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**IMPLICATIONS OF A
NORTHERN CORRIDOR ON
SOFT INFRASTRUCTURE IN
THE NORTH AND NEAR NORTH**

Julia Christensen

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FOREWORD

THE CANADIAN NORTHERN CORRIDOR RESEARCH PROGRAM PAPER SERIES

This paper is part of a special series in *The School of Public Policy Publications*, investigating a concept that would connect the nation's southern infrastructure to a new series of corridors across middle and northern Canada. This paper is an output of the Canadian Northern Corridor Research Program.

The Canadian Northern Corridor Research Program at The School of Public Policy, University of Calgary, is the leading platform for information and analysis on the feasibility, desirability, and acceptability of a connected series of infrastructure corridors throughout Canada. Endorsed by the Senate of Canada, this work responds to the Council of the Federation's July 2019 call for informed discussion of pan-Canadian economic corridors as a key input to strengthening growth across Canada and "a strong, sustainable and environmentally responsible economy." This Research Program will benefit all Canadians, providing recommendations to advance the infrastructure planning and development process in Canada.

This paper, "Implications of a Northern Corridor on Soft Infrastructure in the North and Near North", falls under theme *Social Benefit and Costs* of the program's eight research themes:

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Dr. Kent Fellows

Program Director, Canadian Northern Corridor Research Program

IMPLICATIONS OF A NORTHERN CORRIDOR ON SOFT INFRASTRUCTURE IN THE NORTH AND NEAR NORTH

Julia Christensen

OUTLINE

- Soft infrastructure deficits across the North and near North illustrate the interconnections between health care, housing, education, emergency services and employment, and thus necessitate a comprehensive, systems view on deficits and their impact to individual and community well-being;
- Sparse settlement patterns and a lack of permanent roads in many areas has led to significant challenges vis-à-vis the transportation of people and goods, exacerbating the costs of soft infrastructure delivery and limiting the possibilities for responding innovatively to community-identified soft infrastructural needs;
- There is significant potential for the development of hard infrastructure to support the resilience of northern peoples and communities in the face of climate change;
- Accessibility and connection, affordability, recruitment and retention, and Indigenous self-determination and northern autonomy are all areas in need of support and expansion across the landscape of soft infrastructure in the North and near North;
- Consultation of northern community members and leaders, and their meaningful and sustained engagement across all stages of northern corridor development, is critical if such a northern corridor is to benefit northern peoples, communities and regions;
- Policies prioritizing northern and Indigenous businesses in order to benefit from hard infrastructural development are necessary to limit leakage of economic benefits from northern communities;
- Accessible education and training of northerners is necessary to ensure they can benefit from employment opportunities created through hard infrastructure expansion;
- Strong policy around extractive industry to ensure the distribution of mining revenues and benefits is key to ensuring relative economic well-being and to avoid potential political conflicts between individual communities and the governments and organizations that represent them;
- Appropriate policy development and community planning will be required in order to plan accordingly and to provide the necessary supports and resources for northerners relocating to regional centres and/or to support smaller communities in ensuring an equitable distribution of services, supports and opportunities.

EXECUTIVE SUMMARY

Disparities in health care, education and employment, housing and social welfare have long been documented in Northern Canada. These disparities have been linked to colonialism, ineffective social policy, uneven development and the high costs of service delivery and infrastructure in northern regions. This literature review aims to present a comprehensive understanding of existing research on the current state of soft infrastructure and its deficits in Canada's North and near-North regions. This scoping review contributes to a larger project led by the University of Calgary's School of Public Policy and their Northern Corridor Research Program, a project which aims to evaluate the establishment of permissible corridors in Canada. These corridors provide defined multi-modal rights-of-way with accompanying regulatory and governance structures. Specifically, the term "soft infrastructure," for the purposes of this review, refers to health care, housing, education, employment, jobs training and emergency services. The implications of these deficits in terms of economic and social opportunities in northern regions are discussed in relation to current research. Additionally, the ways in which these deficits relate to current hard infrastructure assets and deficits are assessed based on the reviewed literature. Finally, the costs, benefits and opportunities associated with the proposed Canadian corridor with regards to soft infrastructure deficits and needs are addressed.

Soft infrastructure in the North and near North is found generally to be lacking, and the literature highlights several deficits and needs that have been prioritized by northern and Indigenous communities and regional governments alike. Furthermore, the various types of soft infrastructure highlighted in this report—health care, housing, education, employment and emergency services—intersect in significant ways, and therefore a comprehensive, systems view must be taken on deficits and their impact to individual and community well-being. During the course of our analysis, health-care deficits quickly emerged as an overarching frame for deficits in other areas of soft infrastructure. Housing deficits also contributed significantly to needs in other areas. The significant and pervasive impact of deficits in health care and housing has been further emphasized during the COVID-19 pandemic, where the impacts on northern public health of lack of adequate health care and the persistent housing crisis were particular concerns amongst northern communities and leadership. These impacts included not only the potential for widespread transmission of COVID-19 in the face of an outbreak, but also challenges for physical distancing and self-isolation, the potential severity of the virus given pre-existing health conditions experienced in northern communities, the capacity of the northern health care system to cope with a high number of severe cases and the ability to test and monitor case numbers.

The state of soft infrastructure deficits across the North and near North clearly illustrates the interconnections between health care, housing, education, emergency services and employment. These areas of soft infrastructure cannot be addressed through a siloed approach, but rather one that recognizes the ways in which these areas are linked in the lives of individual northerners as well as families, communities and regions as a whole. Moreover, much of the soft infrastructure detailed in this report illuminates a stubborn commitment to "one size fits all" solutions as a means to boost the efficiency, affordability and ultimately the ease of administration of these various infrastructure types. Altogether, however, the result is systems, programming and policy ill-suited to the context and diverse cultures of the North and near North, leading to a significant disconnect between local

needs, priorities and realities and the type of soft infrastructure that has been established. There is thus a critical need for soft infrastructure deficits to be addressed in a way that facilitates and supports self-determination and northern leadership, all the while being responsive to the contextual and environmental realities of northern regions.

Sparse settlement patterns, a lack of permanent roads and reliance on air transport exacerbate the costs of soft infrastructure delivery, causing and further contributing to soft infrastructure deficits, and have also severely limited the possibilities for responding innovatively to community-identified soft infrastructural needs. Today, Northern Canada is undergoing yet another period of significant and rapid change. Along with the significant political, economic and social impacts of climate change, the way of life of many northern peoples is being threatened. There is significant potential for the development of hard infrastructure in the North to positively support the resilience of northern peoples and communities in the face of such change.

All told, a number of themes emerge when considering the potential impacts of northern corridor development on critical areas of soft infrastructure in the North and near North: accessibility and connection, affordability, recruitment and retention, and Indigenous self-determination and northern autonomy. With appropriate policy intervention, such areas would be bolstered through improved hard infrastructure via northern corridor development. In order to ensure the alignment of hard infrastructure with soft infrastructure deficits and priorities, strong and integrated policy responses across all levels of governments—community, Indigenous, territorial/provincial and federal—are required. To support maximum benefits for northerners, a series of recommendations are advanced: firstly, consultation of northern community members and leaders and their meaningful and sustained engagement across all stages of northern corridor development is critical if such a project is to benefit northern peoples, communities and regions. Secondly, the recognition of Indigenous rights, and the settlement of outstanding land claims and self-government agreements, are crucial to ensuring Indigenous peoples can maximize benefits to their communities. Support for the settlement of claims is crucial. Thirdly, policies prioritizing that northern and Indigenous businesses benefit from hard infrastructural development are necessary to limit leakage of economic benefits from northern communities. Fourthly, accessible education and training of northerners is necessary to ensure they can benefit from employment opportunities created through hard infrastructure expansion. Fifthly, a northern corridor would undoubtedly lead to increased exploration and resource development, due to an abundance of non-renewable resources of all types across the North and near North. Strong policy around extractive industry, to ensure the distribution of mining revenues and benefits, is key to ensuring relative economic well-being and to avoid potential political conflicts between individual communities and the governments and organizations that represent them. Finally, there is significant potential for a northern corridor to encourage further centralization or urbanization in the North and near North. Appropriate policy development and community planning will be required in order to plan accordingly and provide the necessary supports and resources for northerners relocating to regional centres and/or to support smaller communities in ensuring an equitable distribution of services, supports and opportunities.

In sum, this scoping literature review revealed a number of critical deficits in northern health care, education and employment and housing. A comprehensive understanding of these deficits in soft infrastructure in Northern Canada directly informs our discussion

of the potential opportunities that a northern corridor could bring to northerners, their communities and the region as a whole. Accessibility and connection, affordability, recruitment and retention, and Indigenous self-determination and northern autonomy are all areas in need of support and expansion across the landscape of soft infrastructure in the North and near North. In order to ensure the maximized, sustainable and equitable benefit of northerners, however, robust, comprehensive and integrated policy intervention is required across community, Indigenous, regional and federal governments.

KEY FINDINGS

INTRODUCTION

Disparities in health care, education and employment, housing and social welfare have long been documented in Northern Canada. These disparities have been linked to colonialism, ineffective social policy, uneven development and the high costs of service delivery and infrastructure in northern regions. This report seeks to assess the current state of knowledge on soft infrastructure in Northern Canada in order to inform our understanding of the potential opportunities for addressing deficits and needs through a northern corridor. To do so, we conducted a scoping literature review to examine the scope and findings of the research on soft infrastructure in Northern Canada. We then highlighted the themes relevant to the potential for hard infrastructural development via a northern corridor to impact deficits and needs with respect to soft infrastructure in the North and near North. For the School of Public Policy's Northern Corridor program, it is essential to understand the dynamics and complex factors of soft infrastructure deficits and their relationships to socioeconomic and social factors in Northern Canada. This scoping literature review aims to synthesize current knowledge on the state of soft infrastructure deficits in the North and near North. In addition, critical reflection is made to relate this knowledge to various relevant components of the Northern Corridor program and hard infrastructure in the region.

Regions encompassed by the North and near North include Canada's three northern territories, Northwest Territories, Yukon and Nunavut, as well as the country's northern provincial regions, including those of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and Newfoundland and Labrador. Significantly, these regions encompass the ancestral homelands of diverse communities of First Nations, Inuit and Métis, and therefore the soft infrastructural deficits and needs highlighted here are particularly significant for Indigenous peoples of the North and near North. Through our review of relevant literature, a picture of historical marginalization clearly emerged in relation to northern communities and their access to adequate and appropriate health care, education, employment, jobs training, social welfare and emergency services. Moreover, it is evident that these elements of soft infrastructure are deeply interconnected within northern communities and across northern regions, warranting a social determinants of health approach to our understanding of the significance of soft infrastructure deficits at the individual and collective level for northern residents. Additionally, innovation and critical reflections on the state of soft infrastructure in the North appeared in review literature. Ultimately, the compounded nature of these deficits, coupled with colonial legacies, illustrates a complex region with many challenges to the overall health and well-being

of community members. Underlying these issues are themes of colonialism, sociocultural and economic change, and inadequate social supports for remote northern communities, many of which are predominately comprised of Indigenous peoples.

While this research was conducted during the course of the COVID-19 pandemic, and little literature is currently available on the effects of the pandemic related to soft infrastructure, effort will be made through the document to discuss the myriad ways in which the COVID-19 pandemic has underlined current soft-infrastructure needs in northern regions. The public health crisis that we collectively have faced has illuminated in significant ways ongoing crises related to soft infrastructure in the North and near North, and therefore many relevant lessons can be gleaned from the vulnerabilities highlighted over the past two years.

METHODOLOGY

This scoping review includes peer-reviewed journal articles, conference proceedings, theses, policy reports and other grey literature relevant to soft infrastructure in the North and near North of Canada. The research was guided by two core research questions proposed by The School of Public Policy: firstly, what is the current state of soft infrastructure and soft infrastructure deficits in the North and near North of Canada? And, secondly, what are the implications of these deficits in terms of economic and social development and opportunities in the North and the Near North? These research questions motivated our literature searches and enabled us to evaluate research from a wide range of disciplines as well as diverse research methodologies.

Next, we set our search parameters to 2000–2021 in order to ensure the current relevance of our research on the state of soft infrastructure in Northern Canada, and we focused primarily on English-language literature, though French-language literature was also included where relevant. We then developed our search strings to encompass geographical regions as well as specific soft infrastructure types, as the term “soft infrastructure” was used less commonly in articles and therefore was not an effective encompassing search word. Specifically, the search strings we used included geographical regions paired with soft infrastructure types, such as “health care,” “housing,” “social welfare,” “jobs training,” “employment” and “emergency services.” We focused our search through Google Scholar, Web of Science and Scopus to generate the most relevant results.

Using an excel spreadsheet, we scanned the literature results including abstracts to determine their relevance to the study topic and the two guiding questions advanced by The School of Public Policy. We also consulted the bibliographies of relevant literature in order to include additional sources that may have been missed in the literature search. We then evaluated the relevant articles, of which there are 112 in total. We identified common themes and key findings among the literature on various geographical locations in Northern Canada and soft infrastructure types. We then examined this in relation to hard infrastructure and the development of the Northern Corridor project, and finally advanced an evaluation of the potential for hard infrastructure to support soft infrastructure needs in the North based on current knowledge.

FINDINGS

Soft infrastructure in the North and near North was found to be generally lacking, with the literature highlighting several deficits and needs that have been prioritized by northern and Indigenous communities and regional governments alike. Furthermore, it is clear from the literature that the various types of soft infrastructure highlighted in this report—health care, housing, education, employment and emergency services—intersect in significant ways, and, therefore a comprehensive, systems view must be taken on deficits and their impact to individual and community well-being. During the course of our analysis, health care deficits quickly emerged as an overarching frame for deficits in other areas of soft infrastructure. For this reason, we chose to present our key findings in order of significance in the literature, thus underlining the interconnections between these soft infrastructure areas and the need to approach soft infrastructure needs in the North as integrated and inextricable from one another. The significant and pervasive impact of deficits in health care and housing has been further emphasized during the pandemic, where the impacts on northern public health of lack of adequate health care and the persistent housing crisis were particular concerns amongst northern communities and leadership. These impacts included not only the potential for widespread transmission of COVID-19 in the face of an outbreak, but also challenges for physical distancing and self-isolation, the potential severity of the virus given pre-existing health conditions experienced in northern communities, the capacity of the northern health care system to cope with a high number of severe cases and the ability to test and monitor case numbers.

Health Care

A significant body of work exists on the various dimensions of health care in northern regions of Canada. There is a wealth of information on the barriers and deficits that northern residents and health-care providers face when seeking or supplying medical treatment and preventative care. Health indicators consistently reveal that significant disparities exist in health outcomes between residents of Northern Canada and the south (Ryan-Nicholls 2004; Waldram et al. 2006). Moreover, health-care access has significant impacts on health and is a critical gap between Indigenous and non-Indigenous peoples in Canada. This is further illustrated by the cost of health care per capita in Northern Canada, which is two times the amount for the rest of the country (Jong et al. 2018).

Through analysis of the literature, we identified several main themes framing the state of health care infrastructure in Northern Canada: 1) health care accessibility, capacity and cultural safety; 2) medical professional retention; 3) specific health screenings and procedures; 4) health care for vulnerablized groups; 5) mental health services; and 6) response strategies to health-care inadequacies. Healthcare deficits are highly inequitable across the North, with smaller communities experiencing far more significant challenges related to health care than those living in regional centres. Cooper et al. (2021) argue that the inequitable distribution of health care has been framed by a colonial, socio-historical context which has seen key resources and opportunities, including social, health and economic, concentrated in northern town and cities.

Healthcare Accessibility and Cultural Safety

Several aspects of Northern Canada's health-care systems, including its accessibility to northern residents and Indigenous communities, negatively impact its capacity to provide health services. In this section, we discuss the financial and psychological costs of travel for treatment, disparities in capacity between Northern and Southern Canada, health-care organization, and ultimately the lack of culturally appropriate and culturally safe health care for northern, Indigenous community members.

A notable concern amongst patients in the North is the need to travel for treatment, given the remoteness of many northern communities, and the significant distance to different health-care centres (Jong 2013; Hanlon and Halseth 2005; Howard et al. 2014; Huot et al. 2019). Canada's northern communities face numerous geographic, economic, and cultural barriers to accessing specialist care. Residents of northern communities often face inequities in terms of access to service as well as excessive wait times and poorly coordinated care. Moreover, Kerber et al. (2019) cite unnecessary burdens and bureaucratic challenges throughout the medical travel process, including plans and logistics for travel; level of communication between services; clarity around jurisdiction and responsibility for care; indirect costs of travel and direct costs of uninsured services; and having a patient escort or advocate available to assist with appointments and navigate the system. Many communities rely on nurses and nurse practitioners to provide the bulk of primary care services, supplemented by occasional visits from family physicians or a small group of core specialists (e.g. paediatricians), which may occur only a few times a year. Beyond these infrequent visits, access to specialists often requires travel to regional centres like Yellowknife or Iqaluit, or outside northern regions to cities thousands of kilometres away. These trips are rarely direct and may take a full day of travel, with frequent delays or cancellations due to poor weather conditions.

Poor access to health care across Northern Canada adversely impacts the health and well-being of northerners (Huot et al. 2019). Moreover, the cost of providing health care travel to small, widely distributed northern populations is very high, presenting a significant financial burden to both patients and regional health care systems: in Nunavut, a return flight may cost between \$1,000 and \$2,000, not including the price of multiple days of accommodations and the added expenses of bringing someone else along for support (Jong 2013). At the government level, the cost of supporting medical travel is thus enormous: in fact, the Government of Nunavut Department of Health spends more than a third of its total operational budget on medical travel (Libby et al. 2017). Much of this expense comes from the extensive travel many patients must undergo to attend specialist visits, a cost paid by territorial and federal governments. For individuals and families, meanwhile, the financial burden of medical travel includes the out-of-pocket costs patients face in travelling great distances and missing work or school, and the potentially better health outcomes associated with quicker access to care (Huot et al. 2019).

Additionally, specific instances of lack of access to treatment and screenings were documented in literature as well. For instance, Liddy et al. (2017) discuss issues surrounding patient accessibility to specialists in Nunavut. Not only are specialists generally flown north sparingly on a locum basis, but travelling to receive specialist care comes with a host of complications. Jull et al. (2021) describe the participant experience of the journey to receive cancer care and how these experiences may impact opportunities for patients to

participate in critical decision-making around their own care. In the Northwest Territories, Smith et al. (2020) found the delivery of colorectal screening to be a challenge due to the remoteness of this region, redundant system processes, low colonoscopy access, unclear accountability for testing and inadequate information technology. Family planning is another area of health-care delivery with significant barriers in Northern Canada. Barriers to contraception and abortion services in northern communities were identified as a result of biased and non-confidential health-care workers (Hulme et al. 2015).

Travel away from key social and familial support networks as well as culturally relevant health supports (i.e., the accessibility of healthy, traditional food), is a significant concern and ultimately can negatively impact a patient's overall health and health outcomes. Kerber et al. (2019) also argue that a lack of cultural awareness and attention to medical translation for Indigenous patients is a significant issue in overall health-care accessibility. All told, the remoteness of northern communities, and the need to travel significant distances to health centres far removed from familial and other social supports, leads to a barrier in the accessibility of equitable health care. Moreover, both relying on southern-trained medical personnel in the North and flying south for medical services mean that the health care received may not be culturally safe.

Another challenge that surfaced in our analysis of health-care literature is the limited accessibility of culturally appropriate care for Indigenous peoples and communities in the North (Galloway et al. 2020; Kerber et al. 2019; Marchildon and Chatwood 2012; Redvers et al. 2019). Policy discussions surrounding the accessibility of health care in the North must necessarily include access to traditional medicine and removing barriers to culturally safe health care within northern health care systems (Liddy et al. 2019; Redvers et al. 2019).

Related to culturally appropriate care is the issue of health-care capacity in general. Increasing the capacity of health care through the promotion of medical careers amongst northerners is critical to bolstering the long-term sustainability and expansion of northern health care in a way that also promotes Indigenous health-care practices. Crucial here are health-care professionals with cultural knowledge and community ties (Galloway et al. 2020). In response to deficits for health-care services for Indigenous communities, nurses in Northern Saskatchewan have implemented *Etuaptmumk*, or Two Eyed Seeing, approaches to their work (English 2020). Similarly, Bearskin et al. (2016) note how Indigenous nursing and Traditional Knowledge have helped nurses work in remote northern areas and ultimately provide better care to their patients.

Medical Professional Retention

A frequent topic of discussion pertaining to the accessibility and capacity of health care in Northern Canada is the retention of health-care providers in northern remote communities (Ryan et al. 2004). The lack of health-care providers in the North is attributed to several different factors across the reviewed literature. These include personal burnout, emotional tolls, cost of travel, lack of opportunity for professional development and the general remoteness of northern communities, all of which result in decreased health-care provider recruitment and retention (Campbell et al. 2012). In turn, these issues have adverse impacts on the health of northern residents.

Recruiting and retaining physicians in northern communities is a critical challenge (Chatwood 2018; Marchildon and Sherar 2018). High turnover rates often leave patients without a doctor for months at a time (Nair et al. 2016; Huort et al. 2019). Physician shortages occur in remote, rural Northern Canada, and retention strategies are needed to remedy this deficit (Paterson 2010). The issue of physician recruitment and retention is a problem disproportionately felt by Indigenous communities in the North, who experience shortages of medical professionals, along with lengthy wait times, culturally inappropriate care, and barriers to utilizing non-insured health benefits (Halseth and Murdock 2020). Several consequences of the remoteness of northern communities lead to this issue, including the costs of travel, health-care delivery and transportation of medical supplies in northern regions (Hanlon and Halseth 2005; Huort et al. 2019).

Burnout amongst medical professionals is a compounding issue, as northern job positions can mean less supports and providers but more patients (Huort, et al. 2019). These additional pressures on providers result in negative impacts on the quality of care provided to northerners (ibid 2019). Hansen et al. (2021) explain that health care professionals in this region undergo burnout from health system factors and cross-cultural issues, creating potential problems for the well-being of the physicians as well as workforce attrition. Similarly, Jong (2011) points out the barriers non-Indigenous health care professionals can encounter when providing care to Indigenous peoples in Northern Canada. This deficit overlaps with jobs training, as Jong (2011, 4) argues that training to provide culturally appropriate and safe care offers a potential solution to this barrier to equitable health care in the North.

Medical profession retention also intersects with education and jobs training, as potential for future professional development is small in northern regions compared to urban centres (Huort et al. 2019). Furthermore, there are issues with the system that may impact recruitment of local professionals. English (2021) discusses some issues Indigenous nurses specifically face. Of the small number of Indigenous nurses, the majority are employed in remote regions of Manitoba, Nunavut, Yukon and the Northwest Territories. Moreover, language requirements and challenges navigating entry requirements into nursing programs create unnecessary barriers and do nothing to address the issues that are raised regarding the provision of quality care in northern and Indigenous communities (ibid 2021).

Mental Health Services

Access to mental health services is an especially important topic of discussion, as the high suicide and attempted suicide numbers amongst Indigenous youth, and in particular Inuit youth, have grown into a public health emergency, the rates of which are two times higher in Nunavut than in the rest of Canada (Anang et al. 2019; O'Neill et al. 2016). Moreover, emergency room visits in Northern Ontario and First Nations communities in Alberta for self-inflicted injuries were four to five times higher than in the rest of the country (Pollock et al. 2018). As such, literature on this topic stresses the seriousness of this gap in health-care services.

With mental health being a significant concern in northern regions of Canada, deficits in mental health services are a serious issue for the well-being of northern residents. O'Neill et al. (2016) explain that both formal and informal mental health services are complex in Northern Canada due to the region's relative remoteness, which results in provider isolation and difficulties in professional retention. The remoteness of these communities means a

lack of public transport and transportation infrastructure, while health-care centres are located farther away (O'Neill et al. 2016; Rygh and Hjortdahl 2007). There is a need for more policy and programming support for community-based mental health supports that emphasize the strength found in community connections (Fields et al. 2008; Graham et al. 2008). In particular, mental-health-care approaches that integrate community-based and culturally appropriate forms of mental-health support are critical. Lay counsellors, drug and alcohol counsellors, community counsellors, child and youth-care workers, elder counsellors, social workers, nurses and other community helpers, both Indigenous and non-Indigenous, provide essential psychological and emotional support to clients or family members who live in the North (Czyzewski and Tester 2014; O'Neill et al. 2016). Treatment for suicide attempts is also impacted by accessibility of health centres. For instance, Indigenous communities in northern regions often are not located near a hospital. As such, serious injuries need to be transported by air to surrounding or southern institutions, while less severe cases can be responded to using telehealth or within the community (Pollock et al. 2018).

Health Care for Vulnerabilized Groups

In addition to the geographical dimensions of health-care inequity, so too do health-care deficits disproportionately impact vulnerabilized groups within the North and near North. By “vulnerabilized,” we mean to problematize vulnerability, recognizing that certain groups are rendered vulnerable due to a lack of adequate, accessible and relevant health-care services. In addition to Indigenous northerners, this includes women and members of the LGBTQ+ community living in the North (Healey and Meadows 2007; Logie et al. 2019; Logie and Lys 2015).

Firstly, due to economic, housing and health-care deficits, Indigenous peoples in Northern Canada commonly have worse health outcomes compared to other groups nationally (Kleinman et al. 2020). Moreover, in Northern Canada, individuals do not have adequate access to culturally relevant health services, which are necessary for the wellness of Indigenous communities (Redvers and Blondin 2020). As a result of colonialism, many Indigenous communities, including those in northern regions of Canada, are subject to poor health outcomes (Flicker et al. 2014). The literature offers examples of how health-care deficits impact Indigenous communities specifically. For instance, Redvers et al. (2019) point out that in the Northwest Territories, there is a need for accessible traditional medicine and providers without barriers. Amundsen and Kent-Wilkinson (2020) explain another example, in the arena of a deficit of health-care policy. Specifically, this study states that “expectant Indigenous women in northern and remote communities across Canada are often subject to forced prenatal evacuation to give birth in urban health centres” (Amundsen and Kent-Wilkinson, 2020, 1). Along with this, Brubacher et al. (2020) state that calls for Inuit self-determination in maternal health research and policymaking centre Inuit women’s voices and lived experiences.

LGBTQ+ individuals comprise another community mentioned in the literature as having marginally less access to health care in the North. Logie et al. (2018) note that the LGBTQ+ community has access to fewer sexual and mental health services across the North relative to Southern Canada, and even more so in rural settlements. More specifically, they link deficits in health care and education. This study focuses on the Northwest Territories and considers the sexual-health needs of the LGBTQ+ community. Particularly, the article

identifies a deficit in sexual-health education, stating, “structural contexts such as heteronormativity in sexual health education and a lack of access to safer sex tools constrained their ability to practice safer sex,” and notes that the Northwest Territories have one of Canada’s highest rates of sexually transmitted infections (ibid., 1865).

Lastly, the health of women living in northern regions and their access to health care is an area of research focus. Several examples of this were given in existing research for various locations in Northern Canada. Dolan (2013) identified that women in northeastern British Columbia spoke of delaying or neglecting to attend medical appointments out of town because of discomfort leaving familial and community support, the challenges of travelling long distances, and fears of encountering racialized discrimination from health-care personnel in towns and cities far away. Healey and Meadows (2007) discuss Inuit women in northern communities of Nunavut, and the challenges in health they face, such as forced to leave their communities when pregnant to access southern health-care institutions. Lastly, Leipert and Reutter (2005) explore women’s health in the context of northern British Columbia and found that health-care practice and policy must attend to contextual as well as individual and sociocultural factors if women’s health is to be advanced in northern settings.

Responses to Health-Care Deficits

Contrasting the barriers and deficits outlined in existing literature, some authors have examined potential solutions while also highlighting issues within northern health care. Jong et al. (2019) address the disproportionately high cost of providing health care in the North compared to the rest of Canada. In response to this deficit in the soft infrastructure, telehealth and virtual care services are a potential less costly and more accessible solution through their elimination of the need to travel; however, Jong et al. (2019, 1) describe those services as “underutilised” due to deficits in telecommunications infrastructure across the North and near North. For instance, they specify, telehealth services require a minimum reliable internet bandwidth for video of 256kb/sec and secure 3-G Wi-Fi service that can also support video, but Nunavut does not have the ability to provide reliable broad internet bandwidth or 3-G Wi-Fi. Moreover, as of May 2021, neither the UBF (Universal Broadband Fund) nor the CRTC (Canadian Radio-television and Telecommunications Commission) had awarded funding to projects that would improve broadband accessibility in the territory (Koch 2022).

Housing

High costs of construction, labour and transportation, combined with historically poor housing design for northern climates and a lack of funding adequate to meet supply and replace crumbling housing stock, has led to significant housing deficits across the North. Moreover, housing affordability is a significant challenge, particularly in regional centres such as Yellowknife, Whitehorse and Iqaluit. Not surprisingly then, housing was the second-most covered soft infrastructure type in the literature after health care. Moreover, as housing is a social determinant of health (Larcombe et al. 2020), there is considerable overlap between housing needs and health outcomes as well as overall levels of well-being within northern communities.

A chronic housing crisis across the region persists for many reasons. A lack of public funding for northern housing is exacerbated by the high costs of housing construction in the North, including the costs of materials and labour, and the costs of transporting materials as well as bringing southern labour north (Lauster and Tester 2010; Tester 2009). Moreover, the current housing stock is largely comprised of aging housing in need of repair or replacement. Housing design across the North has also been largely contextually and culturally inadequate, adding another dimension to deficits in this soft infrastructure type. The literature notes several issues pertaining to housing design that does not suit the northern climate. Moreover, there are cultural needs pertaining to family size, preparation and cooking of country food, and other design needs that add additional wear and tear on housing. Dawson (2008) highlights the fact that the houses and settlements of Northern Canada are based on Euro-Canadian ideas of family and community that do not fit the cultural context in which they have been placed. All told, the current housing stock does not meet the needs or demands of many northerners, and yet addressing this issue has remained largely in the realm of band-aid solutions, as the funding allocated to housing remains far below what is required to address chronic housing need. The COVID-19 pandemic has also seen the costs of housing construction grow exponentially due to supply-chain issues.

Homelessness and Core Housing Need

A significant focus within the literature on northern housing addresses the rise of hidden and visible homelessness, both of which are linked to chronic housing need and the lack of appropriate social supports for people experiencing poor mental health, addictions, family violence and other issues that compound housing challenges. Over the past two decades, emergency shelters and warming centres have opened or expanded their services in a number of northern regional centres, including Yellowknife, Inuvik, Iqaluit and Whitehorse among others. Moreover, the housing crisis and experiences of homelessness have disproportionately affected Indigenous peoples (Christensen 2011, 2017). To add to this, Christensen (2016) discusses northern homelessness in Canada and argues that northern Indigenous conceptualizations of home and health are unrecognized and discouraged in housing policy, making the administration and management of housing ill-suited to the needs and strengths of Indigenous peoples and communities. It is clear that the broader issue of homelessness requires long-term solutions that centre health and social supports alongside housing security (Young and Manion 2017).

Writing to the context of Yellowknife, Northwest Territories, Christensen (2017) found that visible homelessness first began to emerge in the city in the late 1990s, and has continued to grow in the years since. A similar timeline can be found in the emergence of visible homelessness across other northern capital cities (Christensen et al. 2017). The vast majority of people experiencing visible homelessness in northern capital cities are single adults and adults whose children are not currently in their care (Christensen et al. 2017; Turner Strategies 2017). In Christensen (2017), the chronic nature of many single adults' experiences with shelter living in Yellowknife were underlined, with many citing emergency-shelter stays of more than five years. In Yellowknife's 10 Year Plan to End Homelessness, the prevalence of chronic homelessness (i.e., emergency shelter stays lasting several years) was also described, a dimension in the overall spectrum of homelessness in the city that was also illustrated in Christensen's (2017) work.

Hidden homelessness in the forms of overcrowding, couch surfing and housing insecurity is also prevalent across Northern Canada, and is a particular concern in smaller, remote communities (Peters and Canada 2016; Poole and Bopp 2015). The prevalence of hidden homelessness is closely linked to the high rates of core housing need; in Inuit Nunangat, for example, the levels of core housing are highest, with one third of Inuit households in the Canadian Arctic [in] core housing need, which equates to three times the national average (Riva et al. 2020).

While a lack of affordable, adequate housing across northern communities and for all northern residents is behind the rise in hidden and visible forms of homelessness, a wider-reaching northern housing crisis has been ongoing since the first modern housing programs in Canadian North in the 1950s and 1960s (Tester 2009). A federal northern resettlement policy was implemented shortly after the Second World War, when the Canadian government embarked upon a period of welfare-state reform that included a more interventionist approach to northern Indigenous people (Christensen 2017; Tester 2009). Part of the interventionist approach involved encouraging the centralization of northern Indigenous people into settlements, which the Canadian government believed would be the first step towards their full integration into both Canadian society and the wage economy (Christensen 2012). Not surprisingly, these policies of centralization and housing provision were significant drivers of social and cultural change, and also increased vulnerability for northern Indigenous peoples by creating reliance on the federal and territorial governments for shelter that too often was, and remains, inadequate both in terms of quality and quantity (Tester 2009).

Additionally, inadequate northern housing intersects with well-being and health (Knotsch and Kinnon 2011), leading to a host of chronic health issues including poor respiratory health. Persistent chronic housing need across Northern Canada, coupled with a growing population and the increased effects of climate change on housing, has meant the northern housing crisis is only worsening, and is in fact a 'critical public health issue' (Knotsch and Kinnon 2011), a reality that has been made even more apparent during the COVID-19 pandemic. The role of chronic housing need, and in particular its impact on crowding as well as mould and other household environmental pollutants, has long been linked to pervasive northern public-health concerns such as high rates of tuberculosis and respiratory illness amongst children (Kohen et al. 2015; Kovesi et al. 2006; Minich et al. 2011; Webster 2015).

Indigenous Self-Determination and Community-Led Housing

The literature also highlighted the need for Indigenous self-determination in relation to the built environment in the North. Larcombe et al. (2020) expressed the connection between housing as a social determinant of health and the subsequent necessity for Indigenous peoples to have decision-making power regarding their infrastructure and ultimately self-determination of housing provision and policy. The persistence of a housing crisis in both the territorial and provincial Norths has profound implications for community health and well-being (Christensen 2016; Durbin 2009; Knotsch and Kinnon 2011; McCartney 2016; Riva et al. 2014). Responsibility for solving this crisis continues to be passed from one government to the next, with little done to effectively meet the housing and health needs of northerners who are insecurely housed or not housed at all. At the same time, northern communities are dealing with a federal model that is slowly replacing long-term social

housing funding commitments with one-time and time-limited funding announcements (Peters and Christensen 2016). This change in the funding landscape has exposed capacity issues for Indigenous community governments and non-governmental organizations, which, with resources already thin, scramble to take advantage of funding opportunities, all the while uncertain about whether much-needed programs and services will be available through the next fiscal year (Dyck and Patterson 2016).

Across Northern Canada, communities report increasing social concerns about a lack of quality housing and a rise in the number of northerners who experience hidden and/or visible forms of homelessness (Christensen 2017; Schiff and Brunger 2015). Northern local governments and non-governmental organizations are actively involved in collaborative efforts to understand the contributing factors to homelessness, and work to provide necessary housing programs and supportive services (McCartney 2016). Yet communities cite deepening frustrations over a lack of funding, the limited housing and social services spectrum in northern communities, and challenges of implementing southern policy and programs in northern contexts (Christensen 2012, 2017). These frustrations are compounded by a sense of isolation from territorial/provincial/federal governments as well as from other northern communities, and difficulties in connecting community- and university-led research with meaningful program and policy development. Meanwhile, some northern communities have access to a wider range of resources, including more developed non-profit sectors and better intergovernmental working relationships, than others (Coates et al. 2014; Schiff and Brunger 2015). Within northern regions there is also disparity in resources and capacity between smaller communities and regional centres, though both are embedded in shared geographies of regional homelessness and housing insecurity (Coates et al. 2014).

Housing Unaffordability

Another theme to emerge was the affordability of housing in the North and near North. The barriers to affordable housing in the Canadian North are well-known (Agrawal and Zoe 2021; Christensen 2012, 2017; Dawson 2008; ITK 2004; Stern 2005; Tester 2009; Therrien and Duhaime 2017). The construction of new housing units is challenging due to high costs of materials, high demand for a limited number of skilled, local construction workers, high transportation costs, and complexities around land zoning and development. In northern urban and regional centres, as (Falvo 2011) suggests, increasing unaffordability in the private rental market, combined with a limited number of public housing units, has led to a particularly bleak picture of low-income housing availability. As the main administrative, economic and political hubs for northern regions, many northerners from smaller settlement communities are drawn to regional centres for work, services and housing (Christensen 2012; Poole and Bopp 2015; Turner Strategies 2017).

The relative geographic isolation of northern rural settlements is compounded by the fact that, because most were not formed around a sustainable economic base, there is a critical shortage of formal-sector employment opportunities (Collings 2005; Tester 2009). By contrast, most employment opportunities in northern regional centres reflect the structure of the northern economy and are reliant on non-renewable resource development and territorial/provincial and federal governments. The uneven development of the northern economic landscape is accelerated as a result of major resource-development projects, such as diamond mines and gas pipelines, creating a highly variable, and vulnerable, boom-

bust economy (Abele 2006). The significance of extractive industry-induced economic variability cannot be overlooked when examining the housing landscape and its effects on the city's most marginalized residents. Schmidt et al. (2015) identify the shortage of housing as a critical factor in the incidence of homelessness in Canada's North, citing in particular the very low rental vacancy rates in the larger centres such as Yellowknife and Iqaluit.

Northern resettlement policy, combined with the economic nature of non-renewable resource development, has shaped a geography of economic and social disparity between northern rural settlements and urban centres. This same rural-urban disparity is reflected in the geography of northern housing. For example, Yellowknife is one of only five Northwest Territories communities with functional housing markets—in other words, where housing can be mortgaged and bought and sold directly to buyers (Christensen 2012). Therefore, housing stock is much more diverse, with private ownership and private rental housing being the main forms of housing tenure. Meanwhile, public housing dominates the housing stock in most of the northern rural settlements, and is also the primary source of affordable housing in regional centres like Yellowknife. Thus, not only is there a rural-urban disparity in housing types, there is also a deep divide within Yellowknife with affordable housing provided largely by public housing through the territorial government and little to no regulation of the private rental market to ensure its affordability and accessibility. This becomes a particular barrier for single adults, who are shut out of public housing due to a lack of single-person units. Inaccessibility of public housing, high cost of living, housing unaffordability and employment insecurity all characterize life in Yellowknife for many single adults who experience homelessness (Christensen 2012). The city's 10 Year Plan to End Homelessness strongly emphasizes the need for permanent social housing, where movement out of such housing is not necessarily seen as the end goal, acknowledging that many people experiencing homelessness would benefit from ongoing support. As Christensen (2012, 17) argues: “there is a tremendous need for not only public housing units for single adults, but also for additional supportive housing programs that combine needed social supports, such as counselling or skills development, with housing.” Greater collaboration and coordination between the various levels of government in the territory—municipal, territorial, Indigenous and federal—is required.

Yet even with multiple governmental and non-profit agencies addressing affordable housing, there are many challenges facing housing and service providers in Northern Canada, including jurisdictional obstacles, funding constraints and lack of collaboration with northern communities themselves. The Canada Mortgage and Housing Corporation (CMHC) provides significant funding to the territorial government for housing; however, little is directly channelled from the federal government to the municipal government or non-governmental organizations. Though funding opportunities have shifted since the implementation of Canada's National Housing Strategy in 2018, many housing and service providers cite lack of consistent, annual funding as a primary challenge to providing affordable housing (Freeman and Christensen 2022). This is a particularly significant issue in northern regional centres. Writing to the context of the provincial North, Bonnycastle et al. (2021) examine rising housing unaffordability in Thompson, Manitoba, and the particular impacts this has for vulnerabilized populations, such as women leaving violent relationships and their children. Moreover, the issue of intimate partner violence in Northern Canada has become a driver of homelessness, by which Indigenous women are disproportionately impacted (Groening et al. 2019; Poole and Bopp 2015). Pertaining to northern housing

needs, Riva et al. (2020) examine the benefits of social housing units in Nunavik and Nunavut, and state that housing and social policies are needed to optimize the positive outcomes of housing construction by better working with northern communities to realize community-led goals to promote access and affordability.

Education

Educational outcomes are lacking across the North and near North. Efforts to offer northern teacher-training programs, and the recent emergence of several northern universities, have attempted to address a lack of contextually and culturally appropriate educational options for northern students. Moreover, adult education programs offered in many northern communities are also helping to improve high school graduation rates (Moffitt and Mercer 2015). In this section, we examine the collected literature regarding education systems in the North. Topics identified in this section include deficits to education infrastructure as a result of institutionalized colonialism, academic standards, community involvement and educator retention.

Education in the North is fraught with painful history. Residential schooling and an education system that was historically used to promote assimilation of northern students into Euro-Canadian culture has had a resonating impact on attitudes towards state-led education and educational outcomes. The potential of Indigenous students is limited through Eurocentric curricula, which promote inaccurate depictions of Indigenous peoples (Aylward 2007). In recent decades, efforts have been made on the part of territorial, regional and Indigenous governments to change the education system to better reflect the needs and priorities of northern and Indigenous communities.

In Nunavut, this has meant moves towards an educational system that prioritizes Inuktitut learning and incorporates Elders and cultural-based learning while promoting high academic standards (Berger 2009, 2014). For a long time, Nunavummiut have expressed concerns with low graduation rates, high drop-out rates, engagement with Inuit communities, engagement with parents and stakeholders, and also culturally specific programming and disciplinary responses (Fredua-Kwarteng 2019). Aylward (2007) explains the dynamics around formulated school curricula and programs to fit the realities of the northern experience, such as the inclusion of Indigenous knowledge in formal schooling (Aylward, 2007). For example, the Nunavut Department of Education incorporates Inuit Qaujimagatuqangit, the Inuktitut term for Inuit traditional knowledge, to establish relevant secondary schooling for the region's communities, and has implemented strategies to establish relevant cultural programming in schools and improve the cultural awareness of non-Inuit staff (Aylward 2009).

In the Northwest Territories, meanwhile, Moffitt and Mercer (2015) write that K-12 education is provided in most communities, with strides in Aboriginal curricula. There is a student attendance issue in many schools, and graduation rates are below the national average, but evidence of student success can be seen, for example, in the pride of a small community such as Łutselk'e, where two students graduated from high school in their own community. Prior to this, students finished high school outside of the community. The territorial college, Aurora College, offers a decentralized approach with three campuses (Yellowknife, Fort Smith and Inuvik) providing a variety of post-secondary programs (e.g., teacher education, nursing, social work and business). Also, there are twenty-three Learning

Centres in smaller communities across the North that provide adult basic education. Many university graduates are returning to the NWT, and this enhances the homegrown workforce (Moffitt and Mercer 2015).

Teacher retention in Northern Canada is another deficit area identified by this literature review. Similar to retention challenges with respect to health-care professionals, teacher retention underlines the need for increased support for northern teachers with existing community ties and cultural knowledge. One two-year research project studied teacher supply and demand in school districts of British Columbia, Alberta, Yukon, and the Northwest Territories (Kitchenham & Chasteauneuf 2010). The results found that school districts continue to struggle with finding specialist teachers in the senior-high sciences and mathematics and in elementary special education, and few incentives exist for teachers to come to northern school districts and to stay there. Overall, northern communities require teacher incentives to improve the recruitment and retention of educators (Kitchenham & Chasteauneuf 2010). In fact, some northern districts do provide financial incentives; however, Rass (2012) states it is probable that the challenges of moving to, and working in, rural and northern communities may still influence educators' decisions to work in these areas. Nevertheless, recruitment and retention of teachers has been addressed somewhat through regional Teacher Education Programs like the one offered in the Northwest Territories and Nunavut through Aurora College and Nunavut Arctic College, respectively (Moffitt and Mercer 2015).

The growth of post-secondary education options across Northern Canada signals a recognition that education and training options for northerners in the North that address key sociocultural and labour market priorities are critical to bolstering the education and self-determination of northerners as well as the self-sufficiency and sustainability of the northern economy. For Yukon College, Aurora College (NWT) and Nunavut Arctic College, this has meant moves in recent years to expand postsecondary programs offerings to include university degrees as well as increasing participation in research and the knowledge economy. Yukon College was officially reorganized as a university in 2020, while Aurora College is currently in the transition stage to becoming a polytechnic university. Meanwhile, Nunavut Arctic College is working with Memorial University to develop a plan for offering a decentralized university program.

In light of overwhelming evidence indicating that obtaining a formal education and being engaged in school are strongly correlated with health as well as social and economic well-being, educational disengagement among Indigenous students has become a pressing health and development issue across Canada, including in the North and near North (Davison and Hawe 2012).

Emergency Services

While emergency services were identified as a significant soft infrastructure type to include in this review, there is a dearth of literature in this area as it pertains to Northern Canada. The literature does highlight, however, the need for integration between emergency services located across northern regions in order to ensure interagency cooperation. Orkin et al. (2012) provide an example of an integrated emergency training program in northern Ontario that responds to the frequent lack of formal paramedical services in remote areas. The Sachigo Lake Wilderness Emergency Response Education Initiative is

an initiative between physicians, first aid educators, researchers and a remote indigenous community to develop and deliver a life supporting first aid (LSFA) program in Northern Canada (Orkin et al. 2012).

Emergency response systems and services in remote northern communities were found to be seriously lacking. Search and rescue services are offered through the Canadian Armed Forces across the North and near North, with the RCMP, local police services and Parks Canada coordinating on ground search and rescues, depending on location, with northern regions. However, these services are fragmented and piecemeal, with coordination between service providers suffering poor accessibility between communities and regions as well as deficits in telecommunications infrastructure. In a study focused on Northern Ontario, Mew et al. (2017) found that, given the small population sizes and a variety of other contextual, historical and geographical factors, many communities do not have 911 services or other essential emergency prevention and response systems. There are several programmes and services that address pre-nursing station care; however, the operation of these programmes is heterogeneous and fragmented. Many existing programmes depend on volunteers for operation, leading to burnout, turnover and unreliable care. The study found that these challenges often place the burden on community members to transport patients to the nursing station; however, there is also lack of equitable, frequent and effective training opportunities to ensure that lay responders are adequately prepared to manage the medical emergencies that occur in rural, remote and northern communities.

Additional challenges are related to limited capacity, services, formalised dispatch systems and contextually appropriate models of emergency medical service delivery (Orkin et al. 2016). The expansion of conventional ambulance, first responder and first aid programmes in these isolated and remote Indigenous communities may not meet the unique geographical, epidemiological and cultural needs of communities (Dylan and Ford 2017). Standard first aid protocols and equipment in such settings with limited resources, isolated contexts and minimally trained providers will not ensure quality care (Mew et al. 2017).

Innovative, sustainable, and community-based innovations in emergency health-services delivery are urgently needed, and the potential for climate change to add to search-and-rescue demands is noted (Ford and Dylan 2019). Possible benefits for a community-based emergency care model include reduction in morbidity and mortality, the building of safer and more resilient communities, more local health knowledge and leadership, enhanced emergency response and crisis management capacity, enhanced community ownership and self-determination of health services, and economic development for remote communities (Dylan and Ford 2017; Mew et al. 2017). In the absence of local paramedical services, the management of health emergencies depends on the capacity of lay community members (Mew et al. 2017). The addition of a comprehensive community-based pre-nursing station care model could reduce morbidity and mortality (Orkin et al. 2016). As many northern communities operate in isolated and remote contexts, the expansion of conventional ambulance or first responder programmes may not be an appropriate nor realistic solution (Orkin et al. 2016). Remote communities are the most vulnerable, and transformation in health care to improve equity is needed. It is therefore paramount that novel, sustainable and community-based innovations are developed, particularly those addressing pre-nursing station care.

Employment

Lastly, this literature review examines employment and jobs training in Northern Canada. In the health-care and education sections of this paper, we see that these systems both face issues with recruitment and retention of professionals in northern and remote communities. In these sections we also see the need for health-care workers and educators to be trained for northern cultural contexts. Thus, the state of employment as a soft infrastructure type, and its role in securing both economic self-sufficiency and sustainability for Northern Canada as well as meeting locally identified sociocultural and political needs and priorities cannot be overestimated.

Unemployment rates are higher than the national average across many parts of the North and near North. Yet, at the same time, employers are struggling to develop a skilled and self-renewing local workforce (Abele and Delic 2014). This results in a disconnect between labour-market potential within the North and near North and the current reality of employment across this region. The reasons for the poor labour market outcomes of young Indigenous people in Northern Canada are not fully understood, though certain factors, such as early school leaving, early parenthood and an overemphasis on distance-limited employment opportunities, are important barriers to these individuals' full participation (Abele and Delic 2014). An additional challenge is the emphasis on resource sector jobs, an area which does not necessarily guarantee long-term, sustainable, local employment options (Abele and Delic 2014). There is an emphasis on policy attention and program funding for training in the natural resource sector employment over post-secondary education to prepare youth for work in the public and para-public sectors. A greater emphasis on encouraging post-secondary education to prepare youth for work in the public and para-public sectors would not only would not only expand the range of career options available to young people but also support democratic development, Indigenous self-determination and increased northern autonomy vis-à-vis governance, administration and policy. Moreover, federal and territorial governments should continue to work to improve access to post-secondary academic education, which is generally required for careers that offer steady employment (Abele and Delic 2014).

Extractive Industries and Employment

The northern economy is characterized by its reliance on non-renewable resource development. Extractive industry continues to be the predominant focus of northern economic development plans because of the purported economic benefits they bring, both generally and for the local communities they closely impact. Extractive industries are, in particular, expected to bring economic benefits to local communities through employment opportunities, training, growth of entrepreneurial initiatives, and transfer payments and royalties. Moreover, it has been argued that, in the longer term, the economic benefits of extractive industries promote diversification and inter-sectoral linkages in other areas of the local economy (Kuokkanen 2019; Southcott and Natcher 2018). However, mining companies typically import skilled labor and supplies from outside of local communities, and thus, direct benefits related to employment, service, supply business and infrastructure improvements do not always materialize (Kadenic 2015). Studies have claimed that non-renewable resource exploitation can also lead to an increase in income inequality within communities; may capture critical human, social and cultural capital; and has the potential to leave a harmful legacy on the land (Sandlos and Keeling 2016).

In their analysis of Diavik Diamond Mine in the Northwest Territories, Kadenic (2015) found that the most significant socioeconomic value creation occurs during the construction and operation phase. Examples include direct employment, training, integration of local supporting industries in the value chain of the mining project and contribution to regional economies through taxes and royalties. Business creation in the form of support industries, including transportation and logistics, construction, catering and camp services, and supply of heavy equipment, fuel and explosives, can also be a significant source of socioeconomic benefits to the local communities. The phases of the life-cycle model are interrelated, and the level of local participation and negotiated agreements during the planning phase will influence the socioeconomic outcomes further along in the mine's life. There is therefore a linkage between the level of participation and socioeconomic outcome in mining projects (Kadenic 2015).

Assessing the economic impacts of mining in the North and near North raises additional concerns regarding the participation of Indigenous peoples in economic development and whether a fair share of these economic benefits goes to northern and Indigenous communities. Economic development can ensure that residents in the region receive a share of the wealth extracted from their lands and enjoy opportunities similar to their counterparts in the rest of Canada. While there are unanswered questions about the impact of extractive industries on local economic development, the impacts on business creation are also under researched (Belayneh et al. 2018). Anderson et al. (2004) have explored the role of Indigenous entrepreneurship in the northern resource-based economy, arguing that through Indigenous-owned and -led business development, Indigenous communities can pursue several identified socioeconomic objectives, including (1) greater control of activities on their traditional lands; (2) self-determination and an end, through economic self-sufficiency, to dependency; (3) the preservation and strengthening of traditional values and the application of these in economic development and business activities; and, of course, (4) improved socioeconomic circumstance for individuals, families and communities.

Strong resource-development policy is critical to maximizing the economic benefits of extractive industry for northern communities (Belayneh et al. 2018). For example, the objectives of Nunavik's mining policy are to maximize the social and economic benefits of mining for Nunavik's Inuit population while at the same time minimizing the negative socioeconomic and environmental impacts. The mining policy specifies several principles including priority hiring of Nunavik Inuit, promoting training and increasing the Nunavik labour force, and strengthening education outcomes (Belayneh et al. 2018). At the same time, Nunavik Inuit businesses are given priority when it comes to contracting for the supply of goods and services at all stages of exploration, project development, operation and maintenance, and remediation, and tasks and contracts must be broken down as much as possible to allow small-scale local entrepreneurs to perform the work (Belayneh et al. 2018).

Impact Benefit Agreements (IBAs)

In Canada, non-renewable resource development played a key role in framing the impetus behind the creation of modern-day treaties known as land claims. Since 1973, Canada has signed twenty-six comprehensive land claims (Hodgkins 2018). Modern land-claims settlements have paved the way for the emergence of Impact Benefit Agreements (IBAs), which are negotiated between land-claims organizations and industry. The intention

behind IBAs is to help to ensure that Indigenous communities benefit from non-renewable resource development while the socioeconomic, cultural and environmental impacts of a project are minimized. In particular, IBAs seek to improve the potential for resource development to support education, training and employment of northern and Indigenous peoples as well as to support northern and Indigenous businesses, which in turn has a potentially positive impact on northern employment (Hodgkins 2018). IBAs are a specific form of social licence whereby mining corporations and communities enter into a bilateral, voluntary agreement to achieve a more sustainable mining development that has an appropriate level of consultation and adequate provision of benefits and compensation (Koivurova et al. 2015). Indigenous business is by and large connected to natural resource development and the IBA process, and is one way for Indigenous communities and regions to ensure the long-term sustainability of economic development.

Regardless of the opportunities inherent to IBAs, however, the leakage of benefits remains a significant concern for northern and Indigenous business as well as government (Bernauer 2019). Economists have put the rate of leakage for northern resource development projects very high at fifty-three cents on the dollar (Vail and Clinton 2002). In the context of mining, benefits leakage can mean several things; for example, the presence of training courses in regional or southern centres rather than local communities, or the fact that mining wages are spent on goods and services originating outside of the community. Leakage also refers to the migration of human capital and social capital from small communities to larger regional hubs with more attractive housing options, education and training opportunities, resources and services for the family, and which are then used as a base for fly-in fly-out mining jobs (Belayneh et al. 2018).

A central focus of IBAs relates to their provision for vocational education and training, as well as preferential employment opportunities. In regions where resource development occurs, federal government funding agreements for training are tied to the ability of local communities to partner with resource developers. Communities are therefore encouraged to grant social licence for a mining development, and in return they gain much-needed training and employment opportunities (Hodgkins 2018). At the same time, IBAs provide land-claims organizations with an independent source of capital. In the Northwest Territories, the diamond-mining industry has entered into several IBAs with Indigenous communities, which have in turn provided their consent for the diamond mines and have ensured their participation in all diamond projects within their traditional territories (Missens et al. 2007). Elsewhere in Northern Canada, the Raglan mine in Nunavik, in the province of Quebec, and Voisey's Bay mine in Nunatsiavut, in the province of Newfoundland and Labrador, are important drivers of economic development in their respective regions (Belayneh et al. 2018).

DISCUSSION

The state of soft infrastructure deficits across the North and near North clearly illustrates the interconnections among health care, housing, education, emergency services and employment. These areas of soft infrastructure cannot be addressed through a siloed approach, but rather require one that recognizes the ways in which these areas are linked in the lives of individual northerners as well as families, communities and regions as a whole. The deficits outlined above are in many ways the result of the colonial history of the

North, which has emphasized top-down approaches to the delivery of health care, housing, education and employment programs, often designed outside the North without local community input and leadership. Moreover, much of the soft infrastructure detailed in this report illuminates a stubborn commitment to 'one-size-fits-all' solutions as a means to boost the efficiency, affordability and ultimately the ease of administration of these various infrastructure types. Altogether, however, the result is systems, programming and policy that are ill-suited to the context and diverse cultures of the North and near North, leading to a significant disconnect between local needs, priorities and realities and the type of soft infrastructure that has been established. Above all else, there is a need for soft infrastructure deficits to be addressed in a way that facilitates and supports self-determination and northern leadership, all the while being responsive to the contextual and environmental realities of northern regions.

The administrative and settlement history of Northern Canada has contributed to a distinct physical geography that presents additional challenges for the delivery of soft infrastructure today. Sparse settlement patterns and a lack of permanent roads in many areas has led to significant challenges vis-à-vis the transportation of people and goods. This has exacerbated the costs of soft infrastructure delivery, causing and further contributing to soft infrastructure deficits, and has also severely limited the possibilities of responding innovatively to community-identified soft infrastructural needs. The reliance on air transport is significant across the North, adding enormous cost and logistical complications to soft infrastructure delivery. As Matthew (2013) articulates, northern routes designed decades ago to access northern communities for administrative purposes from remote temperate-zone political and financial capitals have imprinted themselves on local and regional economies and social relations. Commercial logistics of resource development as well as administrative logistics of implementing public programs for education, health care and local services took advantage of the colonial-era air network and ensured its continuity. Local residents follow the same routes as they fly between small rural communities where they maintain social and cultural ties, and urban areas offering better opportunities for higher education, health care and wage employment. The extremely fuel-intensive nature of these modes of long-distance and local mobility thus creates severe challenges to community sustainability in an era of sustained high oil prices and concern over greenhouse-gas emissions.

Today, concerns around the sustainability of northern development are high amongst northerners and northern governments, who every day witness the impacts of climate change on the environment and in turn on northern infrastructure (Moffitt and Mercer 2015). The North is undergoing a period of significant and rapid change. Along with the significant political, economic and social impacts of climate change, the way of life of many northern peoples is being threatened as they become dislocated from their past practices. Water levels are decreasing to such low levels that the barges [boats] bringing supplies to communities cannot make it up the river. Increased variability around freeze-up and break-up times add uncertainty and cost to the shipping of good and supplies along the Arctic coasts. Currently and in the recent past, northern regions experience and have experiences an increase in forest fires due to hot dry summers. The loss of sea ice, melting permafrost and other dimensions of climate change mean that further change is on the horizon, particularly with respect to food insecurity, resource development, shipping and damage

to housing and related infrastructure. There is significant potential for the development of hard infrastructure in the North to positively support the resilience of northern peoples and communities in the face of such change.

The development of corridors in Northern Canada has the potential to significantly improve deficits in soft infrastructure, with the caveat that robust policy measures will need to be implemented to ensure maximum benefits to northerners. In particular, improved transportation and communications infrastructure would address specific deficits outlined thus far in the report.

Health Care

Improved telecommunications infrastructure would facilitate the expansion of telehealth through improved bandwidth in northern communities. Beyond virtual connection, improved transportation infrastructure, including road and rail, would allow for improved connections between communities and across regions. This would facilitate greater integration of service delivery across northern regions and allow for improved mobility for both northerners and health care providers. By reducing the current reliance on more expensive modes of transportation and service delivery, the expansion of hard infrastructure through corridors in the North and near North presents the potential to support community-led health-care efforts in important ways. It may also provide the infrastructural foundation necessary for greater collaboration between service providers and programs at all levels of government within and across northern regions.

Housing

Ultimately, the high costs of materials, construction and labour, as well as the logistical challenges associated with a short construction season, have a significant and detrimental effect on chronic housing shortage across the North and near North. Hard infrastructure corridors would not only provide expanded transportation options, but such options would be more accessible year-round, reducing some of the logistical challenges that plague construction of housing in the North and near North. Undoubtedly, improved, cheaper transportation options across Northern Canada would lead to an overall reduction in the cost of shipping materials and labour for housing construction and allow for greater timeline flexibility, thereby expanding the construction season. This would have a marked impact on the overall affordability of northern housing in terms of both public housing and private housing development. Northern corridor development could also see a greater potential for private sector involvement in housing as well as increased Indigenous investment in housing, diversifying the landscape of northern housing tenure and supporting opportunities for new areas of community economic development.

Education

There is a clear need for an improved northern education system that meets the needs and priorities of northerners. One way to support this for adult and postsecondary education is through remote learning options, which, like telehealth, would be supported through improved bandwidth and telecommunications connectivity across northern communities. The expansion of northern transportation infrastructure more generally, however, would increase accessibility to programs in regional and southern centres and would reduce the overall costs of relocation and travel back and forth between home communities

and schooling. Improved transportation and telecommunications infrastructure also has the potential to support the education and training of northern teachers and to reduce the overall sense of isolation (including isolation from professional and personal supports) for teachers from outside the community, thus improving recruitment and retention of teachers. Finally, the development and expansion of northern universities and the knowledge economy in general would benefit from improved transportation and telecommunications infrastructure, supporting opportunities for these institutions to establish themselves as not only centres for northern postsecondary institutions but also centres for culture, creativity, self-determination and community learning across the North and near North.

Emergency Services

Improvements in transportation and telecommunications infrastructure would benefit emergency services across the North and near North by allowing for greater integration and accessibility of both public and private service delivery. Costs associated with the transportation of emergency supplies and equipment in the event of human or environmental disaster would also be reduced. Finally, improved transportation routes would allow for increased community and regional development and management of emergency services.

Employment

Northern corridors would potentially facilitate new and diversified employment opportunities. Firstly, transportation and telecommunications infrastructural development and expansion would create employment opportunities associated with the construction and maintenance of northern corridors as well as through businesses created by support industries. Secondly, northern corridors would facilitate resource exploration and development further, expanding the potential for employment opportunities in the extractive industry as well as expanding business creation through support industries. Thirdly, improved transportation would allow for increased mobility of the northern labour force within the North and near North, creating opportunities for commuting and lessening the vulnerability of job loss as a result of the limited life cycle of resource development projects, while also ensuring that northerners can maintain community ties.

CONCLUSION

This scoping literature review revealed a number of critical deficits in northern health care, education, employment and housing. A comprehensive understanding of these deficits in soft infrastructure in Northern Canada has directly informed our discussion of the potential opportunities that a northern corridor might bring to northerners, their communities and the region as a whole. Yet the need for strong and integrated policy responses across all levels of governments—community, Indigenous, territorial/provincial and federal—cannot be overestimated here. Increased accessibility within the North also increases the potential for a leakage of economic benefits, out-migration of northern labour and a centralization of opportunities and services in regional and southern centres. Consultation with northern community members and leaders, and their meaningful and sustained engagement across all stages of northern corridor development, is critical if such a project is to benefit northern peoples, communities and regions. First and foremost, the recognition of

Indigenous rights is constitutionally required and yet there remain land claims and self-government agreements still in negotiation across this region. In order for Indigenous peoples to maximize benefits to their communities, support for the settlement of claims is crucial. Secondly, policies prioritizing northern business are in place in areas such as the Northwest Territories and Nunavut; however, strong policy that ensures northern and Indigenous businesses benefit from hard infrastructural development are required to limit leakage of economic benefits from northern communities. Thirdly, and in a similar vein, the education and training of northerners to be able to benefit from employment opportunities created through hard infrastructure expansion is required. Education and training initiatives must not only address specific opportunities within a major development project itself, but also must serve to promote the sustainability of the northern economy through training in fields pertaining to governance, policy and administration. Fourthly, a northern corridor would undoubtedly lead to increased exploration and resource development due to abundance of non-renewable resources of all types across the North and near North. Strong policy around extractive industry to ensure the distribution of mining revenues and benefits is key to ensuring relative economic well-being and to avoid potential political conflicts between individual communities and the governments and organizations that represent them. Fifthly, there is significant potential for a northern corridor to encourage further centralization or urbanization in the North and near North. Appropriate policy development and community planning will be required in order to plan accordingly, and to provide the necessary supports and resources for northerners relocating to regional centres and/or to support smaller communities, thereby ensuring an equitable distribution of services, supports and opportunities.

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ABOUT THE AUTHOR

Dr. Julia Christensen is an Associate Professor in Geography and Planning at Queen's University and a former Canada Research Chair in Northern Governance and Public Policy. She is also the Project Director for At Home in the North. Dr. Christensen is the author of *No Home in a Homeland: Indigenous Peoples and Homelessness in the Canadian North* (UBC Press), co-editor of several volumes on northern housing and social policy, and has authored numerous peer reviewed articles and policy reports on housing, home and health in the circumpolar North.

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