"From this place and of this place:" Climate change, sense of place, and health in Nunatsiavut, Canada

Ashlee Cunsolo Willox [a,*], Sherilee L. Harper [b], James D. Ford [c], Karen Landman [a], Karen Houle [d], Victoria L. Edge [b] the Rigolet Inuit Community Government [e]

[a] School of Environmental Design & Rural Development, University of Guelph, Guelph, Ontario, Canada N1G 2W1
[b] Department of Population Medicine, University of Guelph, Guelph, Ontario, Canada
[c] Department of Geography, McGill University, Montreal, Quebec, Canada
[d] Department of Philosophy, University of Guelph, Guelph, Ontario, Canada
[e] Rigolet, Nunatsiavut, Labrador, Canada

ABSTRACT

As climate change impacts are felt around the globe, people are increasingly exposed to changes in weather patterns, wildlife and vegetation, and water and food quality, access and availability in their local regions. These changes can impact human health and well-being in a variety of ways: increased risk of foodborne and waterborne diseases; increased frequency and distribution of vector-borne disease; increased mortality and injury due to extreme weather events and heat waves; increased respiratory and cardiovascular disease due to changes in air quality and increased allergens in the air; and increased susceptibility to mental and emotional health challenges. While climate change is a global phenomenon, the impacts are experienced most acutely in place; as such, a sense of place, place-attachment, and place-based identities are important indicators for climate-related health and adaptation. Representing one of the first qualitative case studies to examine the connections among climate change, a changing sense of place, and health in an Inuit context, this research draws data from a multi-year community-driven case study situated in the Inuit community of Rigolet, Nunatsiavut, Canada. Data informing this paper were drawn from the narrative analysis of 72 in-depth interviews conducted from November 2009 to October 2010, as well as from the descriptive analysis of 112 questionnaires from a survey in October 2010 (95% response rate). The findings illustrated that climate change is negatively affecting feelings of place attachment by disrupting hunting, fishing, foraging, trapping, and traveling, and changing local landscapes—changes which subsequently impact physical, mental, and emotional health and well-being. These results also highlight the need to develop context-specific climate-health planning and adaptation programs, and call for an understanding of place-attachment as a vital indicator of health and well-being and for climate change to be framed as an important determinant of health.

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I think what I find difficult about the weather is that it affects everybody. It's not an individual thing. …It hits everybody no matter what your age, your body abilities. …That's where I think the larger issues affecting communities, countries, the world are, you know. …I guess it doesn't matter your income level or your age or your gender, everyone is sort of impacted in a way.

Rigolet Resident

Introduction: climate change and place-based health

As climatic and environmental changes are increasingly felt throughout many regions globally (IPCC, 2007a, 2007b), peoples throughout the world are increasingly exposed to changes and disturbances in weather, wildlife and vegetation patterns, and water and food quality, access, and availability in their local regions (Ford, Berrang-Ford, King, & Furgal, 2010; Higginbotham, Connor, Albrecht, Freeman, & Agho, 2007; IPCC, 2007a, 2007b; Speldewinde, Cook, Davies, & Weinstein, 2009; Tong & Soskolne, 2007). Research has indicated that these global climatic and environmental changes have impacts on human health and well-being (Campbell-Lendrum et al., 2009; Few, 2007; Frumkin, Hess, Luber, Malilay, & McGeehin, 2008;

* Corresponding author. Tel.: +1 1 519 837 8713.
E-mail address: ashlee@uoguelph.ca (A. Cunsolo Willox).

St. Louis & Hess, 2008), with climate change simultaneously described as "an environmental health hazard of unprecedented scale" (Frumkin & McMichael, 2008, p. 403) and "the biggest global health threat of the 21st Century" (Costello et al., 2009, p. 1693). Responding to these changes, and the subsequent health impacts, has increasingly become both a priority and a defining issue for public health work and research (Campbell-Lendrum et al., 2009; Costello et al., 2009; Ebi, 2009; Few, 2007; Ford, Berrang-Ford et al., 2010; Frumkin et al., 2008; Frumkin & McMichael, 2008; Hess, Malilay, & Parkinson, 2008; St. Louis & Hess, 2008; Tong & Soskolne, 2007).

To date, much of the climate-health literature examines the physical health impacts of climate change: increased risk of food-borne and waterborne diseases; increased frequency and distribution of vector-borne disease; increased mortality and injury due to extreme weather events; and increased respiratory and cardiovascular disease due to changes in air quality and increased allergens in the air (Few, 2007; Fritze, Blashki, Burke, & Wiseman, 2008; Frumkin et al., 2008; Harper, Edge, Schuster-Wallace, Berke, & McEwen, 2011; St. Louis & Hess, 2008; Tong & Soskolne, 2007). Recognizing that health and well-being is multi-faceted and complex, and encompasses numerous social, cultural, economic, political, psychological, spiritual, and affective dimensions, there is also a growing body of research that examines the link between climatic and environmental change and emotional and mental health and well-being (Berry, Bowen, & Kjellstrom, 2010; Berry, Hogan, Owen, Rickwood, & Fragar, 2011; Cook, Watson, van Buynder, Robertson, & Weinstein, 2008; Cunsolo Willox et al., 2011; Doherty & Clayton, 2011; Fritze et al., 2008; Sartore, Kelly, Stain, Albrecht, & Higginbotham, 2008; Speldewinde et al., 2009; Swim et al., 2010, 2011).

These climate-related health effects are unequally distributed, with Indigenous populations carrying a disproportionate burden of the impacts (Ford, in press; Ford, Berrang-Ford et al., 2010; Ford, Vanderbilt, & Berrang Ford, in press; Furgal & Seguin, 2006; St. Louis & Hess, 2008). For example, Inuit throughout Canada's North are experiencing rapid and acute climatic and environmental changes: decreased snow and ice quality, stability, and extent; later ice formation and earlier ice break-up; melting and slumping permafrost; increased frequency, duration, and intensity of storms; decreased water levels in ponds and brooks; and changes in the abundance, quality, and location of wildlife and vegetation (Ford, Berrang-Ford et al., 2010; Ford & Furgal, 2009; Ford, Smit, & Wandel, 2006; Ford et al., 2008; Furgal, 2008; Furgal & Seguin, 2006; Pearce, Ford et al., 2009; Pearce, Smit et al., 2009; Prowse & Furgal, 2009). These changes are physically altering the local and regional landscapes around the communities, and disrupt the ability of Inuit to continue to practice and participate in culturally- and socially-important land activities such as hunting, fishing, foraging, trapping, and traveling on snow and ice (Ford, Berrang-Ford et al., 2010; Furgal, 2008; Furgal & Seguin, 2006). Consequently, the conditions that have previously supported the health and well-being of Inuit populations, such as spending time on the land—as well as the very places and landscapes themselves—have been changing so rapidly in recent years that the health and well-being of individuals and communities is being negatively affected (Cunsolo Willox et al., 2011; Ford, Berrang-Ford et al., 2010; Furgal, 2008; Furgal, Martin, & Gosselin, 2002; Furgal & Seguin, 2006; Harper et al., 2011).

For Inuit, these climatic and environmental changes are also causing five interrelated impacts to 'place': alterations to tangible, environmental place (i.e. the biophysical, geographical, and climatic processes and attributes); changes to individual and collective senses of place-attachment (i.e. the level of connection to or love of one's home environment or the meaningful bond between people and environments (Scannell & Gifford, 2010)); disruptions to place-specific socio-cultural activities (i.e. hunting, fishing, trapping, foraging, and spending time on the land at ancestral camping grounds or in remote cabins, which contribute to health and well-being); transformations in the mental conceptions of place (i.e. the socio-cultural and psycho-social meanings attributed to particular places, areas, or regions); and finally, alterations to place-based identities held individually and collectively (i.e. sense of being a hunter or trapper, or being 'land people'). From this perspective, understanding individual and collective sense of place, relative levels of attachment to or bond with a particular area (place-attachment), and the ways in which individuals create identities connected to and within place (place-based identities), become an essential component of climate-health research.

Place is particularly important when examining the climatic and environmental determinants of health, for as Hess et al. (2008, p. 476) write, "emphasizing place highlights climate change's effects where they are most acutely felt, where local strengths are best understood, where place attachment can be leveraged most effectively and where residents will reap the benefits of adaptive measures promoting sustainability and livable communities." This connection or attachment to place is at once a physical feeling, a psychological process, and socio-cultural process defined through history, ancestry, and the sense and meaning individuals and collectives apply to a particular place (Scannell & Gifford, 2010). The myriad ways in which place and place-attachment are experienced will determine the range of responses that occur when the place is confronted by change (in the case of this article, climatic and environmental) (Scannell & Gifford, 2010). For example, from research conducted in Australia examining the impacts of prolonged drought on health and well-being, the concept of 'solastalgia' was created to explain the pain, distress, and sadness that emerges when a place to which individuals and groups are deeply and intimately attached changes in a manner that disrupts opportunities for place-based solace, comfort, and familiar activities (Albrecht, 2010; Albrecht et al., 2007; Higginbotham et al., 2007; Sartore et al., 2008; Speldewinde et al., 2009). The bodily experience of place is, therefore, connected to all facets of health—physical, mental, and emotional—and as a result, changes to place or an individual or collective sense of place can impact numerous aspects of health and well-being (Cummins, Curtis, Diez-Roux, & Macintyre, 2007; Curtis & Rees-Jones, 1998; Hess et al., 2008; Kearns, 1993; Macintyre, Ellaway, & Cummins, 2002).

When considering place, it is clear that individual and collective identities, health and well-being, livelihoods, histories, and emotio-spiritual connections are emergent from the lands on which people live; as a result, each of these place-related dimensions listed above is also essential to consider within the context of health and well-being. Therefore, without consideration of a sense of place and place-attachment in climate-health research, the complexity of the health effects resulting from climate change and variability, and the socio-cultural and health implications of local and regional climatic and environmental change, will be under-represented and under-considered (Ford, in press; Ford & Smit, 2004; Hess et al., 2008; Panelli & Tipa, 2007; Speldewinde et al., 2009).

Building on this conceptual understanding of the importance of place when examining the impacts of climatic and environmental change on health and well-being, and emerging from a multi-year, community-driven case study situated in the Inuit community of Rigolet, Nunatsiavut, Labrador, Canada, this research examined the ways in which changes in local landscapes, the subsequent disruption of livelihoods and subsistence activities, and a changing sense of place and place-specific identities determine physical, mental, and emotional health and well-being. Although describing climate-health responses from a single Northern Canadian community, the

results more broadly inform climate-health research, and illustrate the importance of considering the changing state of place, place attachment, and sense of place when designing climate-health adaptation strategies. They also highlight the need for health programs that consider the importance of place to begin to manage the health-related effects of climate change in a locally-appropriate and culturally-relevant manner, and illustrate the importance of acknowledging that different groups and populations require different approaches to healthcare programs and services in response to changing climatic and environmental conditions depending on place and geographic location.

Study location: the community of Rigolet, Nunatsiavut, Labrador

Rigolet (54°N, 58°W; Fig. 1) is the southern-most Inuit community globally, and is one of 53 Inuit communities in Canada. There are 269 residents (139 males, 130 females) in the community, with 40.9% of the population under the age of 25 years old, and 94% of residents identifying as Indigenous (StatsCan, 2006). Rigolet is situated within the land claim settlement region of Nunatsiavut, one of Canada's four Inuit regions, along with the Inuvialuit Settlement Region, Nunavut, and Nunavik. Nunatsiavut—Inuttitut for 'Our Beautiful Land'—is home to 4% of Canada's total Inuit population, spread throughout the communities of Nain, Hopedale, Postville, Makkovik, and Rigolet.

Rigolet is a remote coastal community, accessible only by boat and ferry during the summer months, snowmobile over ice and snow in the winter months, and planes year round (although the cost of plane travel is prohibitive for many). These travel options are also highly weather-dependent and regularly disrupted. Rigolet is also home to a diverse and rich range of fish, wildlife, and medicinal and edible plants, and cultural activities such as hunting and berry picking are still widely practiced. The majority of residents continue to rely closely on the land for hunting, trapping, foraging, firewood, leisure, socio-cultural connections, and physical, mental, emotional, and spiritual health and well-being.

Rigolet residents rely on a mixed-economy for economic opportunities, incorporating subsistence hunting, trapping, and foraging to supplement nutritional intake and, to a lesser extent, income. Many of the employment opportunities in the community are from positions within the provincial, federal, and regional governments. Several people work in the independent sector, and the remainder of the economy is driven by government grants which provide short-term work. In addition, many residents look for seasonal work outside of the community as hunting guides, mine workers, oil rig employees, and on shrimp and fishing fleets, and send remittances back to family members.

As with other Inuit communities in Canada, Rigolet has experienced rapid socio-cultural and socio-economic changes over the last 60 years: forced relocation of residents from traditional homelands throughout the region into the five communities in Nunatsiavut resulting in a loss of land; children removed from their families and communities and sent to residential boarding schools (often quite far away), resulting in widespread spiritual and cultural assimilation, language erosion, discrimination, and marginalization; forced settlement, resulting in a change from nomadic living to sedentary communities; and an increased dependence on a cash economy (Ford, Berrang-Ford et al., 2010; Lehti, Niemelä, Hoven, Mandell, & Sourander, 2009; Richmond, 2009; Richmond & Ross, 2009). Inuit throughout Canada also experience worse disparities in health outcomes compared to non-Inuit Canadians: higher-than-average suicide and addiction rates; increased incidences of infectious diseases; and higher incidences of chronic diseases, such as
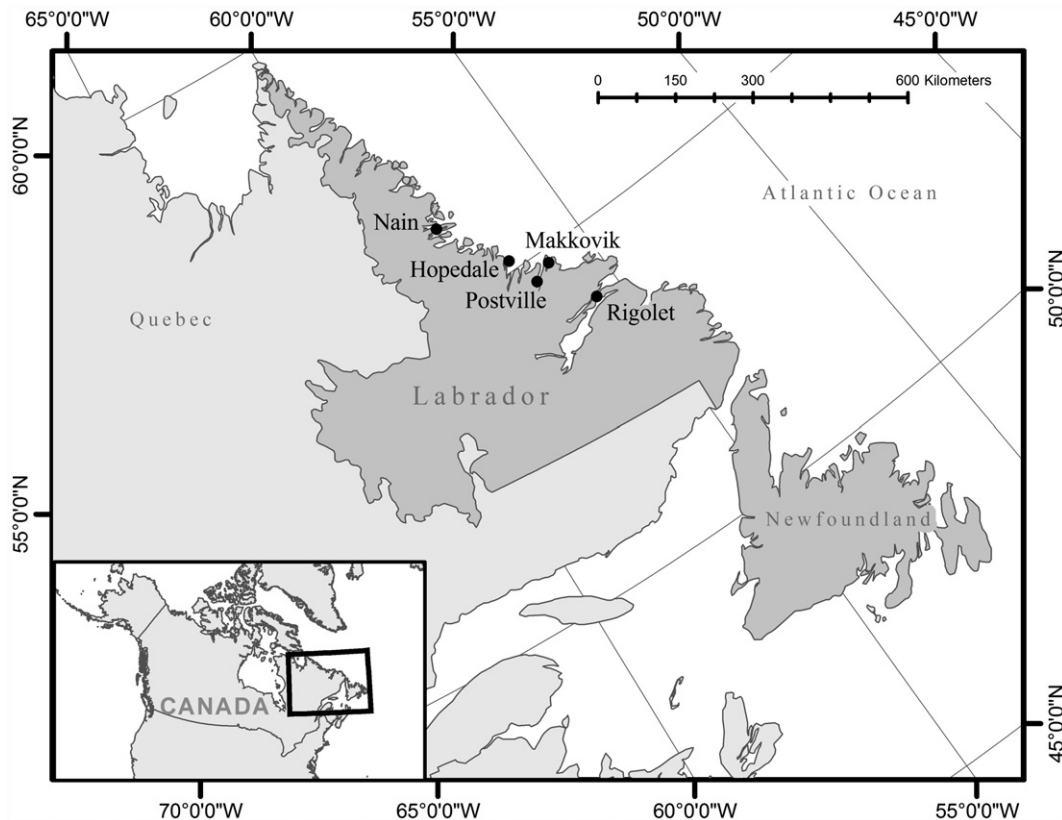

Fig. 1. A map highlighting the location of Rigolet, Nunatsiavut, Labrador, Canada, as well as indicating the other four Nunatsiavut communities (Nain, Hopedale, Postville, and Makkovik) and their placement in Canada.

diabetes and respiratory illness (Ford, Keskitalo et al., 2010; Richmond, 2009). Despite these challenges and the rapid socio-cultural transformations experienced in the community, Rigolet is a thriving and close-knit community that places emphasis on revitalizing cultural practices, increasing opportunities for youth and Elders to share knowledge, childhood education and development, health services, food security, innovative economic opportunities, sustainable tourism, time on the land, and being proactive about research and adaptation concerning changes to climate, environment, and socio-cultural structures.

Methods

The data explored in this article are part of a larger case study, situated in Rigolet, which examined the implications of climate change for health and well-being. This multi-year, community-based participatory research was directed by the Rigolet Inuit Community Government, and united a transdisciplinary team of Indigenous and non-Indigenous researchers from the natural, social, and health sciences from the University of Guelph in Ontario, Canada and from Rigolet through the *Changing Climate, Changing Health, Changing Stories* project (Harper, Edge, Cunsolo Willox, & the Rigolet Inuit Community Government, 2012). Active and meaningful community involvement was essential to all stages of the research process (Harper et al., 2012; Healey et al., 2011). (For an overview of the structure of the research project and the associated team members and positions, please see Electronic Appendix 1). The overall research design for the project was guided by an EcoHealth approach. This approach emphasized an understanding of the intrinsic interdependence of human health with the health of ecosystems, community participation at all stages of the research process, and a focus on social equity in project design and delivery (Forget & Lebel, 2001; Waltner-Toews & Kay, 2005; Webb et al., 2010).

Data-gathering and analysis techniques

This research was also framed through a mixed-methods case study approach (Creswell, 2005), premised on the importance of gaining in-depth, local knowledge and wisdom of observations of climatic and environmental changes (Ford, Berrang-Ford et al., 2010; Ford and Pearce, in press). This research incorporated both in-depth interviews and a survey. When used in combination, this exploratory sequential mixed-method approach allowed the two methods to complement one another to provide a more detailed, rich, and nuanced picture of the research and the impacts of climate change in the community (Creswell, 2005; Creswell et al., 2003); the interviews added individual voices and lived experiences to the numbers gathered through the survey, and the survey provided an overview of the community responses and observations. Analyzing the results together yielded a deeper, richer, and more complete insight into the impacts of climate change in the community than would be possible through the use of only one method (Creswell, 2005; Creswell et al., 2003).

In-depth interviews were conducted with 72 individuals from Rigolet (43 females, 29 males) between November 2009 and October 2010, from all ages (9 to over 85 years old) and backgrounds (hunters, trappers, trawlers, teachers, business owners, crafters, government officials, health workers, town workers, construction workers, miners, parents, grandparents, and great-grandparents). The interviews averaged approximately 60 min, and consisted of a series of 30–40 open-ended questions created to discover individual observations of climatic and environmental change, perceived socio-economic and socio-cultural impacts, and the existence of linkages between climatic and environmental change health and well-being. The content of the interviews was shaped by relevant themes in the literature and by pretesting with academics, researchers, and 15 community members for content and context. In order to gather rich, thick data, all interviews were conducted in a conversational format (Kvale, 1996), allowing for new and unexpected themes and ideas to emerge, and for the interviews to expand well beyond the initial questions. Interviewees were drawn from recommendations from community members, town government officials, health workers, and previous interview participants. All interested community members were welcome to participate in the research. All interviews were conducted in English at the participants' request (the majority of Rigolet residents speak English as their first language), although a translator was always available if an interviewee preferred to conduct the interview in Inuttitut. All interviews were digitally audio recorded with consent, transcribed by a professional transcription company, and checked for accuracy by at least one team member.

The interviews were analyzed descriptively using a rigorous qualitative analysis (Mays & Pope, 1995; Patton, 2002) by members of the team, using a constant comparative method (Bradley, Curry, & Devers, 2007) and inductive open coding to allow for emergent themes within place-specific observations of climatic and environmental change, disruptions to hunting, fishing, foraging, trapping, and traveling, and impacts on mental and emotional health and well-being. This approach required the immersion of the researchers within the transcripts through a multi-step iterative process: first, transcripts were read and re-read while listening to the recordings to note nuances in tone and voice, and recorded emergent and relevant themes. Second, the resulting themes were verified amongst the transdisciplinary research team of Indigenous and non-Indigenous individuals and key stakeholders in the community, to ensure the accuracy and authenticity of the categories. Codes were then expanded and collapsed to reflect newly-discovered themes and ideas from these team dialogs. Third, a final list of codes was created, and the transcripts were re-coded as necessary. This final list of codes was discussed among key stakeholders, as well as with local and regional health professionals to further ensure accuracy, authenticity, and relevancy.

As the interviews progressed, numerous participants were reporting linkages among changes in land, sense of place, and their health and well-being. In order to study these qualitative narrative responses on a larger community scale, the research team decided to use Higginbotham et al.'s (2007) Environmental Distress Survey (EDS). This index is structured to examine the bio-psycho-social impacts of changes in the environment and the subsequent impacts on sense of place and place attachment (Higginbotham et al., 2007), and consists of 82 rating scales (Likert-scale and yes/no responses) and 6 open-ended questions. This index was adapted for this research based on local environmental and cultural contexts, as well as through preliminary results from the interviews.

The EDS was administered in person by two trained community research assistants, who went door-to-door in the community in August and October 2010 (in the initial research design, it was planned that this phase would be completed in one four-week period in August 2010; however, due to an unexpected event in the community, the questionnaires were halted for six weeks, and resumed and completed in October 2010). Considering the small population size, all interested and eligible community members were invited to participate. No criteria were used to select participants other than being 15 years or older and a resident of Rigolet. Administered questionnaires took between 15 and 30 min to complete. One hundred and seventeen people were eligible and invited to participate, and 112 people (52 males, 60 females) completed the questionnaires (response rate = 95.7%), with 25 respondents also participants in the in-depth interviews. Data

emergent from the EDS were analyzed using descriptive statistical techniques with the assistance of the statistical software program, IBM SPSS 19. Frequency tables were created for each variable in the Likert scale and yes/no questions and the overall trends were examined. Bar graphs were then created to provide visual representation of the overall findings and participant responses and to compare differences among male and female participants (i.e. reported love of the land or sense of identity connected to the land, or various emotional responses associated with observed changes). As with the results from the in-depth interviews, all findings from the EDS were shared and discussed among the research team, community stakeholders, and regional health professionals to ensure accuracy and authenticity. This combination of analyzing the qualitative and quantitative results together provided the ability to move from individual level narratives to community level perspectives, and resulted in a stronger and more holistic understanding of the impacts of climate change in the community.

Oral and written consent was obtained from each participant over 18 years of age before participating in the interviews or EDS. For participants under 18, oral and written parental consent was obtained, and the youth participants themselves were also informed of all aspects of the research process and asked to also sign the consent form giving their assent. All members of the research team were also cognizant of the possibility of participant fatigue for the 25 people who had also participated in in-depth interviews; however, given the differences in research methods, no participants expressed an issue with being approached twice. All participants were made aware of their right to withdraw from the study at any time, to only participate in a particular component, and/or to not answer any questions from the interviews and the EDS. Community consent was also obtained to publish results with the community name and location under the co-authorship of the Rigolet Inuit Community Government, in order to highlight the

local and regional climatic and environmental changes being experienced, to illustrate the place-specific impacts on health and well-being, and to celebrate the community-based, collaborative research project from which these data emerged. All research activities were approved by Health Canada Research Ethics Board (2009–2012), the Nunatsiavut Government Research Advisory Committee (2009–2012), and the Research Ethics Board of the University of Guelph (2009–2012).

Results

Climate change, the land, and a changing sense of place

For all the respondents, the land surrounding the community is profoundly important, and the resulting connection and sense of place experienced by participants was reported to be deeply and intimately cultural, spiritual, and corporeal, and founded on long ancestral connections to the region (Fig. 2). Indeed, 98.2% of EDS participants ($n = 110$) reported that they held a strong love for the land, which was connected to a deep sense of place, with little variation between male and female respondents (Fig. 2). As one young mother of three and avid outdoors person explained in an in-depth interview, "the land…defines who we are [as Inuit]. It's part of us. It's just something that we've always went there, we always did things. I don't know, we have this connection to the land that makes you feel good. It makes you, you." As another young participant explained, there's a deep "pride of being from this place and of this place."

Both EDS and interview participants reported that there have been numerous observed changes in the climate and environment in and around Rigolet over the past decade: changes in local and regional weather patterns (97.3%, $n = 108$); decreased snow amounts and quality (94.6%, $n = 106$); decreased ice quality and stability
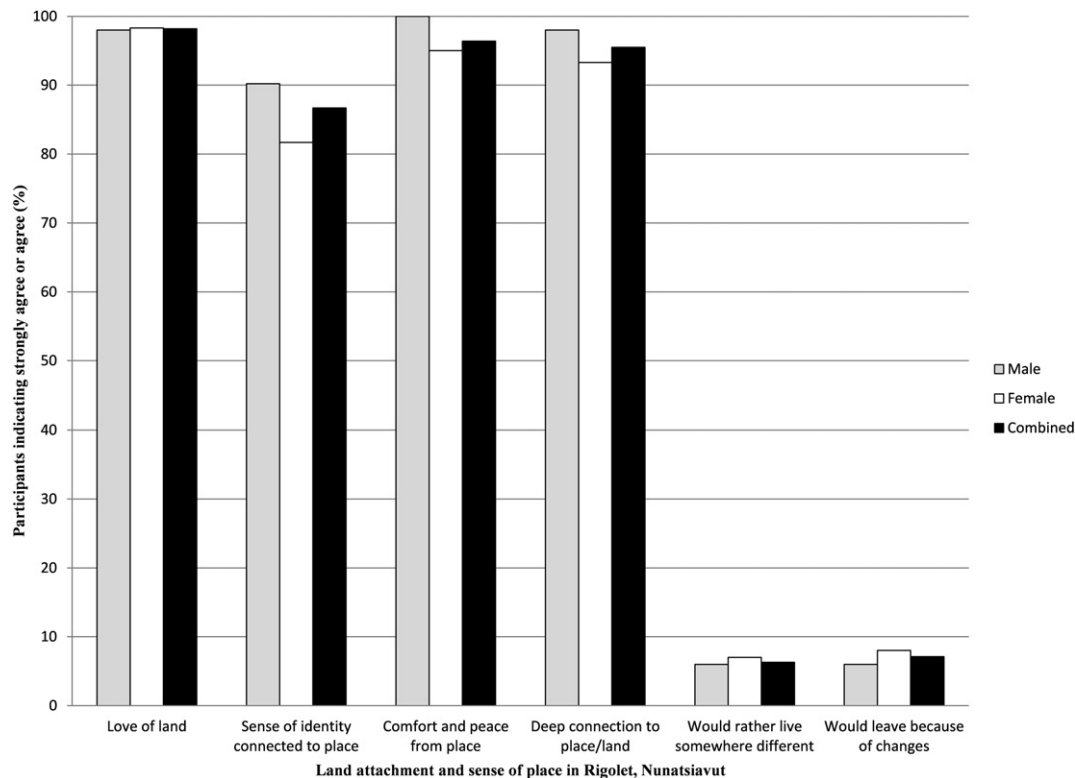

Fig. 2. Responses to selected place-based questions from the Environmental Distress Survey conducted in Rigolet, Nunatsiavut in 2010. The graph depicts the percentage of male (shaded gray), female (shaded white), and combined (shaded black) responses indicating 'strongly agree' or 'agree' ($n = 112$: 52 males, 60 females).

(95.5%, $n = 107$); alterations in the timing of ice formation and break-ups (88.4%, $n = 99$); increased frequency and intensity of storms (80.4%, $n = 92$); changes in precipitation levels (86.6%, $n = 97$); and shifts in wildlife and vegetation patterns (7.4%, $n = 70$ and 69.6%, $n = 78$, respectively) (see Electronic Appendix 2 for a synthesis of the overall climate change observations, and resulting socio-cultural and health impacts emergent from the *Changing Climate* project).

These rapid changes were described as disrupting hunting, fishing, foraging, trapping, and traveling to cabins because people were unable to travel regularly (or at all) due to dangerous travel conditions and unpredictable weather patterns. Many participants reported that a major draw to living in Rigolet—beyond the familial and ancestral connections—was the ability to participate in the type of land activities specific to the region. As one middle-aged woman and life-time Rigolet resident explained during an interview: "I live here because it's my home, but I mean [people live] here too knowing that you're going to live this type of lifestyle. And it brings comfort and peace to your family, I think, just living this lifestyle. To not have it I think would be very stressful, hard." As she further elaborated, "I mean I've heard people say that they've sort of moved back home after being gone away for years because…they missed the lifestyle, but if it continues like this, they might as well just move on." Despite this sentiment, 70.6% of EDS participants ($n = 79$) reported that their sense of belonging to and connection with the land in and around Rigolet had not yet been irreparably affected by the changes experienced thus far in the region, and that they would not choose to move (Fig. 2). That said, many participants were still finding the changes to the land and climate very difficult, because as one participant explained, it is "challenging…when you're living a different lifestyle…but still living in the same area."

Changing climate, changing place, changing health

Participants reported that these changes and variability in climate, snow, ice, and travel conditions, as well as alterations to hunting and foraging, are also impacting health and well-being, physically, mentally, and emotionally. As one senior explained during her interview, going on the land enhances health: "It means for me that I can practice my traditional lifestyle, that I can live healthy…that I can use the land to refresh me. …We use the land to replenish our spirit…to go out there and get rid of all the stress." As another middle-aged man shared in an interview, "I think going on the land…is the healthiest thing you'll ever get. …That's where your health is, out there." With climate change altering the landscapes and disrupting livelihood and subsistence activities, many participants felt that their health and well-being were negatively affected.

For example, many interviewees linked changes in climate and environment to locally-specific physical health determinants, particularly food security. Many participants commented on the changes to local and regional wildlife and vegetation patterns and the decreased access to wild meat and wild berries, due to local variations in weather, snow, and ice (Electronic Appendix 2). As one father, grandfather, and avid hunter explained, the changes experienced in herd migration patterns and in the quality, stability, and extent of ice were decreasing opportunities for people to hunt for wild meat, and shifted diets from country food to store-bought foods: "without a doubt, [people] are eating processed meat and salt and additives and everything else." Many participants linked these dietary changes to increased incidences of physical ailments. As one respondent explained, "I believe the rate of diabetes has jumped really high…30 years ago…I do not think there were any diabetics in town. Now there're lots. A lot of diabetics, a lot of people on high blood pressure medication." Another male interview participant also linked the impacts of climate change on hunting activities to physical health impacts: "there's a higher

increase of obesity…there is also a higher incidence of heart disease. It seems like a lot of people now have high blood pressure and heart attacks and strokes and I think that it is related to food."

While these physical health issues were of great importance to the community members interviewed, there was also a strong emphasis on the emotional and mental impacts of alterations to the land, live-lihoods and subsistence activities, and community identity. For many people, going out on the land around Rigolet made them feel more "fulfilled" and "complete," and being on the land was "relaxing" and "healing" because people could "go out there and get rid of all the stress." As one middle-aged father shared, for many people in Rigolet, health came from the ability "to get off and connect to the land. I think that's…like the only health thing. I think that you need to give [going on the land] more preference and people do that 'cause it just makes you a healthier person." As he further explained, "just the fact of being there [on the land] is a boost to your health." As another regular hunter shared, going on the land "is a good thing I can do for my mind."

For many participants, the observed changes in weather, climate, and environment also evoked numerous emotional reactions. Participants shared with the researchers that they felt "mad," "upset," "pissed off," "angry," "helpless," "frustrated," and "sad" (Fig. 3). Interestingly, the results from the EDS indicated that female respondents reported higher levels of emotional reactions in response to observed and experienced climate change than male respondents (Fig. 3). As an avid hunter explained, when confronted with these climatic and environmental changes, she was "mad. Like literally mad. Like ticked right off, eh? Like pissed right off…It's just destroying our livelihood, the way we live. Completely." As another woman explained, the conditions in Rigolet are changing so fast, "and that's so sad to think about it. It do make you angry, but what can you do? It makes you feel so helpless."

In addition, people also reported that they were feeling 'depressed' and 'down', and that their sense of mental health and well-being was suffering due to climatic and environmental changes. As one participant explained,

> I think that [the changes] will have the impact maybe on mental health, because it's a depressing feeling when you're stuck. I mean for us to go off [on the land] is just a part of life. If you don't have it, then that part of your life is gone, and I think that's very depressing. It could be a depressing thing for a lot of people, and it could have an impact on your health.

Echoing this sentiment, an experienced hunter shared that climatic and environmental changes in Rigolet

> certainly disrupts your lifestyle. Not only us, everybody. I mean you are stuck here on this point of land in the community and you want to get out and you cannot go. People get bored and people turn to drinking and drugging and social problems and stuff like that. … I mean people, day after day after day look out the window and it's this old depressing fog and rain and windy. I mean it got to play on people's minds, especially people with not a lot to do and looking forward to it [going on the land].

As another young woman explained, this depression not only affects individuals but also expands into a larger collective emotion, impacting a sense of community cohesion and community health and well-being:

> there's definitely depression [as a result of the changes], and you know a lot of things come about when everything that you know is taken away from you. And you can't, you're in no place to control that yourself, so if you can't affect your own…life or circumstances, you're going to feel very helpless…I think that if climate change could change to move forward to the point that it impacts cultural-based activities…then I think the
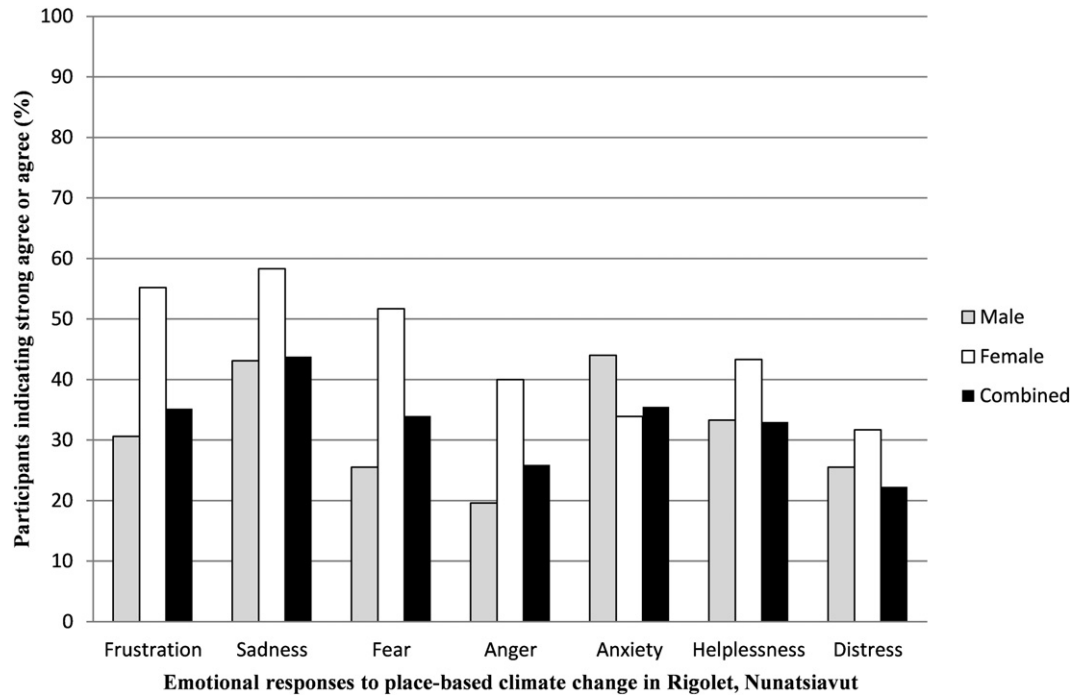
Fig. 3. Responses to selected emotional responses to changes in weather patterns, snow, ice, wildlife, vegetation in climate identified in the Environmental Distress Survey conducted in Rigolet, Nunatsiavut in 2010. The graph depicts the percentage of male (shaded gray), female (shaded white), and combined (shaded black) responses indicating 'strongly agree' or 'agree' ($n = 112$: 52 males, 60 females).

cohesiveness of the community could be questioned. …So I think community health is related to preparedness and how well you can fit within a new world and a new reality.

These changing climatic and environmental conditions and the disruption to hunting, fishing, foraging, trapping, and traveling were reported to also impact mental and emotional health through a decreased sense of self-worth. As one young woman and experienced hunter shared,

if more and more people can't be going to the cabin and can't be hunting and can't be dependently going on the land, than they just start to see a community shifting, not knowing what they're supposed to be doing. Not knowing what you're good at, not knowing what your self-worth is, not knowing what you should be doing with your time.

Finally, it is also important to note that despite being asked explicitly in both the interviews and the EDS if there were any perceived or observed positive impacts of climatic or environmental change in the community, individuals did not identify any positive impacts stemming from climate change for health and well-being at this time.

Discussion: climate change and place-based health and well-being

Place has been identified within the field of medical and health geographies as integral and essential to physical, mental, and emotional health and well-being, and a sense of place has been identified as an important determinant of health (Cummins et al., 2007; Curtis & Rees-Jones, 1998; Hess et al., 2008; Kearns, 1993; Macintyre et al., 2002). As is clear from this research, place-specific climatic and environmental changes impact physical, bodily, social, economic, cultural, emotional, and psychological connections with

the land and, as a result, negatively affects the physical, mental, and emotional health and well-being of individuals and communities (Berry et al., 2010, 2011; Cook et al., 2008; Cunsolo Willox et al., 2011; Doherty & Clayton, 2011; Few, 2007; Fritze et al., 2008; Frumkin et al., 2008; Speldewinde et al., 2009; St. Louis & Hess, 2008; Swim et al., 2010, 2011; Tong & Soskolne, 2007). This research contributes to a growing body of climate change and health research in Canada and internationally that examines the connections between climate change and health (Campbell-Lendrum et al., 2009; Costello et al., 2009; Cunsolo Willox et al., 2011; Ebi, 2009; Few, 2007; Ford, Berrang-Ford et al., 2010; Frumkin et al., 2008; Frumkin & McMichael, 2008; Harper et al., 2011; Hess et al., 2008; St. Louis & Hess, 2008; Tong & Soskolne, 2007), and indicates that climate-health research and adaptation strategies can be enhanced by considering the importance of local connections to and sense of place.

It is also clear from this research that changes to place impact the physical, mental, and emotional health of individuals in this region. For example, and providing further support to the literature linking climate change and physical health (Costello et al., 2009; Few, 2007; Ford, Berrang-Ford et al., 2010; Frumkin et al., 2008; Hess et al., 2008; St. Louis & Hess, 2008), place-specific changes in climate and environment can impact physical health through decreased access to country foods, and the subsequent increased consumption of store-bought foods. From this example, even subtle changes in climate and environment can have lasting impacts on physical health. Place, then, becomes an important component in understanding the extent of climate change on health, as a place-focused approach highlights the effects of climate change on health where it is most acutely experienced and from a local perspective (Hess et al., 2008).

In addition, one of the new contributions of this research within the context of climate change and place is the ways in which individuals in Rigolet are experiencing deep mental and emotional responses due to climate change and the subsequent alterations in

the local land and surrounding ecosystems. For the participants in this study, the land around the community is rapidly changing, leading residents to report climate- and environmental-induced feelings of sadness, fear, anxiety, depression, anger, and distress. Clearly, these feelings resulting from localized changes to a sense of place, combined with the subsequent disruption to hunting, trapping, foraging, fishing, and traveling to cabins, impact the mental and emotional health and well-being of individuals and communities. These findings resonate with the concept of solastalgia discussed previously in the Introduction (Albrecht, 2010; Albrecht et al., 2007; Higginbotham et al., 2007; Sartore et al., 2008; Speldewinde et al., 2009), and provide further support for this theory and framework from a Canadian Inuit perspective (c.f. Cunsolo Willox et al., 2011). These findings also complement research from an Australian context examining the ways in which drought conditions impact on the mental health and well-being of individuals and communities, and add further support from a very different geographical and cultural perspective (Albrecht et al., 2007; Berry et al., 2010, 2011; Hart, Berry, & Tonna, 2011; Polain, Berry, & Hoskin, 2011; Rigby, Rosen, Berry, & Hart, 2011; Sartore et al., 2008). From the findings in this article, then, it is clear that more research is needed to further examine the connections among changing environmental conditions, sense of place, place attachment, and health and well-being—physical, mental, and emotional—from other geographical locales and response to other environmental alterations (rising sea levels, forced migration, and flooding, for example).

These changes to the land, place-attachment, and place-based identities also manifest in regional variations in health indicators and adaptive behaviors (Ford, Berrang-Ford et al., 2010; Ford, Keskitalo et al., 2010; Ford et al., 2006; Hess et al., 2008; Lehti et al., 2009); as such, it is important for health researchers and practitioners to understand the ways in which individuals and communities in specific regions identify with and connect to place, and respond to changes, physically, mentally, and emotionally (Albrecht, 2010; Albrecht et al., 2007; Berry et al., 2010; Hess et al., 2008; Sartore et al., 2008; Speldewinde, 2009). The myriad ways in which people make sense of, and apply meaning to, place will determine the range of responses that occur when the place is confronted by climatic and environmental change, and the subsequent impact on health and well-being. An approach to health and well-being that seriously considers the importance of place from a multi-faceted perspective within the context of climatic and environmental change, then, allows for a more nuanced understanding of the socio-cultural and geo-physical underpinnings of health, health responses, and adaptation strategies. A place-based climate-health approach also understands that even subtle alterations in climate and environment can have profound impacts on health and well-being (Ford, Keskitalo et al., 2010; Furgal et al., 2002).

As introduced in the Results section, despite being asked about positive impacts of climatic and environmental change, individuals in this research did not identify positive outcomes of these changes on sense of place and place attachment. Despite the negative perceptions and feelings expressed, there was a strong sense among participants that Rigolet was still home, and were not willing or wanting to move away (Fig. 2). Although people are experiencing negative impacts and mourning the ways in which their home environment is changing, the connection to the land in the region was still very strong. As a result, adaptation—social, cultural, technological, and health (Ford, Berrang-Ford et al., 2010)—is of increasing importance to Rigolet and to other Inuit communities experiencing similar changes, to assist individuals in adapting to and coping with rapid changes in land, livelihoods, and health and well-being. An understanding of place-attachment and

sense of place, then, will be critical when considering susceptibility, resilience, and adaptation within a climate change context, as well as to understanding localized barriers to and supports for health. A resilient and robust sense of place has also been connected to an increased awareness of and concern for the health of the land and local ecologies and for shaping place-related identities and attitudes about environmental issues (Albrecht et al., 2007; Hess et al., 2008; Vorkinn & Riese, 2001). A place-based approach to climate-health research and planning, then, has the potential not only to highlight regions of susceptibility, but also to encourage and understand factors behind motivation and action, and foreground already-present strengths, resilience, innovation, and physical, mental, emotional, and health adaptive capacities (Ford et al., 2006). For example, research projects should incorporate a component assessing the impact that climatic and environmental change has on a sense of place and place attachment, and then assess the health implications resultant from changes to place. This would further inform the creation of place-specific adaptation strategies and health programs to mitigate the impacts of climate change on health and well-being.

In addition, health systems themselves need to adapt to the challenges posed by climatic and environmental change (Blashki et al., 2011; Ford, Berrang-Ford et al., 2010), and this research can inform that adaptation process. From a health services perspective, and from within the context of Canadian Inuit populations—and potentially also extendable to other Indigenous or resource-dependent communities in Canada and internationally—there are important implications for health programming. For example, health professionals working with Inuit populations can create programs and services that provide the opportunity for individuals to speak about emotions they may be experiencing due to climatic or environmental changes through one-on-one counseling sessions or groups discussion settings. In addition, on-the-land programming that brings participants from communities to camps on the land to participate in hunting, trapping, fishing and foraging, can be further enhanced and funded to provide more individuals the opportunity to continue to access the land for health and well-being, despite the climatic and environmental conditions. Finally, there is growing recognition that peer-to-peer support and the fostering of social networks is important to enhancing resiliency to, and maintaining health and well-being when confronted with, change (Berry et al., 2011; Horton, Hanna, & Kelly, 2010; Saniotis & Irvine, 2010; Sartore et al., 2008). This can be done by enhancing already present locally-appropriate and community-driven activities (recreational activities, sports nights, community craft evenings, youth nights, support groups, for example) or by creating new health programs to provide opportunities for healthy activities for individuals who are no longer able to spend time on the land due to the changes and would benefit from social activities and networks in the community.

It is clear from this research that the climate-health field needs to be expanded to incorporate the importance of place, and of place-specific impacts on health and well-being emergent from the climatic and environmental changes, not only in a Canadian Inuit context, but also in other Indigenous contexts globally and in communities that are reliant on the environment for sustenance, survival, socio-cultural and emotio-spiritual connections, and health and well-being. This research also supports many other studies showing that place, place-attachment, and place-based identities are vital aspects of health and well-being (Albrecht, 2010; Albrecht et al., 2007; Hess et al., 2008; Sartore et al., 2008; Speldewinde et al., 2009). Going further, these results also support the conceptualization of climate change and the subsequent environmental alterations as a determinant of health and well-being, to be included with other determinants of health—income

distribution, education, housing, food security, access to healthcare, quality of early life, and social safety nets—to acknowledge the profound health effects experienced due to climatic and environmental alterations.

Conclusion: climate change, health, and a new world reality

As one participant stated above in the Results section, people are not only *from* a particular place, but they are also *of* the place; that is, their identities, well-being, livelihoods, histories, and emotio-spiritual connections are emergent from the lands on which they live. Therefore, without a consideration of a sense of place and place-attachment in climate-health research, the complexity of the health effects resulting from climate change and variability, and the socio-cultural and health implications of local and regional climatic and environmental change, will be under-represented and under-considered (Hess et al., 2008; Panelli & Tipa, 2007; Speldewinde et al., 2009). As another interviewee explained, "community health is related to preparedness and how well you can fit within a new world and a new reality." Climate-health-related research needs to include an understanding of the profound attachment to the land and sense of place held by Indigenous communities and peoples who closely rely on the natural environment for economic, spiritual, social, and cultural reasons, such as the Canadian Inuit in this study. With this understanding, climate-health research and health adaptation work can be, and strive to become, prepared to meet the new world reality of a rapidly changing climate and environment through the understanding and inclusion of the importance of place and place attachment, the implementation of locally- and regionally-specific public health planning and research, and further research examining the ways in which place-attachment interacts with individual and collective susceptibility, adaptability, and resilience to climate change.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.socscimed.2012.03.043.

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