

# Examining relationships between climate change and mental health in the Circumpolar North

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**Abstract** Indigenous people living in the Circumpolar North rely, to varying degrees, on the natural environment and the resources it provides for their lifestyle and livelihoods. As a consequence, these Northern Indigenous peoples may be more sensitive to global climate change, which has implications for food security, cultural practices, and health and well-being. To date, most research on the human dimensions of climate change in the Circumpolar North has focused on biophysical issues and their consequences, such as changing sea ice regimes affecting travel to hunting grounds or the effects of melting permafrost on built

infrastructure. Less is known about how these changes in the environment affect mental health and well-being. In this paper, we build upon existing research, combined with our community-based research and professional mental health practices, to outline some pathways and mechanisms through which climate change may adversely impact mental health and well-being in the Circumpolar North. Our analysis indicates that mental health may be affected by climate change due to changes to land, ice, snow, weather, and sense of place; impacts to physical health; damage to infrastructure; indirect impacts via media, research, and policy; and through the compounding of existing stress and distress. We argue that climate change is

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likely an emerging mental health challenge for Circumpolar Indigenous populations and efforts to respond through research, policy, and mental health programming should be a priority. We conclude by identifying next steps in research, outlining points for policy, and calling for additional mental health resources that are locally responsive and culturally relevant.

**Keywords** Climate change · Mental health · Circumpolar North · Indigenous · Arctic

### Climate change and mental health in the Circumpolar North

Anthropogenic climate change is a major concern and an increasing challenge for peoples' living in the Circumpolar North (ACIA 2005; IPCC 2013; 2014). Local observations and scientific monitoring have documented rapid changes, including increasing surface air temperatures, changing precipitation levels (including snowfall) and ice dynamics, melting permafrost, rising sea levels, changing wind dynamics, and changes in the health and distribution of some wildlife and plants, many of which are important for subsistence (ACIA 2005; Ford et al. 2012; IPCC 2013; 2014). These and other changes in climate and environment are already affecting livelihoods, lifestyles, and human activities of Circumpolar populations, particularly Indigenous people who rely closely on the natural environment for sustenance and cultural connection (Ford et al. 2010, 2012; Ford 2012; Pearce et al. 2010, 2011a, b).

Recent research indicates that climate change may negatively affect the health of Circumpolar peoples (ACIA 2005; Costello et al. 2009; Ebi et al. 2006; Ebi 2011; Evengard and Sauerborn 2009; Parkinson and Evengard 2009). Rising temperatures and changing precipitation regimes have been linked to increased frequency and distribution of foodborne, waterborne, and vectorborne diseases (Furgal and Seguin 2006; Harper et al. 2011; Martin et al. 2007; Parkinson and Butler 2005); increased mortality and morbidity from hazardous travel conditions and extreme weather events (Ford et al. 2006a, b; Furgal and Seguin 2006; Pearce et al. 2010); and disruptions to nutritional intake from wild foods and an increased reliance

on processed foods (Egeland et al. 2010; Furgal and Seguin 2006; Furgal et al. 2002; Sharma et al. 2010). These climate-sensitive health impacts are not limited to the Circumpolar North, and some scholars have identified climate change as the biggest global public health threat of the twenty-first century (Costello et al. 2009; c.f. Myers and Patz 2009).

While research emphasis was initially placed on the potential physical health consequences of climate change, the potential implications of climate change for mental health and well-being, both at the individual and the community levels, are now also beginning to be explored (Berry 2009; Berry et al. 2010a, b; Cunsolo Willox et al. 2013a, b; Doherty and Clayton 2011; Swim et al. 2010, 2011). In 2010, the American Psychological Association Task Force on the Interface between Psychology and Global Climate Change called for global climate change research to expand beyond a biophysical framing to include psychological and mental health perspectives (Swim et al. 2010). Building on this study, Doherty and Clayton (2011) argue that climate change is likely to have far-reaching negative effects on mental health and well-being globally, particularly among marginalized populations, those living in rural or remote areas, and those with preexisting mental illnesses (c.f. Fritze et al. 2008; Page and Howard 2010) (Table 1). Climate change will likely continue to negatively affect Circumpolar Indigenous populations, based on a combination of existing high instances of mental health challenges and already occurring rapid fluctuations in climate and ecosystem dynamics that may challenge communities heavily reliant on the natural environment for subsistence and economy (Swim et al. 2010; Cunsolo Willox et al. 2012, 2013a, b).

Presently, only limited work specific to the Circumpolar Indigenous populations has engaged with climate change and mental health (Cunsolo Willox et al. 2012, 2013a, b), leaving key gaps in our understanding. Given the importance of land-based activities for both mental and physical health in the Circumpolar North, the rapidity of the changes in the region, and the preexisting mental health challenges, this article posits that climate-sensitive mental health impacts are likely to worsen, and be prevalent and widespread across the North as climate change continues. Building on our combined experiences in community-based research and professional mental health practice working with Circumpolar Indigenous peoples, together with a synthesis of the human dimensions of climate change literature and the emerging scholarship on climate change and mental health, this article outlines possible pathways through which climate change could impact mental health and well-being in the Circumpolar North. This article also aims to provoke thought and stimulate action among researchers, health professionals, and policy

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**Table 1** Possible pathways and impacts of climate change on global mental health (Berry 2009; Berry et al. 2010a, b; Cunsolo Willox et al. 2013a, b; Doherty and Clayton 2011; Swim et al. 2010, 2011)

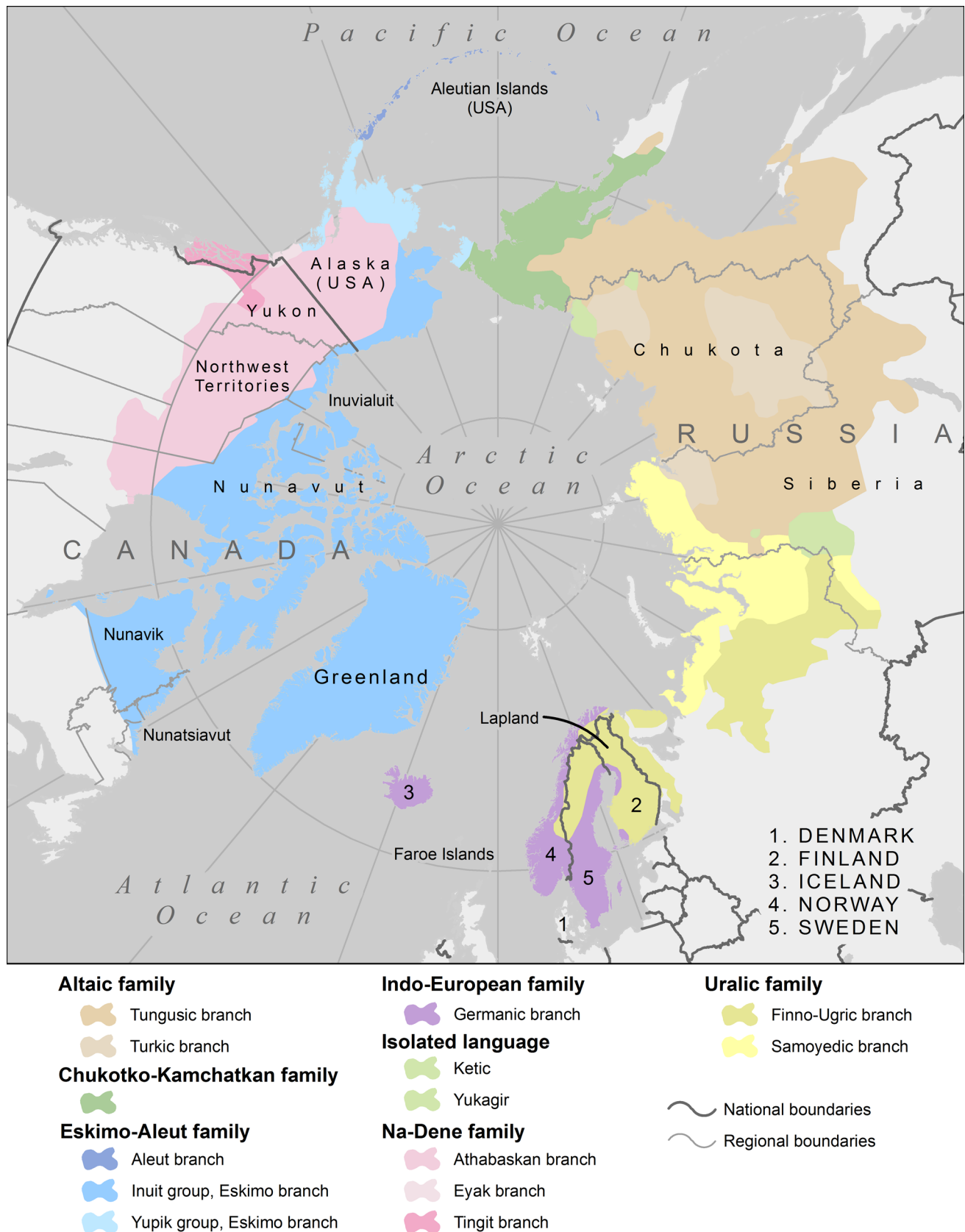
<b>Direct impacts</b>	
<i>Acute or extreme weather events</i>	<i>Possible mental health impacts and implications</i>
Severe storms (rainstorm, hailstorm, thunderstorm, windstorm, snow storm, ice storm, tropical storm, hurricane, cyclone, monsoon, blizzard, tornado)	More frequent exposure to physical danger and injury leads to elevated levels of stress and worry
<i>Resulting natural disasters</i>	Elevated rates of mood disorders, including major depression
Mudslides	Elevated rates of anxiety disorders
Wildfires	Increase in strong emotional responses: sadness, distress, anxiety, stress, helplessness, hopelessness
Flooding	Increased rates of violence from prolonged heat
<i>Sub-acute weather events</i>	Increased individual, family, and community stress from weather events, disasters, heat waves, and disruptions to culture, activities, and livelihoods
Drought	Increased rates of suicide ideation and alcohol and drug usage
Heat waves	
<b>Indirect impacts</b>	
<i>Physical health</i>	<i>Possible mental health impacts and implications</i>
Increased risk of physical health impacts (communicable and noncommunicable diseases, vectorborne and waterborne illnesses, allergens, nutritional disruption)	Elevated rates of mood disorders and major depression
<i>Landscape degradation</i>	Elevated rates of anxiety disorders
Loss of wildlife or vegetation	Increase in strong emotional responses: sadness, distress, anxiety, stress, helplessness, hopelessness
Plant and animal disease	Decreased sense of connection to place and place identity
Changes in ecosystem characteristics	Decreased sense of capabilities and self-value due to disruptions in livelihoods
Resource extraction and industrial development	More frequent chronic stress from changes
<i>Social and economic networks disruption</i>	Loss of place-based identities and sustenance livelihoods
Loss of livelihoods or economic means	Elevated rates of violence and conflict
Decreased social capacity and social connections	Increased rates of suicide ideation and alcohol and drug usage
<i>Impacts to infrastructure</i>	Decreased opportunities for mental health supports
Need for relocation of buildings and houses due to rising sea levels and coastal erosion	Stress, anxiety, and worry from watching representations of climate change and resulting impacts
Trails, ice roads, and camps altered	Stress and anxiety from loss of housing or municipal services
Municipal services (water, sewage, airstrip) impacted from slumping permafrost	Distress from forced relocation
Psychosocial impacts	
<i>Mass migration</i>	<i>Mental health impacts and implications</i>
Increased climate refugees due to ecological stresses	Elevated rates of mood disorders, including major depression
<i>Relocation and displacement</i>	Elevated rates of anxiety disorders
Ecological conditions cause relocation of groups or communities (rising sea levels, loss of water or natural resources, movement from industrial development)	Increase in strong emotional responses: sadness, distress, anxiety, stress, helplessness, hopelessness
	Loss of connection to homeland and social connections negatively impacts mental health

makers to consider including the current and potential mental health impacts of climate change in research, policy, and budget decisions and dialogs.

### Indigenous peoples in the Circumpolar North

The region identified as the Circumpolar North comprises land and human populations in eight countries (often referred to as ‘The Arctic 8’), which also include the membership of the Arctic Council: USA (Alaska), Canada, Denmark and its self-

governing territories of Greenland and the Faroe Islands, Iceland, Norway, Sweden, Finland, and Russia. There are approximately 4 million people living in the Circumpolar North, with approximately 650,000 people from over 40 different ethnic groups identifying as Indigenous (Lehti et al. 2009): for example, Aleut, Yupik, and Inupiat in Alaska; Dene and Inuit in Canada; Inuit in Greenland and Russia; Sami in Finland, Sweden, Norway, and Russia; and Nenets, Khanty, Evenk, and Chukchi in Russia (Fig. 1). These groups have existed in the North for millennia, with archeological evidence dating back between 4,000 and 40,000 years (ACIA 2005).



**Fig. 1** Map of Circumpolar regions with Indigenous populations and Associated Language Groups (Language regions based on Young 2012)

While Indigenous groups in the Arctic are diverse and have unique histories, they share various commonalities. Most of these Indigenous groups continue to identify a deep cultural connection to the natural environment, and their sustenance, livelihood, and a strong emotional connection is often linked to land-based livelihoods: hunting, fishing, trapping, harvesting, and/or reindeer herding. Circumpolar Indigenous people also share many European colonial legacies that continue to affect their contemporary social, economic, and political systems (Bjerregaard et al. 2004; Kirmayer et al. 2009c; Lehti et al. 2009; Richmond 2007). While not static cultures before contact, a dramatically accelerated process of change began with colonization and the presence of missionaries, fur traders, explorers, and colonial governments from the seventeenth century onwards (Kirmayer et al. 2009c; Young 2012). These changes include cultural and linguistic assimilation; mass land dispossession; forced relocation from traditional homelands; residential or boarding schools (notably in Canada, the USA, and Norway) that removed children from their communities and attempted to ‘Westernize’ students; systematic political and social marginalization and abuse; and epidemics from introduced diseases, such as smallpox, measles, influenza, and tuberculosis, which decimated populations (Bjerregaard et al. 2004; Kirmayer et al. 2009c; Lehti et al. 2009; Richmond 2007). More recently, climatic and associated environmental changes—specifically loss of sea ice and easier access to Circumpolar regions—have further disrupted livelihoods and, increasingly, facilitated industrial development that may threaten Indigenous peoples and cultures (Nuttall 1998) and their mental health (Noble and Bronson 2005). Despite these challenges, Indigenous peoples have shown strong resilience in the face of rapid changes and are proactively working to preserve and promote culture, heal intergenerational trauma, reclaim political power and decision making, and support physical and mental health through community-focused programs. There has also been a widespread movement toward Indigenous political organization and rights, including increased control over economic development and social services: Greenlandic Self-Rule from Denmark in 2009; land claim settlement agreements undertaken across Canada in the 1980s, including the creation of Nunavut as a Territory; and the establishment of Sami Parliaments in Norway, Finland, and Sweden in the late 1980s and early 1990s (Young 2012).

### Circumpolar Indigenous mental health and well-being

Circumpolar Indigenous communities, as well as many organizations and researchers throughout the North, prioritize community wellness and agency to build a strong and

resilient future in the face of rapid change. Yet, Circumpolar Indigenous populations generally experience greater disparities in health indicators and outcomes when compared to non-Indigenous populations: lower life expectancies; higher incidences of mortality and morbidity; higher incidences of infant mortality; decreased nutritional intake coupled with greater food insecurity; and increased incidences and prevalence of infectious, noninfectious, and chronic diseases (Bjerregaard et al. 2004; ITK 2010; Kirmayer et al. 2009c; Young 2012).

There are also major mental health disparities across much of the Circumpolar North. Data are limited, however, and, where research exists, it has struggled to define and characterize ‘mental illness’ or ‘mental health’ in culturally-relevant ways (Kirmayer et al. 2009c; Waldram 2009). That said, suicide rates represent a measurable indicator of psychological wellness and distress within a population and have emerged as the most serious representation of mental health disparities across the North (Allen et al. 2011; Kral 2012; Tester and McNicoll 2004; Wexler 2011): suicide rates in most Circumpolar Indigenous populations are well-above the global average, with the highest rates in Greenland (86 per 100,000), Nunavut (76 per 100,000), and Alaska (40 per 100,000) (Young 2012). This situation is particularly serious among Circumpolar Indigenous youth populations (Allen et al. 2011; Lehti et al. 2009). There are, however, variations in the reported suicide rates: some Circumpolar Indigenous populations, such as the Sami in Norway, have very low suicide rates, only slightly higher when compared to the nonIndigenous populations. There are also higher rates of drug and alcohol usage, and increased incidences of depression and severe mental health disorders (including psychotic and other affective disorders) per capita in some Circumpolar Indigenous populations when compared to nonIndigenous populations, though these trends also vary regionally (Lehti et al. 2009; Young 2012).

Coinciding with, and likely contributing to, these disparities in both physical and mental health outcomes are challenges to health care access and provision in the Circumpolar North. Examples include the remoteness of many of the Indigenous communities across the North, with mental health resources and practitioners often centered a great distance from the communities (Jong 2004; Kirmayer et al. 2009a; Minore et al. 2009; Wexler and Graves 2008); the limited access to primary and specialized healthcare options; the underfunding or understaffing of services; and the high turnover of health practitioners in many of these regions that may disrupt continuity in care (Marrone 2007; Minore et al. 2009).

Service shortfalls do not fully capture the challenges of mental health services for Indigenous Circumpolar populations; there has also been on-going tension between



Western bio-medical and Indigenous mental health perspectives, approaches, and interventions, with medical models often not incorporating broader understandings of Indigenous wellness, including intrapersonal, social, cultural, and environmental determinants of well-being (Wexler and Gone 2012). Mental health services may imply forced imposition of Western values and bio-medical models onto cultures and contexts that have previously relied upon—and continue to rely upon—different strategies for mental health and wellness. Medical models may also obfuscate and reify the psychological nuances and historical and contemporary inequities within communities and populations associated with colonialism, while at the same time overlooking individual strengths and community dynamism and resilience, and the many ways in which communities are already working toward promoting and supporting mental health, healing intergenerational traumas, and rectifying past wrongs from all levels of government (Adelson 2009; Allen et al. 2013; Waldram 2009). Contributing to this tension is also a lack of trust in health care systems, which are sometimes viewed as representing central authorities and politics, not local needs (Nystad et al. 2006). Mental health services, then, could potentially be considered another form of colonization, and as a way of removing local control of mental wellness in exchange for bureaucratic structures created by and through a different knowledge system premised on Western values and assumptions (Gone 2009; Stevenson 2012; Wexler 2009).

### Climate change and Circumpolar Indigenous mental health: potential pathways

The current and expected health consequences of climatic change occur within a context of the rapid socio-cultural transformations listed above, the effects from colonial legacies and policy paternalism, and other serious ongoing health challenges. As has been illustrated in the human dimensions of climate change research (e.g., Adger 2006; Duerden 2004; Ford and Smit 2004; Füssel and Klein 2006; Pearce et al. 2010; Smit and Wandel 2006), vulnerability to climate change in Circumpolar countries is likely to differ according to the numerous cultural, economic, political, and historical contexts of each of the Indigenous groups in the Circumpolar North, and this differential vulnerability will be further influenced by contemporary socio-economic changes and conditions. Consequently, the potential mental health impacts from climate change are anticipated to be unequally distributed across the Circumpolar North and even *within* populations and communities, depending on age, gender, socio-economic factors, and preexisting levels of distress and psychopathology.

To articulate how climate change is, and could possibly, affect mental health, we have identified five broad categories of linkages between biophysical climate impacts and psychological impacts. These include: (1) changes to the land, ice, snow, and weather resulting in changes to sense of place and existing practices supporting well-being; (2) impacts to physical health that, in turn, compromise mental well-being; (3) damage to the built environment and infrastructure with consequences such as loss and displacement; (4) indirect impacts from narratives communicated and shared through various forms of media; and (5) the magnification or compounding of existing drivers of stresses. The pathways through which climate change could impact mental health are complex and difficult to disaggregate: the above categories may all have similar, overlapping, or interwoven mental health implications. These categories, therefore, are not meant to be deterministic but rather aim to illustrate the potential scope of impacts.

#### Impacts from changes to the land, ice, snow, and weather

Disruptions to the land and land-based activities, such as hunting, herding, fishing, foraging, and traveling, may drive various climate-related mental health impacts. As mentioned, many Indigenous populations in the Circumpolar North continue land-based lifestyles and experience an interdependent relationship with the land, where identity, self-confidence, and socio-cultural and socio-spiritual significance emerges, in part, from one's connection to the land and to place. The land, then, is a site for deep healing, renewal, and revival and is vital to concepts of well-being, enrichment of the mind, body, and spirit, and resilience (Cunsolo Willox et al. 2013b; Kirmayer et al. 2009c; Kral et al. forthcoming; Pearce et al. 2010), and not being on the land can cause deep psychological stress (Cunsolo Willox et al. 2013b; Dowsley et al. 2010). Within this interdependent relationship, even subtle alterations in climate and environment affect sense of place and time spent 'on the land', and as a result, can have large impacts on mental health and well-being (Cunsolo Willox et al. 2012, 2013a, b; Kirmayer et al. 2009b; Wexler et al. 2013).

Since many of the Indigenous people throughout the Arctic are remote and rely on the sea ice for travel to other communities and hunting, even slight variations in the formation or duration of ice and snow can lead to large community-level impacts (Krupnik et al. 2010). For example, people may be unable to travel to cabins and areas with historical, spiritual, and personal significance or access hunting grounds safely and reliably provide food for family and friends (Ford et al. 2010; Krupnik et al. 2010; Nuttall 2010). This change in sea ice and the resulting

impacts on individuals and communities could potentially lead to a range of emotional responses (anxiety, fear, stress, anger, grief, sense of loss, or anticipation for future changes), as well as potential changes in behavior, such as withdrawal, aggressiveness, or increased drug and alcohol usage (Cunsolo Willox et al. 2013a; Nuttall 2010). As climatic conditions and weather patterns change, some traditional knowledge for weather prediction and navigations has become less relevant under changing conditions (Ford 2012; Kunuk and Mauro 2010). A sense of a loss of traditional knowledge and wisdom around predicting weather patterns may also cause negative emotional responses. This is also connected to the ability to find meaning and value in being able to pass along knowledge based on predicting weather patterns, navigational strategies, and understanding conditions for safe travel to younger generations, which could lead to feelings of cultural dislocation and disorientation as well as impact senses of identity and self-worth (Pearce et al. 2010, 2011a, b). This inability to participate in land-based activities may also disrupt cultural histories and spiritual importance of hunting and foraging and can affect sense of purpose or identity for frequent hunters (Sharma et al. 2010).

Circumpolar Indigenous people have a long history of adapting to change, including to past climatic variability and shifts in species abundance, by modifying seasonal hunting activities, pursuing alternative species, and alternating modes of transportation (Berkes and Jolly 2002; Wenzel 2009). However, the literature suggests that climate-related disruption of land-based and subsistence activities is likely to disproportionately affect those who lack economic access to equipment that might enable them to continue to pursue or modify hunting practices (e.g., using a boat instead of a snowmobile if the sea ice melts early), those without an active skills teacher in their lives (essential for the generation and transmission of hunting knowledge and skills), and those who have weaker social networks (e.g., to provide equipment and food sharing) (Ford et al. 2006a, b; Pearce et al. 2010; 2011a, b; Ford and Pearce 2012). Individuals who are unable to continue to participate in subsistence practices due to changing climatic conditions and economic barriers express feelings of being 'stuck' or 'trapped', and responses such as frustration, anger, distress, anxiety, and depression may result (Cunsolo Willox et al. 2013a). This may put the heaviest mental health burden on those who are already experiencing other forms of socio-economic inequality and social isolation, as interlocking forms of precarity and disadvantage often have long-term impacts on basic functioning (Wolf and de Shalit 2007). While climate change is an increasing stressor, it is important to take caution when framing climate-related distress solely within the terms of mental health and, therefore, neglect to consider how

material deprivations interact with climate stressors or to understand the way fear and anxiety associated with changing environmental conditions may inhibit functioning, behavior, or health outcomes (Wolf and de Shalit 2007).

#### Impacts from physical health effects of climate change

Many of the physical health impacts from a changing climate, including disruptions to food security, increased foodborne and waterborne diseases, and increased risks of morbidity and mortality (Egeland et al. 2010; Furgal and Seguin 2006; Ford et al. 2006a, b; Harper et al. 2011), have known or possible mental health consequences. For example, uncertainty and change in the weather make predicting weather patterns or conditions difficult, which may result in increased dangers and potential for death and injury while navigating on the land. This has the potential to increase morbidity and mortality rates across the Circumpolar North through injury or trauma from extreme weather events and unpredictable conditions and may add further stress to mental health and wellness as people worry about their own safety, or the safety of their friends and family. Disruptions to food security also affect mental health and may be linked back to climate change. Decreases in sea ice and snow may disrupt the ability to hunt, herd, trap, fish, and forage, with resulting impacts on food security, as well as cultural continuity and identity. At the same time, changing patterns in land and marine wildlife and vegetation (from changes in seasonal temperatures, shifting ecozones, and ocean temperature rise and acidification) also affect the ability of individuals and households to access country foods (Ford 2012; Ford et al. 2012). Declines in country food harvesting related to climate change may also stress economic resources when people have to purchase and consume the often more expensive (and less nutritious) store-bought food and, as a result, has the potential to lead to a further increase in food-related chronic illnesses, such as diabetes and obesity, which can also be associated with impacts to mental health, such as depression and anxiety. Consumption of country foods is, for many Circumpolar Indigenous communities, also understood as a source of mental health and well-being (Kirmayer et al. 2009b; Kral et al. 2011), and climate-related disruptions to the supply of country foods may compromise physical and mental health.

#### Impacts from damage to infrastructure and displacement

Climate change is anticipated, or has already been documented, to drive and/or exacerbate erosion, permafrost degradation, and sea level rise, all of which may affect the built environment in the Circumpolar North, from impacts

to formal structures (housing and municipal infrastructure) to disruptions to informal structures (winter trails, ice roads, and camps) (ACIA 2005; IPCC 2014). These infrastructural impacts will inevitably vary in scope and severity, with the most severe results including relocation of entire settlements from changing coastlines and erosion (as is already being experienced in communities such as Newtok and Shishmaref, Alaska). While most Indigenous communities in the Circumpolar North will not experience this dramatic displacement, many are likely to experience impacts to community infrastructure: coastal or ice roads degrading or disappearing from erosion and rising sea levels; potential need for relocation of buildings or houses away from coast; damage to buildings and underlying municipal infrastructure (pipelines, wastewater treatment, bridges) from accelerated permafrost shifts; and damage to foundations, roads, and airstrips from slumping permafrost (ACIA 2005; IPCC 2014). In the context of existing infrastructural inadequacies (including inadequate drinking water and wastewater provision, safe housing, homelessness and under-housing, community facilities, affordable food, and health care), these added stressors may contribute to mental health impacts associated with anxiety and distress from current or anticipatory loss and displacement.

#### Indirect impacts via media, research, and policy

In addition direct experiences with climate change, many Circumpolar Indigenous people now also experience climate change through indirect channels (e.g., news channels, social media, movies, books, articles, and novel services, programs, and regulations). For example, media items, research outputs, and policy measures often portray the inhabitants of the Arctic region as those who will be most ‘vulnerable’ to climate changes. It is possible that witnessing one’s own community, culture, and environment depicted as among the most susceptible to climatic change worldwide, coupled with direct experiences with these changes, may cause added feelings of stress, anxiety, fear for the future, and deep concern across the North (Reser and Swim 2011). Many of these ‘disaster narratives’ also portray Circumpolar communities and cultures on the verge of collapse, showing how a culture that has already undergone so many transitions in recent decades is being further harmed by climate change impacts to the point of no longer existing. This narrative of cultural extinction via rapid climatic change and upheaval creates a trope of a dying culture or civilization reminiscent of colonial attitudes and policies, obscures local agency and resilience, and may further the distress, anxiety, fear, and depression experienced as a result of climatic change (Lear 2006, 2007). Research activities that focus on Indigenous communities’ vulnerability to climatic change while neglecting

their adaptive capacity, strengths and success, may also perpetuate these harms, as can top-down policy and programming. Similarly, policy actions motivated by climate change—such as changes in species management regulations, or economic development plans prompted by changing climatic conditions and access to resources—may also affect local adaptive capacity, leading some to suggest that it is not only climate impacts, but climate politics, that will tax Circumpolar Indigenous peoples’ ability to adapt (Wenzel 2009). The injustice of having global climate concern and associated actions foisted disproportionately upon local communities—largely in the absence of local channels for political engagement that can effect decisions at a broader scale—may further undermine feelings of agency and contribute to stress.

#### Magnification or compounding of existing stresses and distress

As noted above, Circumpolar Indigenous communities currently experience a disproportionate array of existing social determinants of physical and mental health, which climate change is anticipated to impact, amplify, and magnify. Mental health implications of climate change do not arise in isolation; rather, they emerge from a complex interplay of co-occurring social, cultural, political, economic, and historical changes. Therefore, we propose that climate change may also have an amplifying effect on other ongoing sources of stress and distress within the community—including land dispossession, forced relocation, intergenerational trauma, loss of knowledge transfer and collective cultural memories among generations, and impacts to identity, sense of self, and ontological understandings of one’s place and position in culture and community—and may become an additional stressor for the underlying determinants of mental health in the Circumpolar North.

In a recent community-based study in Northern Labrador, some individuals self-reported spending more time in the community without other options for employment or activities due to an inability to go out on the land. This has led to feelings of isolation, lack of purpose and self-worth, boredom and depression, and a sense of mourning for the loss of land access and associated lifestyles (Cunsolo Willox et al. 2012, 2013a, b; c.f. Albrecht et al. 2007). According to Inuit participants and mental health professionals in the region, these climate-related impacts may lead to increased drug and alcohol consumption, and potentially even increased suicide ideation (Cunsolo Willox et al. 2013a). In addition, issues such as housing overcrowding, interpersonal violence, and drug and alcohol usage may add further cumulative stressors and associated impacts.



## Moving forward: research, policy, and action

Very little is known about the actual mental health impacts of climate change *currently* being experienced by Circumpolar Indigenous populations, due to a lack of research and to difficulties in characterizing the complex interactions among climate change, mental health, and the social, cultural, historical, environmental, political, geographic, and economic conditions in which these changes occur. Yet, a similar set of social determinants of mental health is shared across much of the Circumpolar North (Marmot and Commission on Social Determinants of Health 2007), constituting a central consideration in and approach to understanding current mental health status across as the North, as well as the mental health impacts of climate change in Circumpolar settings. Having identified various climate-mental health mechanisms and pathways in this paper, we suggest the following key recommendations against what is already known, to stimulate discussion and advance knowledge and action. Given the complexity of this research, the rapid climatic change projected for the region, and the resultantly serious consequences for Circumpolar Indigenous populations it is imperative that this issue moves to the forefront of research and policy in the North.

### Research priorities

The historical processes associated with colonization and its accompanying oppression created patterns of unrelenting and persistent inequalities (Kirmayer et al. 2011), and climate change now constitutes a further disruption within this ongoing process. More research is urgently needed in climate change and mental health in all Circumpolar countries that holistically considers how climate change interacts with the social determinants of mental health from within the context of colonial legacies and be expanded to include other social, cultural, spiritual, and environmental factors of importance to Indigenous peoples across the North (Gracey and King 2009; King et al. 2009). Key research priorities in this area include: a better understanding of how bio-physical changes translate to affect mental health and well-being; the adaptive capacities of individuals, households, and communities; and how research can contribute to the development of culturally appropriate and locally relevant policy.

Analysis of *impacts*—the climate-sensitive determinants of mental and emotional health and well-being—encompasses a broad range of questions, including how sense of place and mental health are connected to and affected by climate change; how climate change affects local health through impacts to access to land-based activities and country foods; and how these impacts are (perhaps

unevenly) distributed across populations according to social networks and land access. Such research can take lessons from the vulnerability and adaptation literature, paying deliberate attention to inequality in impacts, and to cultural and geographical variations in mental health responses and susceptibilities to climatic change. Understanding *adaptation* to the mental health impacts of climate change also presents an important research consideration, with key questions being how mental health adaptation can proceed and be supported, and what strategies can foster psychological resilience to a changing environment.

A key challenge for researching climate-sensitive determinants of mental health will be unpacking what role climate change plays in affecting mental health and highlighting existing inadequacies and challenges in existing mental health services and community-level services in some regions of the Circumpolar North. A focus on climate change may also provide an entry point for understanding cumulative impacts of distress at the community scale and broader (e.g., connections between sedentarization and climate-related displacement/relocation). First, broadening the scope of inquiry to examine interactions between climate change and other determinants of mental well-being will ensure that attention to climate change impacts does not obfuscate or depoliticize other crucial mental health inequities or health inequities more broadly. It will also allow research to proceed without preemptively characterizing the magnitude of climate impacts or neglecting the strength, resilience, and positive actions of Indigenous peoples across the North to enhance mental health. We note that although the climate-sensitive mental health impacts are assumed to be predominantly negative, research should be careful to not start with this assumption and maintain openness to potential positive or desirable mental health outcomes (c.f. Berry 2009).

With changing ice regimes, there may be potential for industrial activities and associated community economic development, leading to increased employment, access to services, and changing food security, and opportunities that could have positive benefits for mental health across the North. However, if mining and oil and gas activities proceed, research into the cumulative community-level mental health impacts from attendant environmental and socio-economic change must be undertaken, as few Circumpolar studies exist on this topic. International examples suggest that the mining sector can generate socio-economic well-being (Hajkowicz et al. 2011), but that its inherent ‘boom-bust cycles’ lead to increases in pregnancies, sexually transmitted diseases and injuries when mines are active, and greater incidences of depression, anxiety, and other mental health issues (including increased addictions) when they are inactive (Shandro et al. 2011). Of particular importance to remote Circumpolar communities, the

industry model of ‘fly-in and fly-out’ work that separates workers from their families has been found to exacerbate smoking, alcohol consumption, and obesity (Joyce et al. 2013) and that efforts to promote family contact and support from co-workers, employers, and service organizations can enhance mental health (McLean 2012). Efforts to integrate human and mental health considerations into environmental impact assessment within Northern resource development context has been advocated and is an area of research that would assist in better understanding present and future cumulative impacts (Noble and Bronson 2005).

Similarly, working across scales and directing attention to differential impacts will help ensure research is not inappropriately ‘scaled up’ or ‘scaled across’ and is more reflective of the local populations and their diverse cultural, social, and political Circumpolar contexts. Larger-scale research, involving multiple jurisdictions, will need to be carried out in a manner that respects the diversity of climates, cultures, and community health factors while at the same time finding meaningful points of analysis and comparison. This can be achieved through well-coordinated interdisciplinary research, ideally involving international collaboration among Indigenous populations, government, policy makers, and researchers throughout the eight Circumpolar countries, as well as key research and policy organizations.

Research on climate-sensitive mental health also has the opportunity to contribute to a beneficial broadening of ontological and conceptual models of health. Climate change research is a well-situated entry point for better understanding different models of mental health and well-being, precisely because culturally-situated sources of mental health—including land-based activities and sense of place and identity—are those most impacted by climate change. By adding a mental health lens to climate change, conceptions of mental health that move beyond the Western medical model and are more place-based and culturally diverse and give primacy to environmental determinants and the unequal distribution of distress can be illuminated.

### Policy priorities

Climate change and mental health need to be considered in climate change adaptation strategies and policy at the local, regional, national, and international levels. In many cases, policy for adapting to climate change is congruent with recognized areas for improvement in existing mental health services: coordinating cross-scale research; ensuring locally situated and contextually appropriate policies and services are in place; and bridging different cultural models of adaptation and health. While these priorities can be accomplished through concerted efforts and collaborations

between and among mental health professionals, different levels of government, researchers, individuals and communities, there are, of course, a number of challenges that will need to be overcome, including (but of course not limited to) lack of resources and/or access to mental health services; lack of communication or willingness to collaborate across sectors; competing priorities among the stakeholders; differing perceptions, understandings, and models of, and approaches to, mental health issues; and lack of political support for including mental health within the climate change dialogue. A starting point to address this policy deficit is to apply a mental health lens to examine existing information on climate change impacts and adaptation, while simultaneously conducting cross- and multi-sectorial interdisciplinary research working across jurisdictions and with multiple layers of government and health provision services to create climate policies sensitive to and inclusive of mental health.

### Action priorities

While research and changes in policy are important, the most essential and immediate change that is needed is changes to the mental health resources, services, and infrastructure available in and for Circumpolar Indigenous populations, not only to meet the additional stressors of anticipated changes to climate and resulting impacts, but to mitigate current and very serious disparities in mental health outcomes experienced by many Indigenous peoples throughout the Circumpolar region—outcomes that have been chronically and unjustly under-addressed. Funding, creating, and mobilizing these much-needed programs and infrastructure to deal with current mental health issues are a major priority and will help begin to address current and future mental health problems. Without these supports and responses, communities will likely continue to experience greater disparities in mental health that will be exacerbated by climate change impacts and increasing resource development.

While many Indigenous populations across the Circumpolar North will already be familiar with Western-based mental health practices, these approaches can certainly play a role in mitigating climate-sensitive mental health impacts. However, it is important for mental health care to be locally determined, based on local knowledge and values, and practiced in partnership with other knowledge systems and healing and resilience approaches. Indeed, it has been found that when Indigenous Circumpolar Indigenous communities address mental health from their own perspectives, outcomes are often more positive than when programming, services, and resources do not reflect local cultural values, perspectives, and histories (Kral and Idlout 2009; Kral et al. 2009; Wexler and Gone

2012). Embedded community-led research programs, co-developed with input from communities, researchers, health professionals, and decision makers, will ensure that local contexts and models of health are represented and respected, and will assist with creating locally-appropriate and culturally-relevant mental health resources and services.

## Conclusions

This paper aims to stimulate research and policy action to address the current and expected future impacts of climate change on mental health for Circumpolar Indigenous populations. Separately, both climate change and mental health are major priorities for communities across the Circumpolar North. When the impacts of climate change are considered together within the context of existing mental health issues stemming from a complex history of colonialism and related intergenerational traumas and increasing industrial development—and with an understanding that these changes are expected to continue and, in many instances, accelerate in the future—there is cause for serious concern, as there is evidence that climate change could amplify existing mental health stresses and issues and exacerbate preexisting inadequacies in mental health-care services in some Circumpolar regions.

In this light, and reflective of what has already been identified in the public health field for physical health (Costello et al. 2009) and what we have outlined in this article, we contend that climate change is likely to be one of the biggest threats to mental health, both in the Circumpolar North and in many places globally (c.f. Swim et al. 2010). Understanding the impacts of climate change on mental health in the Circumpolar North is, then, a matter of importance and warrants serious consideration. Yet, to date, the human dimensions of climate change scholarship has largely overlooked this area.

While we use the term mental health throughout this paper, we acknowledge its limitations in describing the deep sense of loss, upheaval, anxiety, and mourning that accompanies changes in climate, declining habitat, and loss of livelihoods, culture, and homes. While it is difficult to capture the impacts of such radical life changes on community and individual levels in such a term, and while the use of this term in this context needs to be critically evaluated, it is still a useful starting point to bring attention to this issue and begin dialogue and action. Given the current currency of mental health discourse, however, and the frequent ignoring of nonphysical consequences of climate change, we believe that by focusing on mental health we can move research and policy toward greater attention to how individuals and communities experience radical environmental changes.

This article, then (with an awareness of the shortcomings of this term), advocates for mental health to be included in climate change policy and debate as another possible pathway through which humans will be impacted, not only within the Circumpolar North, but also potentially in other regions.

As already well established in the human dimensions of climate change scholarship, it will also be important to examine climate change impacts on mental health in the context of other nonclimate-related stresses and structural inequalities already affecting individuals, households, and communities, and to assess the cumulative impacts. These include already present health disparities, high unemployment levels, government malfeasance, a history of colonization and systemic marginalization, and increasing industrial development. Importantly, food security challenges and the often-daily struggle to provide for family take precedence over dealing with the immediate or future threats of climate change, and research on climate change and mental health should be careful never to overshadow the other pressing socio-economic and mental health issues present in many of these communities. Indeed, future research must be interdisciplinary in order to deal with the multifaceted issues; situated within a contextual understanding of the complex challenges, priorities, and daily realities in the North; be careful to avoid a priori assumptions about whether the mental health impacts from a changing climate and environment will be positive or negative; should incorporate and celebrate strengths and resilience of communities; and create tangible community-level benefits. These approaches reflect and respect the immediate needs, priorities, and capacity of communities and have the potential to generate local support and well-being, while anticipating and responding to how a changing climate might affect people now and into the future.

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