected to have a substantial impact on those who rely on natural ecosystems for subsistence, such as many Indigenous populations. Also at increased risk are the elderly (due to reduced mobility and immune function), children, women, and those living in climate-sensitive areas such as polar and coastal regions worldwide (Costello et al., 2009; Health Canada, 2002; McMichael, Friel, Nyong, & Corvalan, 2008; Schneider et al., 2007). Across the Canadian North, several environmental and climate changes already have been observed by Indigenous peoples as well as documented empirically. These include higher ambient temperatures; increased frequency and intensity of storms; and unpredictable changes in rainfall, snow, and ice formation patterns (Christensen et al., 2007; Cunsolo Willox et al., 2012, 2013a,b; Ford et al., 2008; Fox, 2002; Furgal & Seguin, 2006; Füssel, 2009; Healey et al., 2011; Pearce et al., 2009). Indigenous populations living in these regions, such as Canadian Inuit, are particularly vulnerable to effects of climate change due to their dependence on the surrounding land, water, and ice for livelihood, cultural activities, and subsistence (Ford, Pearce, Duerden, Furgal, & Smit, 2010b; Ford, Smit, & Wandel, 2006; Ford et al., 2007; Ford et al., 2008; Furgal & Seguin, 2006). In addition, the impacts of colonization—economic, social, and political marginalization; a history of residential schools; and forced relocation of communities from historical homelands—contribute to underlying social inequities and disparities in health outcomes in many Indigenous populations (Gracey & King, 2009; Richmond, 2009; Richmond & Ross, 2008, 2009). Climate change negatively impacts or exacerbates several of these social determinants of health, leading to poorer social and health outcomes (Costello et al., 2009; Health Canada, 2002; McMichael et al., 2008).

For many Inuit, the concept of “good health” does not simply imply a disease-free state; rather, it signifies the achievement of a physical, emotional, mental, and spiritual balance (Borré, 1994; Cunningham, Reading, & Eades, 2003; Inuit Tuttarvittangat, 2010; King, Smith, & Gracey, 2009). Climate change and variability increasingly challenge this balance of health and well-being. For example, Inuit in Nunatsiavut have reported various impacts on health, such as dietary changes, reduced access to safe drinking water, and increased stress that are attributed to a changing climate (Cunsolo Willox et al., 2013a,b, 2012; Furgal et al., 2002; Furgal & Seguin, 2006; Harper et al., 2011). Research, however, has consistently called for more information about how climate change affects vulnerable subgroups within populations, such as the elderly, and those with limited equipment and financial resources (Furgal et al., 2002; Furgal & Seguin, 2006; Health Canada, 2002).

In Nunatsiavut and across the Canadian North, the concept of healthy and successful aging emphasizes and values the transmission of accumulated knowledge and wisdom, in addition to physical factors (Aporta & MacDonald, 2011; Collings, 2000, 2001; Lewis, 2011). Inuit Elder and senior observations of climate and environmental change, and perceived impacts on health within Inuit communities, are based on a substantial amount of wisdom, insight, and history. Furthermore, the elderly are a subgroup who are more vulnerable to climate change because of their often reduced mobility, increased prevalence of chronic illnesses, weakened immune systems, and higher poverty rates (Costello et al., 2009; Health Canada, 2002; Schneider et al., 2007). These risk factors increase susceptibility to infectious diseases and negative effects of extreme environmental conditions (e.g., weather events, heat waves, smog, water contamination, etc.), which are projected to be exacerbated by climate change (Costello et al., 2009; Health Canada, 2002; Schneider et al., 2007).

While anyone over the age of 50 can be considered a senior, the designation of “Elder” is only given to those individuals recognized as having an abundance of knowledge and wisdom, and are considered leaders in their communities (Bell, 2003). In particular, Elders are highly valued in their communities as knowledge-keepers and wisdom-holders, and hold an esteemed place in the culture. While previous research has involved Inuit Elders and seniors in documenting community-wide observations of climate change in relation to Inuit community health, these studies have not specifically investigated how climate change affects, or has the potential to affect, the health of older Inuit.

The goal of this research was to examine the impacts of climate change on physical, mental, and emotional health, as observed by Elders and seniors in the Inuit community of Rigolet, Nunatsiavut, Canada. The objectives of this case study were to identify recent climate changes and resulting environmental disturbances observed by Elders and seniors in Rigolet; to examine their perceptions about physical, mental, and emotional health impacts related to observed climate and environmental changes; and to identify potential sustainable, culturally relevant adaptation strategies for a preferred and optimistic future. While this research explores perspectives and insights through the voices of Elders and seniors in one Inuit community, the improved understanding of how climate change affects community health could be extended to other Indigenous populations experiencing rapid climate and environmental change.

Community profile

Nunatsiavut (“Our Beautiful Land”) is one of Canada’s four Inuit regions (Figure 1); ratified in 2005 as an Inuit Land Claim Settlement Area, it is self-governed by the Nunatsiavut Government. The community of Rigolet, Nunatsiavut (54°N, 58°W) has a population of 300 people, with approximately equal numbers of men and women, of whom 95% identify as Aboriginal. Approximately 25% of the total population of Rigolet are over the age of 50; however, Rigolet remains a growing community with over 40% of the population under the age of 25 (Statistics Canada, 2013). The languages spoken in Nunatsiavut include English and the Rigolet dialect of Inuttitut; however, Inuttitut is listed as a UNESCO endangered language and is spoken by only three people...
in the community (UNESCO, 2010). Rigolet is remote, accessible only by seasonal ferry and year-round commercial airline service. Transportation within and around the community is primarily by snowmobile in the winter and by boat and ATV in the summer. The community relies heavily on hunting, trapping, and gathering practices for food—which may include caribou, partridge, seal, rabbit, duck, fish, and berries—as well as furs and firewood for warmth. The community also relies on resources from the surrounding land for various cultural activities, such as grass weaving, carving, and sewing.

**METHODS**

**Project background**

This research was part of a larger, multi-year research project entitled Changing Climate, Changing Health, Changing Stories (Harper, Edge, Cunsolo Willox, & Rigolet Inuit Community Government, 2012). In an effort to explore climate-health relationships within a culturally relevant framework, the project was conducted by a multidisciplinary team of researchers, health practitioners, and community digital storytelling facilitators, in partnership with the Rigolet Inuit Community Government. Local community members were engaged in all aspects of the research process, including project design, data collection, analysis, and dissemination (Pearce et al., 2009; Stephens, Porter, Nettleton, & Willis, 2006). To respect and acknowledge the authority, experience, wisdom, and historical knowledge seniors and Elders possess, Elder and senior observations and perceptions were critical in all stages of the research. This research emerged from a larger data set collected through the Changing Climate, Changing Health, Changing Stories project, and although the questions were not specifically designed for Elders or seniors, it became clear to the research team that the voices, experiences, and observations of Elders and seniors were rich and contained a number of important differences when compared to the responses of other age groups. As a result, our team undertook a specific in-depth analysis of the responses from Elders and seniors to highlight these important and valuable voices.

This study followed ethical guidelines for research with Indigenous communities (Canadian Institutes of Health Research, 2007; Grenier, 1998; Inuit Tapiriit Kanatami & Nunavut Research Institute, 2007). It received approval from the University of Guelph Research Ethics Board, the Health Canada Research Ethics Board, and the Nunatsiavut Government Research Advisory Committee.

**Conceptual framework**

We used a case study design because it involved in-depth, place-based research that focused on a particular population (Yin, 1994), which is particularly effective in characterizing vulnerability determinants and identifying opportunities to enhance adaptive capacity (Ford et al., 2010a). We used a convergent, parallel, mixed-methods approach, which involved collecting quantitative survey data and qualitative in-depth interview data at the same time (Figure 2), analyzing the data separately, and then merging the results to explore convergence, divergence, contradictions, and relationships between the two data sets (Creswell, 2009; Creswell & Clark, 2007; Stake, 2005). The combination of results from the two types of data analysis provided a more complete understanding of the health impacts of climate change in Rigolet. The quantitative data provided an understanding of the issue at the population level, while the qualitative data gave a more detailed and in-depth understanding of the issue. For the purposes of this study, and following Nunatsiavut age classifications, we considered Elders and seniors to be Rigolet residents over the age of 50 years.

**Quantitative data collection and analyses**

In November 2009, as part of the larger Changing Climate, Changing Health, Changing Stories project, we conducted a community survey in Rigolet to capture data on local knowledge of climate change, observations of various climate and environmental changes, and perceived health impacts of climate change. The questionnaire was open to those 12 years and over, and included 26 closed-ended and 11 open-ended questions (questionnaire available upon request), which took approximately 15 minutes to complete. The questionnaire had been formally pre-tested for content, context, and clarity by academics, health professionals, and community members in October 2009. Trained community research assistants went door-to-door over a two-week period in November 2009 to verbally administer the confidential questionnaire.

We compared the gender demographics of the survey sample with those of the 2006 Canadian census of the Rigolet population (Statistics Canada, 2007). We examined frequency counts and distribution of the questionnaire data, and coded and
tabulated the various responses from the open-ended questions. Using the Fisher's exact test and a significance level of $p < 0.05$, we tested the null hypothesis of no overall association between the following independent and dependant variables: gender and weather observations for Elders and seniors; weather observations and perceived climate change impacts on lifestyle for Elders and seniors; and weather observations and perceived climate change impacts on health for Elders and seniors. We managed and analyzed all data with Microsoft Excel (2010 edition) and Intercooled Stata (version 10).

### Qualitative data collection and analyses

Qualitative data were collected from January to October 2010 through in-depth, semi-structured interviews (Kvale & Brinkmann, 2009). The interviews were designed to gather data on the depth and breadth of local observations of climate and environmental change, and perceived health impacts of climate change. Interviews were open-ended and conducted conversationally to allow for new ideas and themes to emerge (Kvale, 1996). Interviews took approximately 60 to 90 minutes to complete. The interview guide (available upon request) had

**Research Goal**

To examine the impacts of climatic and environmental change on physical, mental, and emotional health, as observed by Inuit Elders and seniors in the northern community of Rigolet, Nunatsiavut, Labrador, Canada.

**Community-wide Survey:**
- November 2009
- $n = 75$ participants
- 26 close-ended
- 11 open-ended questions
- Administered in-person
- Approximately 15 minutes per person to complete

**In-depth Interviews:**
- January-October 2010
- $n = 22$ Elder and senior participants
- Conducted in-person in a conversational format
- Approximately 60-90 minutes to complete

**Survey Analysis:**
- Descriptive statistics
- Mantel-Haenszel $\chi^2$ Test statistically compared groups

**Interview Analysis:**
- Constant comparative method was used to analyze data
- Qualitative data analysis software (Atlas.ti) was used to assist the research team in coding each interview

**Integration of Results**

Tables and figures from the quantitative data were combined with quotations and themes from qualitative data to explore convergence, divergence, contradictions, and relationships between the two sets of data and give a broad overview of Elder and senior perspectives of health impacts of climate change.

*Figure 2.* A model outlining the mixed-methods approach used to conduct this study in 2009-2010 in Rigolet, Nunatsiavut, Canada.
been pre-tested in October 2009 for content, context, and clarity by community members, academics, and health professionals. We recruited participants from the community using posters, mailbox flyers, radio announcements, door-to-door visits, and word-of-mouth communication. Interviews were held until a point of qualitative data saturation was evidently reached (Miles & Huberman, 1994). Though participants had the option of being interviewed in Inuktitut, all participants preferred English, which was their first language. All interviews were audio-recorded with permission, transcribed professionally, and reviewed by the research team for errors.

We used a constant comparative method for analysis, involving six iterative steps (Bourgeault, Dingwall, & de Vries, 2010). First, a multidisciplinary team reviewed and analyzed each transcript while listening to the accompanying audio recording. Second, the team wrote reflective memos that profiled each interview and compared the similarities and disparities within and among interviews. Third, the team discussed each interview transcript and used key words to generate a list of codes, which described common and contrasting themes (Miles & Huberman, 1994). Fourth, the transcripts were then coded, line by line, by labelling the text. Fifth, the team expanded the list of codes and then collapsed them into emerging recurring themes that best fit the data. Finally, the team checked the list of codes for accuracy, reliability, and authenticity. Atlas.ti (version 6), a qualitative data analysis software tool, was used to assist in data organization through the use of electronic transcript coding, and for the retrieval of relevant quotations relating to themes that emerged from the research team's content analysis (Friese, 2012; Konopásek, 2008; Richards & Richards, 1994).

RESULTS

Quantitative results

Of 100 people invited, 75 people participated, giving a response rate of 75%. Twenty-eight of those surveyed were over 50 years of age (37% of respondents). Using the 2006 census as a guide, we determined that the gender proportion was representative of the Rigolet community (Figure 3).

Nearly all Elder and senior participants had heard of the term "climate change" or "global warming" (96%; Figure 4). Elder and senior survey respondents indicated that climate change was an important issue in the community, with 71% indicating it was "very important" or "important" (Figure 5).

We analyzed gender differences among Elders and seniors to explore the possible influences of gender roles on climate-health observations and perceptions. Male Elders and seniors more often reported changes in weather, temperature, rain, snow, and ice, as well as climate change impacts on health, as compared to females (Figure 6). Conversely, female Elders and seniors reported changes in water systems and wildlife, as well as impacts of climate change on lifestyles, more often than men. However, these differences were not significantly different ($p > 0.05$; see Table 1).

Many Elder and senior participants felt that climate change was having an impact on their lifestyle (57%) and health (64%; Figure 4). Elders and seniors reporting climate change impacts on health significantly differed in whether or not participants observed changes in weather patterns, water systems, and wildlife ($p < 0.05$; Table 1). There were no statistically significant relationships between Elder and senior observations on weather and perceived climate change impacts on lifestyle (Table 1). Since nearly all Elders and seniors reported changes in temperature, snow, and ice, there was not enough variation to test these variables.

Qualitative results

A total of 22 in-depth interviews with Elders and seniors over the age of 50 years were completed in the community, which represents one-third of the Elder and senior population in Rigolet.

Climate change observations

All Elder and senior interview participants discussed changes in climate, as well as climate variability over their lifetimes, including changes in temperature, ice, snow, rain, and seasonal timing. Many participants observed that the average annual temperature had increased over the years, yielding much milder winters. Furthermore, participants noted greater variability in temperature from year to year. Many participants observed that ice freezing patterns, normally dependent on predictable seasonal temperatures, have changed. They observed that ice was no longer forming as quickly; was melting sooner, and was of poorer quality (Table 2).

All Elder and senior interview participants reported changes in precipitation. Snowfall was said to have decreased, resulting in reduced depth and condition of snow accumulation. Participants reported that snow conditions had decreased because accumulated snow would melt at an increased rate after falling, an observation also attributed to the increase in average annual temperature. Also noted was an increase in rainfall throughout the year, including when seasonal precipitation was anticipated to fall as snow. Most participants explained that the combination of these observed climate changes resulted in altered seasonal timing, including winters being shorter in duration, with ice formation occurring later in the year and ice break-up occurring sooner. Elders and seniors noted that ice formation historically took place in November, but had recently occurred in January; ice break-up historically occurred in June, but had recently happened in April. A male Elder explained:

There is a lot of change. And you know, years ago, like in the 50's and 60's, and probably even into the 70's, you could pretty much tell when [the ice] was going to... break-up in the spring... and freeze-up in the fall. You could almost judge [the timing], but it seems like you can't do that anymore.
Figure 3. Gender demographics of survey respondents \((n = 75)\) in Rigolet, Nunatsiavut, Canada (2009) compared to the 2007 Canadian census (Statistics Canada, 2007), as a proportion of the total population.

Figure 4. The proportion of elder and senior respondents observing changes in weather and the environment, and resulting impacts on health and lifestyle in Rigolet, Nunatsiavut, Canada (2009). Displayed as a percentage of the total survey population over the age of 50 \((n = 28)\).
**Figure 5.** The frequency of elder and senior survey responses about their perceptions of climate change importance to Rigolet residents (2009). Displayed as a percentage of the total survey population over the age of 50.

**Figure 6.** The proportion of community respondents observing changes in weather and the environment, and resulting impacts on health and lifestyle in Rigolet, Nunatsiavut, Canada (2009). Displayed as a percentage of the total elder and senior survey participants (n = 28) and stratified by gender.
While some participants attributed these seasonal changes to annual climate variability, many reported that these changes were part of a long-term trend in regional climate change. Participants perceived that these changes had had an impact on their lifestyle, including a substantial reduction in ice travel, which also resulted in decreased cabin accessibility and difficulty hunting. Referring to these impacts, one male Elder and hunter stated, “The weather has changed, and it has changed for the worse” (Table 2).

### Physical health, activity, and nutrition

Changes in ice formation patterns, perceived to have resulted from climate change, were reported to impact livelihoods in a variety of ways. Elder and senior interviewees explained their heavy reliance on the formation of good ice for travel during the winter months. One male Elder and hunter expressed concern regarding these changes and said, “We won’t be able to get anywhere in the winter without ice.” Another participant said, “The ice is our highway.”

Participants also reported challenges in hunting, accessing their cabins, and performing certain land-based cultural activities, such as ice fishing, trapping, and collecting firewood, due to the inability to travel over ice. Participants believed that these challenges resulted in a decrease in outdoor activities, which they believed contributed to an overall decrease in physical activity levels, and increase in sedentary lifestyles. Many interviewees also reported concern regarding climate-related changes in the physical activity levels of the younger generation (Table 2).

Participants also reported various challenges to obtaining adequate hunted food, including a decreased ability to hunt because of a lack of reliable ice for travelling, as well as changes in animal migration patterns and the introduction and disappearance of species. Participants perceived that these changes were collectively contributing to a nutritional shift in the diet of many community members (Table 2).

Among the participants, the most prominent observation of nutritional change was the shift from wild meat to store-bought
Table 2. A comparison of the quantitative and qualitative evidence from Rigolet Elders and seniors for each of the research findings from this case study: climate change observations and resultant impacts on lifestyle and health.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Quantitative evidence</th>
<th>Qualitative evidence: Salient quotations</th>
<th>Codes</th>
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<tbody>
<tr>
<td><strong>Climate change observations</strong></td>
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<td>Changes in weather:</td>
<td>Observed changes in weather: 75% of Elder participants</td>
<td>“This year when I saw the difference between -3 and 0 or +1 [degrees Celsius], that is all the difference of ice forming or not. That was a huge difference, those 3 degrees. . . . What came down was rain instead of snow because of those 2, 3 degrees.”</td>
<td>Ice</td>
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<td>“Our snow is supposed to last until June – or at least part of June, even early July. But this past spring here in Rigolet, I found the snow was almost gone by April.”</td>
<td>Snow, Rain, Temperature, Seasonal timing</td>
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<td>“There is a lot of change. And you know, years ago, like in the 50’s and 60’s, and probably even into the 70’s, you could pretty much tell when [the ice] was going to be a break-up in the spring […] and freeze-up in the fall. You could almost judge [the timing], but it seems like you can’t do that anymore.”</td>
<td>Wind and/or storms</td>
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<td>“The weather has changed, and it has changed for the worse.”</td>
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<td>Changes in temperature:</td>
<td>Observed changes in temperature: 93% of Elder participants</td>
<td>“This winter is mild, really mild. I’ve [never] ever seen it like this in my life. This is the first time I ever saw a Christmas with no ice.”</td>
<td>Ice</td>
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<td></td>
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<td>Snow, Rain, Temperature, Seasonal timing</td>
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<td>Changes in precipitation:</td>
<td>Observed changes in rain: 54% of Elder participants, Observed changes in snow: 82% of Elder participants</td>
<td>“We don’t get so much snow and the snow don’t seem to last like it used to. It goes away a lot faster.”</td>
<td>Ice</td>
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<td>“[There has been] more rain this winter and mild weather than anybody can remember.”</td>
<td>Snow, Rain, Temperature, Seasonal timing</td>
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<tr>
<td>Changes in ice:</td>
<td>Observed changes in ice: 93% of Elder participants</td>
<td>“[The ice] has changed a lot, because it used to be really thick and it would last, but now it’s not so thick, and early in the spring, the ice goes out, so we don’t have so much ice or snow.”</td>
<td>Ice, Rain, Temperature, Seasonal timing</td>
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<td>“When I was a young fellow, there used to be a lot of snow and ice. I can remember my grandfather [having to cut] a fish hole with a 12-foot stick.”</td>
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<td>Other changes:</td>
<td>Observed changes in water systems: 60% of Elder participants, Observed changes in land, wildlife, and/or vegetation: 57% of Elder participants</td>
<td>“We have migrating animals, birds… maybe they too did notice there was something changing in our land and they didn’t come back.”</td>
<td>Berries, Vegetation, Hunting/fishing/trapping, Animal migration</td>
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<tr>
<td>Climate change impacts</td>
<td>- Perceived climate change impacts on hobbies and lifestyle: 57% of Elder participants</td>
<td>- “It affects everyone because you can't travel like you could before. It affects you in that way. You don’t know if the ice is going to be safe anymore.”</td>
<td>Hunting/fishing/trapping</td>
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<td>- No statistically significant relationships between weather observations and perceived impacts on hobbies and lifestyle ($p &gt; 0.05$)</td>
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<td>Survival skills</td>
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<td>Travel</td>
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<td>Impacts on lifestyle:</td>
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<tr>
<td>Impacts on health:</td>
<td>- Perceived climate change impact on health: 64% of Elder participants</td>
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<td>- Observing changes in weather patterns significantly increased the odds of Elders and seniors perceiving climate change impacts on health by 10 times compared to Elders and seniors reporting no changes in weather patterns (controlling for gender; $p &lt; 0.05$)</td>
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<td>Exercise</td>
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<td>- Observing changes in water systems significantly increased the chance of Elders and seniors perceiving climate change impacts on health by 33 times compared to Elders and seniors reporting no changes in water systems (controlling for gender; $p &lt; 0.05$)</td>
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<td>Hunting/fishing/trapping</td>
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<td>Physical activity:</td>
<td>- “Even the physical exercise of being able to go and chop your wood in the winter, Ski-Dooing here and there, and doing your ice fishing. Those things would be physical—walking on your snowshoes or whatever, but they also would be good for your outlook on life, because it’s so calm, it’s so relaxing, it’s so quiet.”</td>
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<td>Survival skills</td>
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<td>- “For one thing, they tend to eat more food from the land when they’re out there, and they probably walk more. And you know, you’re engaged more with like hunting and stuff like that.”</td>
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<td>Sedentary lifestyle</td>
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<td>- “You don’t see [youth] out and around; you do not see them taking part in activities. You do not see them, the young people these days, with a pair of snowshoes on. You do not see them going sliding, or just running around and stuff like that.”</td>
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<td>Travel</td>
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<td>Nutrition:</td>
<td>- “Wild meat is healthier, and other people would tell me that wild meat is healthier too. That’s what I grew up on, wild meat.”</td>
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<td>Animal migration</td>
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<td>- “I think [the changes] affect everyone to a certain degree, you know... It makes [the wildlife] different... and we’ve always used wildlife for food.”</td>
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<td>- “We have to rely on store food if we can’t get a caribou. We eat a lot of caribou and wild meat, [like] partridges. If we can’t get that, we rely on store food.”</td>
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<td>Climate change impacts (continued)</td>
<td>Observing changes in wildlife significantly increased the chance of Elders and seniors perceiving climate change impacts on health by 31 times compared to Elders and seniors reporting no changes in wildlife (controlling for gender; ( p &lt; 0.05 ))</td>
<td>“I believe that the rate of diabetes has jumped really high. When I came here 30 years ago... I do not think there were any diabetics in town at the time—now there [are] lots. A lot of diabetics, a lot of people on high blood pressure medication.”</td>
<td>Alcohol/drug use, Cabin, Connection with the land</td>
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<td>No statistically significant relationships between gender and climate change observations</td>
<td>“I find it hard, because like if I want to go caribou hunting or something, I can’t get there. You know, there’s not enough snow on the land.”</td>
<td>Depression/frustration/boredom</td>
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<td>No statistically significant relationships between gender and perceived climate change impacts</td>
<td>“You’ll probably see more people being stressed... If you can’t go out and everyone is kind of just stuck here, after a while I think it’s going to kind of get to people.”</td>
<td>Knowledge transfer</td>
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<td>“People get bored and people turn to drinking and drugging and social problems and stuff like that.”</td>
<td>Land-based cultural activities</td>
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<td>“I mean people, day after day after day look out the window and it’s this old, depressing fog and rain and wind. I mean it’s got to play on people’s minds.”</td>
<td>Loss of Inuit culture and language</td>
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<td>“Your cultural identity is partly what you eat and stuff like that. I mean, when you stop eating the land foods and stuff like that, I mean, part of identifying with being Inuit is eating what I call ‘Inuit food,’ so that is certainly something that’s going to be impacted.”</td>
<td>Travel</td>
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<td>“It becomes a part of you [begins to cry]. Those beautiful days in October, I just loved to go and collect my grass.”</td>
<td>Worry</td>
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<td>“I can’t see nothing good coming out of the climate change.”</td>
<td>Younger generation</td>
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<td>Climate-health adaptation:</td>
<td>Familiarity with the term “climate change” or “global warming”: 96% of Elder participants</td>
<td>“If it keeps getting warmer, I guess we’re just going to have to adapt to the climate, because we have no plans of leaving.”</td>
<td>Adapt, Alternative activities</td>
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<td>Hear people discuss climate change “often” or “always” in Rigolet: 40% of Elder participants</td>
<td>“[There are] a lot of people that have to be prepared. I think now, they know that the snow is not going to stay very long, so I find a lot of people now, [in] January, a lot of people are [collecting wood] every chance they get.”</td>
<td>Climate change awareness, Elder consultation</td>
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<td>Believe climate change is an “important” or “very important” topic in Rigolet: 71% of Elder participants</td>
<td>“We are not used to [not being able to go to our cabin], but we can keep ourselves busy with like I said, we both work full-time, and I got sheds and we do crafts and stuff like that, so we are always busy.”</td>
<td>Research, Travel</td>
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<td>“Nothing you can do about the weather though... you just have to adapt I guess.”</td>
<td>Worry</td>
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food, which some participants attributed to environmental and climate change. Participants explained that the traditional Inuit diet revolves around the consumption of wild meat, as it provides an abundant source of vitamins and essential nutrients. In contrast, participants reported that the selection of store-bought foods is often limited and that many products contain high levels of preservatives and few essential nutrients. Another participant stated, “Without a doubt you are eating processed meat and salt and additives and everything else.”

All participants reported that a diet largely based on store-bought foods was affecting physical health. One female participant, a mother and grandmother, linked a substantial increase in diabetes within the community to a rise in the consumption of store-bought foods, which she perceived to have resulted indirectly from climate change (Table 2). These changes in diet and physical activity levels were reported by almost all interview participants, who linked them to a variety of observed climate and environmental changes in the Nunatsiavut region (Table 2).

Mental and emotional health and well-being
All participants emphasized their deep and intimate connection with the land. A male Elder and hunter described this connection:

> You have to know what the land does to a person, like it, it just gives you that sense of freedom, identity. If, you know it’s the best therapy that anybody could have in the world.

Given this powerful connection, participants reported that the on-going climate and environmental changes were particularly difficult to observe and experience, and affected mental and emotional health. While describing this connection with the land, one of the participants expressed his concern about changes observed in the younger generation by saying, “I think my generation is the last generation that got a true connection with the land.”

A male Elder described this isolation:

> I mean people, day after day after day look out the window and it’s this old, depressing fog and rain and wind. I mean it’s got to play on people’s minds.

Some participants perceived a sense of depression throughout the community during times of decreased cabin accessibility. Furthermore, several participants believed that some community members had turned to alcohol and drug use as a coping mechanism for decreased cabin accessibility, and decreased traditional land-based activities caused by reduced ice travel.

While female participants focused on how climate changes would impact the well-being of their families, male participants more often focused on the well-being of the overall community of Rigolet. Many participants also reported that men were no longer able to hunt as easily because of the reduced ice travel, and women were no longer able to regularly participate in their land-based cultural activities, such as grass weaving.

Lastly, it should be noted that participants reported no positive impacts of climate change in Rigolet, even when asked directly. For example, a male Elder and hunter said, “I can’t see nothing good coming out of the climate change” (Table 2).

Climate-health adaptation
Numerous participants noted a sense of worry about adaptation. They expressed concern about the escalating rate at which climate and environmental changes were being observed, as well as the community’s ability to adapt, and how the changes would alter their traditional Inuit lifestyle. Worry about the appropriate measures and timing for culturally relevant adaptation strategies was widespread among interview participants. This sense of concern was described by one male Elder:

> I think a lot of people are starting to worry about...what’s going to happen in a few years down the road.

Participants said they must be able to travel over ice to maintain their traditional Inuit lifestyle. Since participants reported that the ice surrounding Rigolet has been becoming increasingly unreliable, alternative methods of transportation have become the focus of most of the local adaptation initiatives. A male Elder and hunter explained, “We won’t be able to get anywhere in the winter without ice.” As such, several participants suggested boats as an alternative method of transportation in the milder winter months.

The implementation of current adaptation strategies was also reported to have begun within the community of Rigolet. Several participants mentioned alternative activities as an adaptive method for constructively occupying themselves while unable to access their cabins. The implementation of these activities was explained by a male Elder:

> We are not used to [not being able to go to our cabin], but we can keep ourselves busy with like I said, we both work full-time, and I got sheds and we do crafts and stuff like that, so we are always busy.

Participants identified that the goal of these adaptation strategies and alternative activities was to ultimately reduce the physical, mental, and emotional health impacts of climate change and variability within the community. As one participant said, there is “nothing you can do about the weather...you just have to adapt, I guess” (Table 2).

DISCUSSION
The results from this research project indicate that there is a strong awareness among Elders and seniors about the health impacts of climate change in Rigolet. Observations of climate and environmental changes reported by Elder and senior interview participants included increased average annual temperatures; increased rain; decreased snowfall; decreased ice quality, thickness,
EXPLORING ELDERS’ AND SENIORS’ PERCEPTIONS CLIMATE CHANGE IMPACT

and extent; and unpredictable seasonal timing. The findings from this subgroup support previously published Inuit observations and empirical research both within the region of Nunatsiavut, as well as across the Canadian North (Christensen et al., 2007; Cunsolo Willox et al., 2012, 2013a,b; Ford et al., 2008; Fox, 2002; Furgal et al., 2002; Furgal & Seguin, 2006; Füssel, 2009; Healey et al., 2011; Nickels, Furgal, Buell, & Moquin, 2005; Pearce et al., 2009).

Many Elders and seniors in Rigolet reported that climate change had affected their ability to access the surrounding land for hunting and gathering, altered animal migration patterns, and increased reliance on food bought from the store. Elders and seniors perceived that these changes decreased physical activity and led to poorer nutrition in the community. Indeed, other research indicates that accessing the land for hunting and gathering provides physical activity, and that eating wild food is part of a nutritious diet (Nancarrow & Chan, 2010; Kuhnlein, Soueida, & Receveur, 1996; Kuhnlein, Chan, Leggree, & Barthet, 2002). Unfortunately, high levels of diabetes, malnutrition, and obesity have been documented across the Arctic (Engeland, Johnson-Down, Cao, Sheikh, & Weiler, 2011; Huet, Rosol, & Egeland, 2012; Sheikh, Engeland, Johnson-Down, & Kuhnlein, 2011). Research suggests that these poor health outcomes could be exacerbated by current and future climate change, particularly among the elderly, unless appropriate adaptation strategies are developed and successfully implemented. Therefore, future research across the Canadian North is required to better understand how climate change affects health, and to develop programs to manage these climate-related health outcomes in vulnerable subgroups of Inuit populations, such as Elders and seniors. This type of climate-related health research and programming will be essential to enable Elders and seniors to remain physically healthy and active, and maintain a nutritious and subsistence-based diet in the face of climate change.

All Elder and senior interview participants also reported climate change was having an impact on personal and community-wide mental and emotional health and well-being. This included a perceived sense of depression throughout the community because of decreased access to the land resulting from hazardous ice conditions, accompanied by a sense of isolation in not being able to travel. These Elder and senior perspectives support community-wide observations previously reported in the literature (Berry, Bowen, & Kjellstrom, 2010; Cunsolo Willox et al., 2012, 2013a,b, 2014; Fritze et al., 2008; Saniotis & Irvine, 2010). Furthermore, this research identified Elder-specific concerns and worries about how climate change might affect future health challenges for Inuit youth, including a loss of Inuit language and culture. Similarly, other research from Rigolet has shown that youth are concerned about the well-being of Elders in the face of climate change (Petrasek MacDonald, Harper, Cunsolo Willox, Edge, & Rigolet Inuit Community Government, 2012). This common concern between the generations might present an opportunity to actively unite Elders and youth in the development and implementation of health-related climate change adaptation strategies.

Past research has called for rapid implementation of sustainable, culturally relevant adaptation strategies in the Canadian North (Berrang-Ford, Ford, & Paterson, 2011; Ford, 2009; Ford et al., 2010b). Accessing and including the extensive historical knowledge possessed by Inuit Elders and seniors could support the development of adaption strategies to lessen the health impacts of climate change in the Canadian North. Furthermore, the involvement of Inuit Elders and seniors—who are often well-respected and have a substantial amount of authority, experience, and history within their communities—in implementing these strategies could also support community-wide, long-term participation. This research also highlights the need for actions and programs that specifically target Inuit Elders and seniors. These could include programs that unite youth and Elders, nurture the emotional and spiritual connections Elders maintain with the land, promote physical activity among Elders, and enable Elders to access wild food sources. Obtaining funding for climate change adaptation strategies suitable for vulnerable communities across Canada remains challenging (Ford, Smith, & Berrang-Ford, 2011), and we encourage long-term climate-health adaptation strategies from all levels of government. Such strategies will lessen the potentially harmful and far-reaching health impacts of climate change.

As noted previously, our research is limited by the fact that the findings are based on a subgroup of data from a case study where the sample population was relatively small, and where the length of time for the study was relatively short. Bias may be present in the qualitative analysis since a subset of the interview data was used from the Changing Climate, Changing Health, Changing Stories project (which was not specifically designed for Elders and seniors). However, given the limited Inuit Elder-centric perspectives in the climate and health literature, the importance of this work is that it not only supports greater recognition of these wise and valuable voices—whose availability is rapidly diminishing—but it also serves as an introduction to understanding Elder and senior perspectives on climate-health relationships. In order to better extrapolate the results and Elder-specific adaptation-related insights across the Canadian North, similar studies should be conducted in more Inuit communities.

CONCLUSION

Inuit are an essential part of the fabric of Canadian society and deserve the attention of the political and scientific community, particularly because they are especially vulnerable to climate change due to their dependence on the surrounding environment for cultural activities and subsistence. Nunatsiavut Elders and seniors are their community’s history; they have a strong connection with the land, and powerful insights into how it is changing. Results from this research suggest that the physical, mental, and emotional health of Inuit Elders and seniors has been affected by climate change. Therefore, further research and funding from all levels of government is important for a better understanding of climate-health relationships among the Inuit, and other vulnerable Indigenous populations. The results from this case study represent
an organized collection of observations that the community can use to better understand the various health impacts of climate change. They also can use these observations to develop culturally relevant and sustainable adaptation strategies for health and well-being in Rigolet and across the Canadian North. The inclusion of these community voices and perspectives ensures that the results from this research project can influence climate-related public policy at the municipal, provincial, and federal levels of government, providing new hope for the future of the Canadian North.

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