Addressing social determinants of health is a priority for managing COVID-19 in Arctic Indigenous communities: results of a scoping review

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Abstract

Background. Arctic Indigenous communities are unique, geographically remote and/or isolated, and currently among the most susceptible populations in the world to the effects of the coronavirus disease 2019 (COVID-19) pandemic. Since colonization, Indigenous communities have been particularly susceptible to infectious disease outbreaks.

Methods. This study reviewed current knowledge regarding social determinants of health (SDH) and pandemics in Arctic Canada and highlighted the implications of the current COVID-19 pandemic on individuals, families, and communities in Arctic Canada.

Studies published in English and French pertaining to SDH or pandemics in the Canadian Arctic were located using key search words in three databases (PubMed, Medline, and CINAHL) as well as reference tracking of relevant articles up to September 2021. Studies were categorized according to infectious disease (COVID-19, H1N1 influenza, and tuberculosis) or SDH (healthcare access, food security, mental health, socioeconomic status, cultural continuity, housing, and community infrastructure). NVivo was used to theme and sub-theme findings of selected studies.

Results. One hundred studies were included in this scoping review. Two articles related to COVID-19, five to influenza, and five to TB; 27 healthcare access, 19 to food security, 17 to mental health, nine to SES, seven to cultural continuity, six to housing, and three to community infrastructure. Documented lessons learned from previous pandemics in Arctic communities provides evidence to inform public health policies and culturally safe programs for the current COVID-19 pandemic where many SDH exist as challenges for Indigenous communities. The SDH included limited healthcare access, food insecurity, mental health challenges, low socioeconomic status, limited cultural considerations in healthcare, and suboptimal housing. These findings are also relevant to Indigenous communities in other Arctic regions facing similar challenges due to the pandemic.

Conclusions.: It is essential to understand how SDH underlie the health and wellbeing of Indigenous communities in the Arctic and to utilize this information to inform critical policy and practice decisions for COVID-19 prevention, management, and treatment. This review indicated that many SDH are unique to Canadian Arctic settings and pose specific challenges for the prevention and management of infectious diseases, such as COVID-19.

Background

Social determinants of health (SDH) are strong predictors of how different population groups can mitigate the impact and prevent transmission of infectious diseases, including the current COVID-19 pandemic. Indigenous communities in the Arctic are particularly susceptible to the pandemic's effects given unique SDH challenges, including long lasting and ongoing trauma caused by colonization. Indigenous communities around the world have been affected disproportionately by COVID-19. In the United States, COVID-19 has killed one in 2,300 Indigenous people, compared to one in 3,600 non-
Hispanic white people. (3) Studies attribute these disparities to structural and socioeconomic inequalities. (2, 4)

The Arctic as a region overlaps eight nations: Denmark (Greenland), United States (Alaska), Sweden, Norway, Finland, Russia, Iceland, and Canada. Of approximately seven million inhabitants of the Arctic, Indigenous peoples make up almost 10%. (5) In Canada, Indigenous peoples contribute 5% of the total population and over 75% of the Arctic population. (5) Arctic Canada constitutes approximately 40% of Canada's landmass and has the second lowest population density (3.3 persons per km$^2$) of all Arctic Nations after Iceland. (6) Although no clear definition of the Canadian Arctic exists, it includes three northern territories: Nunavut, the Northwest Territories and the Yukon, and anthropologically, parts of Northern Quebec and Newfoundland and Labrador, in addition to the political definition. (6) In terms of climate, Canadian Arctic expands to Northern Ontario where Arctic tundra exists along with the other regions mentioned. (7, 8)

Historic colonialism and assimilation practices in Canada include separating children from families and cultures through residential schools and the Sixties Scoop, and continue to negatively impact Indigenous communities, resulting in socially mediated health inequities, disparities, and adverse health experiences and outcomes. (9, 10) Average life expectancy is roughly 10 years lower for Inuit at 72.4 years compared to 82.9 years in the non-Indigenous population. (11) Intergenerational trauma in Indigenous communities has resulted in disadvantageous socioeconomic status (SES) and a higher burden of illness manifested by poor general health and increased risk of chronic and infectious diseases, many of which were historically foreign to Indigenous communities; mental health conditions, such as depression, substance abuse, and suicide; increased engagement in harmful activities; and increased mortality. (10, 12) The legacy of the residential school system continues to have negative effects on all aspects of health and well-being of Indigenous communities throughout the country, including in the Arctic. (13) For more than 100 years, Indigenous children were forcibly relocated to residential schools and were disconnected from family, community, language and culture, and experienced physical, sexual, and psychological abuse. (12) Many residential schools provided poor quality diets and unsanitary and overcrowded living conditions. (10, 12, 14) Residential schools ran from the 1870s until 1996 and the adverse effects continue through psychological mechanisms, intergenerational trauma, and biologically embedded mechanisms such as malnutrition. (10, 12, 14)

When discussing how SDH, health outcomes, and infectious diseases are interwoven in the Canadian Arctic, a historical perspective is essential. Cross-continental travel from Europe to America began in the late 1400s and created networks of trading for food, knowledge, technology, and animals. (15) This introduced foreign disease pools that flowed far across continental boundaries, and new settler diseases, previously non-existent in Indigenous communities, disproportionately affected First Nations, Inuit, and Métis. (15) Historical accounts report that John Cabot's contact with Labrador Inuit in 1498, and subsequent contact with whalers, explorers, missionaries, and traders, led to numerous outbreaks of diseases such as smallpox, syphilis, influenza, and measles. (16, 17) Inuit in the Canadian Arctic experienced substantial changes to environments and lifestyles as a result of European settlement in the
region. The “High Arctic Relocation” involved the Canadian government relocating nomadic Inuit from Northern Quebec to the High Arctic to permanent government-built settlements in the 20th century. This resulted directly in an outbreak of measles during transportation among Inuit as well as dogs (quimmiit), which Inuit relied upon for Arctic survival. (18, 19) Many of the new settlements were poorly located and constructed, lacked proper sanitation, and were distant from food sources. Diseases such as tuberculosis (TB) were rampant, and people were transferred forcibly to southern hospitals for treatment, separating patients from families, language, culture, and communities – sometimes forever. Despite the trend of TB declining in the Arctic, today TB rates are still approximately 300 times higher among Inuit than non-Indigenous Canadians. (20) During the 1918–19 influenza pandemic, mortality was as high as 90% in some Indigenous communities in Labrador. (21) During the 2009–2010 H1N1 pandemic, Indigenous communities across Canada disproportionately faced an increased risk of severe manifestation of the infection, (22) such as overcrowded housing, limited healthcare access, (23) delays in time to hospitalization, and higher rates of comorbidities. (22) These factors persist today, highlighting an increased risk for significant infection and poor health outcomes during pandemics.

In March 2020, the Yukon, the Northwest Territories, and Nunavut declared a state of public health emergency due to COVID-19. Support services and measures to prevent COVID-19 were implemented by territorial and federal governments to minimize impact on residents of the territories. High prevalence of poverty, food insecurity, overcrowded housing, (24) and inadequate basic infrastructure, including access to water (25, 26) and healthcare services (27) in the Arctic could make it difficult for Indigenous communities to follow recommendations for prevention, which require access to safe water for frequent handwashing, space for physical distancing, and immediate access to healthcare when needed. Existing literature primarily focuses on describing the spread of COVID-19 in Arctic nations, which draws attention to current gaps in the literature that facilitate understanding the implications of SDH in the context of the Arctic, including how SDH, such as healthcare resources and SES, can impact the overall health of Indigenous communities. (1)

The aim of this study was to review current knowledge of SDH (healthcare access, food security, mental health, SES (livelihoods, employment, income, and education), cultural continuity, housing, and community infrastructure) in the Canadian Arctic and discuss implications for the COVID-19 pandemic. Given that COVID-19 is a novel viral disease with scarce relevant literature, this review included literature regarding the risk, response, prevention, and management of respiratory infectious diseases such as H1N1 influenza, TB, and COVID-19.

**Methods**

The methodological framework described by Levac, Colquhoun, and O’Brien (28) was used for this scoping review. Ethics approval was not required.

Arctic Canada was defined as the three northern territories (Yukon, Northwest Territories, and Nunavut) and northern regions of Québec, and Newfoundland and Labrador. Remote and isolated regions in
northern parts of Ontario, close to the northern coastline, were also included in the definition to broaden the search. In addition to the current COVID-19 pandemic, a preliminary search of literature identified eight infectious diseases that have previously substantially affected Arctic Canadian communities: TB, human immunodeficiency virus (HIV), H1N1 influenza, sexually transmitted infections (STI), diphtheria, smallpox, *Helicobacter pylori* (*H. pylori*) infection, and hepatitis. Of these, STI, HIV, *H. pylori*, and viral hepatitis infections were excluded due to the different transmission mechanisms and varying approaches to management and prevention.

Search strategies: After consulting seminal works related to SDH in Indigenous communities,(29, 30) the following search terms were selected: healthcare access (utilization, accessibility, and medical travel), food security (traditional/country food), mental health (depression, suicide, and substance/alcohol use), socioeconomic status (SES) (livelihoods, employment, income, and education), cultural continuity (language), housing, community infrastructure, environment (climate), isolation (remoteness), and discrimination (colonialism). Command and operator terms such as AND or OR, asterisks, and quotation marks were iteratively used with these MeSH terms. Three scientific databases (Pubmed, Medline, and CINAHL), and AlterNative: An International Journal of Indigenous Peoples, (which included references not found in the other databases), were searched by the authors (DI, SLJ, and GO), and articles published up to September 2021 were retrieved. The search was limited to original studies published in English and French. References of other types of publications including reviews and commentaries were reviewed to identify additional articles.

Study selection: Articles were deemed eligible if: 1) they investigated at least one of the predefined areas of interest, 2) they pertained to Arctic Canada as defined above, and 3) full text was available through the University of Alberta Library access. Two authors (GO and SJ) first screened the title and abstract, reviewed the full text, and discussed the eligibility of studies by identifying and presenting to each other the study settings and study findings related to the search terms. A third author (DI) verified the screening criteria. Multinational studies were included if findings were presented by county and results related only to Canada were available. Following discussion, the search terms “Environment” and “isolation” were removed as they yielded too many search results with relevant findings. Diphtheria and smallpox were removed as search terms for yielding zero or one article respectively. The term discrimination was removed as it was discussed in the context of other SDH and was impossible to differentiate separately. Following a full text review, articles that were deemed out of scope or not about the Canadian Arctic were excluded.

Data extraction: The following information was extracted from the eligible papers: year of publication, study location, study population, methods, and the summary of findings.

Summarizing the results and quality appraisal: Included articles were categorized into one of the three infectious diseases (COVID-19, H1N1 influenza, and TB) or the seven areas of SDH (healthcare access, food security, mental health, SES, housing, cultural continuity, and community infrastructure). Three authors (SD, DI, SJ) utilized NVivo 12 to analyze and code the findings of eligible articles and verified
codes through discussion and re-checking. Subthemes emerged from the thematic analysis of the included studies. Relevant quotes were extracted from the studies for each subtheme. STROBE (31) for quantitative studies, SRQR (32) for qualitative studies and MMAT for mixed-method studies were used to appraise the quality of the studies.

**Results**

The database search yielded 3,068 results, and an additional 948 articles were identified by manually reviewing reference lists of secondary studies. After removing duplicates, 2,335 articles remained for screening. One hundred and fifty-three articles received a full-text assessment for eligibility. Finally, 100 articles remained eligible and included (Fig. 1). The extracted data are summarized in Table 1 and relevant quotes are shown in Table 2. The included articles were categorized into one of the infectious diseases or one of the SDH. Two articles focused on COVID-19, five on influenza, and five on TB. Twenty-seven articles pertained to healthcare access, 19 to food security, 17 to mental health, nine to SES, seven to cultural continuity, six to housing, and three to community infrastructure.
<table>
<thead>
<tr>
<th>First Author, Reference, Publication Year</th>
<th>Study Design</th>
<th>Findings</th>
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<tbody>
<tr>
<td><strong>Infectious Disease 1: COVID-19</strong></td>
<td></td>
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<tr>
<td>Petrov AN, et al.,(33) 2021</td>
<td>- Canada, Denmark, Finland, Iceland, Norway, Sweden, Russia, and the USA</td>
<td>- Northern Canada had the spread under control, with very few deaths.</td>
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<td></td>
<td>- N/A</td>
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<td></td>
<td>- Analyses of regional data (February 2020-January 2021)</td>
<td>- Northern Canada was at a “pre-pandemic” state until later in 2020 and had had a smaller second wave in November and December 2020.</td>
</tr>
<tr>
<td>Petrov AN, et al.,(1) 2020</td>
<td>- Canada, Denmark, Finland, Iceland, Norway, Sweden, Russia and the USA</td>
<td>- Northern Canada and Greenland did not have significant COVID-19 outbreaks between February and July 2020.</td>
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<td></td>
<td>- N/A</td>
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<td></td>
<td>- Analyses of regional data (February-July 2020)</td>
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<tr>
<td><strong>Infectious Disease 2: H1N1 Influenza</strong></td>
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<tr>
<td>Banerji A, et al.,(34) 2016</td>
<td>- NWT, Nunavut, and Northern Quebec</td>
<td>- Influenza A (H1N1) was found in 12% of the cases.</td>
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<td>- 348 admissions of infants (&lt; 1 year) with lower respiratory tract infection</td>
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<td>- Prospective multicentre surveillance study</td>
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BMI: Body Mass Index; CFP: Community Food Program; CHR: Community health representative; CI: Confidential interval; FV: Fruits and vegetables; NNDF: Non-nutrient dense foods; NWT: Northwest Territories; OR: Odds ratio; SDH: Social determinants of health; SES: Socioeconomic status; TB: tuberculosis; TF: Traditional foods UAV: Unmanned aerial vehicles
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</table>
| Charania NA, et al. (36) 2013             | - Location: Northern Ontario  
- Population: 9 adult key informants  
- Methods: Interviews | - Lack of resources (supplies, monies, trained personnel) and poor community awareness were barriers to implementing measures. |
| Charania NA, et al. (37) 2012             | - Location: Northern Ontario  
- Population: Community stakeholders involved in the community's pandemic response  
- Methods: Interviews and meetings | - Participants suggested adding the following in the pandemic response: community-specific detail about supplies and resources needed due to the geographical remoteness of study communities, detail on how, when, where, and who was responsible for implementing the pandemic plans. |
| Charania NA, et al. (35) 2011             | - Location: Northern Ontario  
- Population: 13 adult key informants in health care services  
- Methods: Interviews | - Barriers included receiving contradicting governmental guidelines and direction from many sources, and a lack of human resources, information sharing, and specific details in community-level pandemic plans.  
- Developing a communication plan, increasing human resources, and updating community-level pandemic plans were suggested. |
| Charania NA et al. (23) 2011              | - Location: Northern Ontario  
- Population: 13 adult key informants in health care services  
- Methods: Interviews | - Participants experienced challenges related to overcrowded housing, limited human resources, and limited community awareness when delivering healthcare services during the pandemic. |

**Infectious Disease 3: Tuberculosis**

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<tr>
<td>Alvarez GG, et al.,(42) 2021</td>
<td>- Nunavut</td>
<td>- The largest super-spreading events were associated with a homeless shelter and a gambling house, suggesting a socioeconomic nature of TB spread.</td>
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<td>- 185 TB cases among 178 patients</td>
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<td></td>
<td>- Social network analysis and genome sequencing</td>
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</tr>
<tr>
<td>Kilabuk E, et al.,(38) 2019</td>
<td>- Nunavut</td>
<td>- Unadjusted risk ratios for latent TB infection were associated with age, education, smoking tobacco, crowded housing, and Inuit ethnicity.</td>
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<tr>
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<td>- 261 participants, mostly Inuit</td>
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<tr>
<td></td>
<td>- In-person surveys</td>
<td>After adjusting for other SDH, latent TB infection was associated with increasing age, crowded housing, and ethnicity.</td>
</tr>
<tr>
<td>Pease C, et al., (39) 2019</td>
<td>- Nunavut</td>
<td>- Undergoing a tuberculin skin test due to employment screening was associated with increased non-initiation of treatment.</td>
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<td>- 2,303 patients with a tuberculin skin test implanted</td>
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<td></td>
<td>- Retrospective review of medical records</td>
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<tr>
<td>Bourgeois AC, et al.,(40) 2018</td>
<td>- Canada, Finland, Greenland, Norway, Russia, Sweden, and the US</td>
<td>- The annual TB incidence ranged from 4.3/100,000 (Northern Sweden) to 199.5/100,000 (Northern Quebec, Canada).</td>
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<td>- 7,213 cases of tuberculosis reported in the International Circumpolar Surveillance Tuberculosis system.</td>
<td>- Jurisdictions with the highest proportion of cases that were classified as cured or as having completed treatment were Yukon (96.6%), the NWT (85.7%), Northern Norway (84.6%), and Alaska (83.6%).</td>
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<td></td>
<td>- Descriptive analysis of all active TB cases</td>
<td>- The highest proportions of death among TB cases were observed in Arkhangelsk (13.6%) and the NWT (13.0%).</td>
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<tr>
<td>Alvarez GG, et al., (41) 2016</td>
<td>- Nunavut</td>
<td>- The youth-led interventions were acceptable to the Inuit communities and resulted in uptake of TB knowledge among community participants.</td>
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<td>- 41 Inuit youth (12–20 years)</td>
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<td>- Field test case study using a knowledge-to-action process</td>
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**SDH 1: Healthcare Access**

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<tr>
<th>Jull J, et al. (67), 2021</th>
<th>- Nunavut and Ontario</th>
<th>- Participants described the experience in relation to 4 main events through the cancer care journey: initiating cancer care, getting cancer care, getting supports from family and community, and engaging in decision making.</th>
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<td>- 8 Inuit cancer patients and 6 medical escorts of Inuit cancer patients on medical travel in Ontario</td>
<td>- Most participants were away from home for over one month.</td>
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<td></td>
<td>- Semi-structured interviews</td>
<td>- Participants experienced challenges such as delay in the initial diagnosis, overwhelming travel logistics that often involved more than one flight, limited information and support, geography, weather, and commitments to job and family care.</td>
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</tbody>
</table>

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<tr>
<th>Hansen N, et al. (53) 2021</th>
<th>- Yukon, NWT, and Nunavut</th>
<th>- Positive experiences among the participants were directly associated with love of work and coworkers’ support, and inversely associated with using electronic medical record, insufficient remuneration, and cultural issues.</th>
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<tbody>
<tr>
<td></td>
<td>- 57 physicians</td>
<td>- Factors contributing to physician burnout included “lack of influence on policy and administration”, “systemic failures in cultural safety”, “discontinuity of care”, “upshifting of tasks”, “physician turnover”, and “lack of systemic supports”.</td>
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<td>- Mixed method using a cross-sectional survey and semi-structured interview</td>
<td>- Factors mitigating physician burnout included “relationships” with colleagues and communities and “time on the land and outdoor activities”</td>
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<td>- Factors that could either contribute to or mitigate physician burnout included “scope of practice”, “blurring boundaries”, and “time away”.</td>
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<tr>
<td>Cooper R, et al.,(55) 2021</td>
<td>- NWT</td>
<td>- Most articles reported negative patient experiences related to “structural barriers to care”, “perpetuation of inequalities and colonial legacy”, and challenges with “health system communication”.</td>
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<td></td>
<td>- N/A</td>
<td>- Positive patient experiences related to quick follow-ups and referrals, improved access to treatments, and telehealth.</td>
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<td>- Review of 128 eligible news media articles covering 71 patient experience cases</td>
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<td>Galloway T, et al.,(50) 2020</td>
<td>- Nunavut</td>
<td>- The following themes were identified: difficulties associated with extensive medical travel, preference for care within the community and for family involvement in care, challenges with communication, challenges with culturally appropriate care, and the value of service providers with strong ties to the community.</td>
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<tr>
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<td>- 10 patients and family members who experienced cancer or end of life care</td>
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<td>- Interviews</td>
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<tr>
<td>Akande VO, et al.,(60) 2019</td>
<td>- Nunavut</td>
<td>- 2.9% of respondents strongly agreed that Nunavut Department of Health was committed to implementing obesity prevention policies and programs.</td>
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<td>- 93 program managers, program officers, and policy analysts</td>
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<td>- Survey</td>
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<td>- 16 LGBTQ2S + youth, 21 LGBTQ2S + adults, and 14 key informants</td>
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<td></td>
<td>- Interviews</td>
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<tr>
<td>Sheffield HA, et al., (66) 2019</td>
<td>- Nunavut</td>
<td>- The cases showed effective and safe use of non-invasive ventilation in air transport of patients in respiratory distress improved patient transport in rural and remote regions.</td>
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<td>- 10 paediatric or neonatal patients with respiratory distress or infections</td>
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<td>- Case studies</td>
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<td>McDonnell L, et al., (43) 2019</td>
<td>- Nunavut and Manitoba</td>
<td>- Medevacs can be the result of several factors: the referring and receiving provider's experience, insufficient staffing in health centres, lack of access to diagnostic or treatment-related, and challenges related to recruitment and retention.</td>
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<td>- 90 frontline care providers and decision makers</td>
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<td>- Interviews</td>
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<tr>
<td>Kerber K, et al., (63) 2019</td>
<td>- NWT</td>
<td>- Respondents were satisfied with the care received overall with some unnecessary burdens and bureaucratic challenges throughout the travel process.</td>
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<td>- 52 patients and patient escorts, 14 key informants</td>
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<td>- A mixed-method study using one-on-one interviews, focus group discussions and key informant interviews</td>
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<td>- To improve access to healthcare: improve information and logistic plans prior to travel, increase effective communication between services, reduce jurisdiction and bureaucratic barriers to care, reduce indirect costs of travel and direct costs of uninsured services, and have a patient escort or advocate available to assist with appointments and navigation of the system.</td>
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<tr>
<td>Young TK, et al., (64) 2019</td>
<td>- Nunavut, NWT, Yukon</td>
<td>- The proportion of the population living within 100 km of a hospital was 83% in Yukon, 63% in NWT, and 21% in Nunavut.</td>
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<td>- 287 nurses and 61 physicians</td>
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<td>- Analysis of medical travel data from the health departments, online surveys</td>
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<td>- The relative absence of roads is a major reason why the patient transportation costs are high in Nunavut and NWT.</td>
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<td>- Medical travel accounted for 5% of the health expenditure in NWT and 20% in Nunavut.</td>
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<td>- A medevac on average costs $218 per person per year in NWT and $700 in Nunavut.</td>
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</table>
| Young TK, et al.,(48) 2018               | - 8 Arctic countries  
- N/A  
- Review and comparison of publicly available databases | - Nordic countries exceeded North America in the density of all three categories of health professionals.  
- The largest disparities between "north" and "south" are observed in the NWT and Nunavut, Canada. |
| Clark DG, et al.,(49) 2018               | - Nunavut  
- 18 search and rescue responders, Elders, and emergency management officials. 17 UAV test flights with community members  
- Semi-structured interviews, UAV test flights, and analysis of weather data to examine UAV flight suitability | - Rates of search and rescue have more than doubled over the past decade.  
- 2/3 of volunteers reported not having received any first aid training in the past five years, with many members reporting anxiety around potentially dealing with medical conditions perceived as complex.  
- Some issues of infrastructure mentioned were power outages and long wait times for additional treatment. |
| Logie CH, et al.,(59) 2018               | - NWT  
- 16 LGBTQ2S + youth (15–24 years), 21 LGBTQ2S + adults (≥ 25 years), and 14 key informants  
- Interviews | - Participants discussed how structural contexts such as heteronormativity in sexual health education and a lack of access to safer sex tools constrained one's ability to practice safer sex.  
- Social contexts of intersectional stigma resulted in shame, concealing identities, and fear of accessing safer sex materials. |

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</table>
- 10 community health leaders, 33 stakeholders  
- Interviews, roundtable meeting | - Four issues related to emergency response systems and training were: inequity in response capacity and services, lack of formalised dispatch systems, turnover and burnout in volunteer emergency services, and challenges related to first aid training. |
| Liddy C, et al., (61) 2017               | - Nunavut  
- 165 eConsult cases  
- Cost analysis of all eConsult cases submitted between August 2014 and April 2016 | - Of the submitted 165 eConsult cases, the most popular specialties were dermatology (16%), cardiology (8%), endocrinology (7%), otorlaryngology (7%), and obstetrics/gynaecology (7%).  
- Specialists provided a response in a median of 0.9 days. Total savings associated with eConsult in Nunavut are estimated at $180,552.73 or $1,100.93 per eConsult. |
| Cano JK, et al. (68) 2016               | - Yukon  
- 16 women who utilized abortion services  
- Semi-structured interviews | - Accessing abortion services was challenging because of complication and a lack of transparency in the process and significant burden in logistics including multiple travels, long wait times, and financial influences. |
| Romain SJ, et al.,(47) 2015             | - Nunavut  
- 35 key informants  
- Interviews | - Significant human resources were utilized in community health centres to distribute duties associated with retail pharmacy medications.  
- Large quantities of unclaimed prescription medications suggested suboptimal patient care and low adherence rates  
- The absence of a clear policy and oversight for some controlled substances, such as narcotics, may increase the risk for potential illegal procurement or abuse. |

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<tr>
<td>Oosterveer TM, et al.,(46) 2015</td>
<td>- NWT</td>
<td>- Both primary care service providers and service users understood the constraints in providing equitable access to primary health care services in remote communities.</td>
</tr>
<tr>
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<td>- 14 primary healthcare service providers and service users</td>
<td>- Emergency care was found to be particularly challenging, because of limited qualified staff in the community and the dependence on aeromedical evacuations.</td>
</tr>
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<td></td>
<td>- Interviews</td>
<td>- For non-emergency care, the need to travel outside the community was generally not favoured.</td>
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<td></td>
<td>- All recognized the need for more preventive services which were often postponed or delayed because of the overwhelming demand for acute care.</td>
</tr>
<tr>
<td>Logie CH, et al.,(58) 2015</td>
<td>- NWT</td>
<td>- LGBTQ2S + youth identified community norms that devalued same sex identities and stigma surrounding LGBTQ2S+-specific services and agencies.</td>
</tr>
<tr>
<td></td>
<td>- 12 LGBTQ2S+ persons and 15 stakeholders</td>
<td>- Stigma was exacerbated for youth in secondary schools.</td>
</tr>
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<td>- A meeting with youth, a meeting with stakeholders</td>
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<tr>
<td>Fraser SL, et al.,(54) 2015</td>
<td>- Northern Québec</td>
<td>- Themes that are inter-related with healthcare and social service experiences were identified, including needs for services, access to services, and satisfaction with care</td>
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<td>- 14 community members including 3 elders</td>
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<td>- Individual interviews</td>
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<tr>
<td>Mendez I, et al., (69) 2013</td>
<td>- Northern Newfoundland and Labrador - Physicians, nurses and patients who utilized a total of 252 activation of remote presence - Surveys and qualitative interviews</td>
<td>- The use of the RP-7 robot that provided remote physician presence was estimated to have reduced air transport of patients by 60%. - Physicians, nurses, and patients expressed a high degree of satisfaction, suggesting the use of robot technology for remote physician presence may be a feasible and cost-effective way to improve healthcare access in northern remote communities.</td>
</tr>
<tr>
<td>Bhattacharyya OK, et al., (45) 2011</td>
<td>- Northwestern Ontario - 24 healthcare providers - Interviews and focus group</td>
<td>- Clinic-related barriers such as short staffing, staff turnover and system fragmentation were discussed.</td>
</tr>
<tr>
<td>Bhattacharyya OK, et al., (57) 2011</td>
<td>- Northwestern Ontario - 24 healthcare providers - Semi-structured interviews</td>
<td>- Although healthcare providers ranked patient factors as having a large impact on care than CHRs, physicians were less likely to rank patient-provider communication as having a large impact.</td>
</tr>
</tbody>
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<tr>
<td>McDonald TJ, et al.,(56) 2010</td>
<td>- Nunavut, NWT, Northern Labrador, Northern Quebec - 14,282 Inuit, Métis, First Nation and non-Indigenous adults (21–65 years) - Analysis of the Canadian Community Health Surveys and Aboriginal People’s Survey by Statistics Canada</td>
<td>Lower utilization of cancer screening appeared to be due to unobserved factors specific to Inuit and the unique social-cultural context.</td>
</tr>
<tr>
<td>Bird SM, et al., (51) 2008</td>
<td>- Nunavut - 4 Inuit with type 2 diabetes mellitus for a minimum of 5 years and had been prescribed oral anti-hyperglycemic medication - Interviews, field observations, and informal interviews</td>
<td>Accessibility was a concern with respect to foods, health knowledge, language interpretation, and health service. - There was strong desire for diabetes education and support, coupled with skepticism towards outsiders. - Talking, listening, and food sharing were described most often as examples of social support.</td>
</tr>
<tr>
<td>Tarlier DS, et al.,(44) 2007</td>
<td>- Northern regions of Western Canadian provinces - 15 patients and health care providers - Patient observations and interviews with care providers</td>
<td>Remote geographical location, and nurses’ level of preparedness to practise in the North formed patterns of social distancing in nurse-patient relationships and constrained nurses’ ability to engage in practice that promotes continuity of care.</td>
</tr>
</tbody>
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</table>
| Chamberlain M, et al.,(65) 2000          | - Central Canadian Arctic  
- 23 postnatal women and partners and 5 community members.  
- Interviews | - Women faced many stressors as a result of being transferred from the community for the birth of the baby, including the absence of a partner and family support.  
- Stressors were categorised as emotional, physical and economic. |

**SDH 2: Food Security**

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| Ready E,(76) 2018                        | - Northern Quebec  
- 109 households  
- Household survey | - Food sharing is more common in households with higher food availability.  
- Poor, low-harvest households may be more vulnerable to disruptions in the availability of country food. |
| Huet C, et al., (72) 2017                 | - Nunavut  
- 431 households with children, 468 households without children  
- Focus groups, in person interviews, telephone questionnaires | - Food insecurity was significantly higher in households with children (32.9%) than in households without children (23.2%).  
- Low formal education attainment of the person responsible for food preparation was associated with increased odds of food insecurity in households with children. |
| Teh L, et al., (77) 2017                  | - Northern Quebec  
- 130 pregnant women (18–48 years)  
- Psychometric evaluation of a modified Household Food Insecurity Access Scale | - Women were more likely to be food insecure at both ends of the sample's age distribution, particularly women with low formal educational attainment, who had three or more adults and/or children in the household, who were unemployed, and who had few household hunters/fishers. |

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<tr>
<td>Collings P, et al.,(84) 2016</td>
<td>- NWT</td>
<td>- Households of single men and women experienced limited access to country food.</td>
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<td>- 22 households</td>
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<td>- A social network analysis of country food exchange</td>
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<tr>
<td>Guo Y, et al., (71) 2015</td>
<td>- Nunavut</td>
<td>- 28.7% of surveyed households in Iqaluit were food insecure, a rate 3 times higher than the national average.</td>
</tr>
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<td>- 532 randomly selected households</td>
<td>- Food insecurity was associated with poor quality housing and reliance on income support.</td>
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<td>- Modified United States Department of Agriculture Food Security Survey</td>
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<tr>
<td>Skinner K, et al.,(74) 2015</td>
<td>- Northwestern Ontario</td>
<td>- Food sharing, especially with family, was an important way to adapt to food shortages.</td>
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<td>- One adult from 51 households</td>
<td>- Participants felt hunting, preserving and storing TF was important.</td>
</tr>
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<td></td>
<td>- Interviews</td>
<td></td>
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<tr>
<td>Organ J, et al., (85) 2014</td>
<td>- Northern Labrador</td>
<td>- The community freezer supported socio-cultural, economic, and local access to wild foods.</td>
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<td>- 13 community freezer users, 2 volunteer managers, 2 elders, 9 active harvesters, and 6 freezer managers.</td>
<td>- There were issues associated with supply, dependency, social exclusion, and tension between feasibility and traditional values and practices.</td>
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<td>- Interview, focus groups, participant observation, and document analysis</td>
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</table>
- Population: 64 households  
- Methods: Household Food Security Survey Module questionnaire | - 70% of households were food insecure, 17% severely and 53% moderately.  
- The prevalence of food insecurity in households with children was 76%. |
| Douglas V, et al., (70) 2014              | - Location: Yukon  
- Population: 2 Elders, 2 youth, and 16 + key informants  
- Methods: Interviews, focus groups, nutrient analysis of caribou muscles and organs. | - The challenges to food security had 4 major themes: traditional harvest (cost and difficulty of harvesting caribou), market foods (poor nutritional quality, lack of nutrition education), decline in TF culture (younger generation losing connection to traditional culture), and adaptation strategies (improved food storage, gardening/food production and conservation through increased traditional education). |
| Ford JD, et al., (79) 2013               | - Location: NWT  
- Population: 61 CFP users.  
- Methods: Photovoice workshops, a modified USDA food security survey, and open-ended interviews | - CFP users were more likely to be housing insecure, female, middle aged (35–64), unemployed, Indigenous, and lack a high school education. |
| Spiegelaar NF, et al., (86) 2013         | - Location: Northwestern Ontario  
- Population: 8 community members  
- Methods: Interviews and analysis of soil samples | - Considering climate change, fruits and vegetables, historically stunted-in-growth or outside the distributional range of Subarctic Canada, could grow in the North. |

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<tr>
<td>Ford J, et al., (78) 2012</td>
<td>- Nunavut - 94 clients of CFPs - Open ended interviews and a fixed-choice survey on a census</td>
<td>- CFP users are more likely to be Inuit, be unemployed, have not completed high school, be more dependent on social assistance, have low household income, and be without hunters in the household compared to the general Iqaluit population.</td>
</tr>
<tr>
<td>Huet C, et al., (73) 2012</td>
<td>- Nunavut - 1901 Inuit households - Survey</td>
<td>- Food insecurity was associated with household crowding, income support, public housing, single adult households, having a home in need of major repairs, having an active hunter in the home.</td>
</tr>
<tr>
<td>Nancarrow TL, et al., (87) 2010</td>
<td>- Nunavut - 17 adults - Two-day bilingual focus groups</td>
<td>- Three themes emerged from the observations: ice/snow/water, weather, and changes in species. - Climate change can affect the accessibility and availability of the key species of country foods. - Participants found that climate change was affecting the country food harvest in both positive and negative ways.</td>
</tr>
<tr>
<td>Wesche SD, et al., (88) 2010</td>
<td>- NWT - N/A - Analysis or reports of climate observations or food use</td>
<td>- Changes in access to, availability of, quality of, and ability to use TF resources has implications for quality of diet.</td>
</tr>
<tr>
<td>Lambden J, et al., (81) 2007</td>
<td>- Arctic Canada - Dene/Métis and Inuit women (≥ 20 years) - Survey</td>
<td>- 10%-38% of participants noticed recent changes in the quality and health of TF species.</td>
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- 22 adults and 60 youth in grades 6–8, 7 adult key informants  
- Focus groups, one-on-one key informant interviews, and a community environment scan | - Themes were empowerment, trust, resources, barriers and opportunities.  
- Major sub-themes were food security, cost, accessibility/availability, capacity building, community support, programs/training and the school snack/breakfast program. |
| Chan HM, et al.,(80) 2006                | - Nunavut  
- 46 community members (17–60 years)  
- Focus groups | - Barriers to increased TF consumption included high costs of hunting and changes in lifestyle and cultural practices. |
| Lambden J, et al.,(82) 2006              | - Arctic Canada  
- 1771 Yukon First Nations, Dene/Métique and Inuit women  
- Survey. | - A considerable regional variation in the ability to afford adequate food existed (40–70%) and it was reflected in the percentage of community members who could afford, or had access to, hunting or fishing equipment.  
- Up to 50% of the responses indicated inadequate access to fishing and hunting equipment, and up to 46% of participants said not being able to afford to go hunting or fishing. |
| SDH 3: Mental Health                     |              |          |
| Logie CH, et al.,(103) 2021              | - NWT  
- 339 adolescents (13–18 years)  
- Questionnaire | - Female cisgender, LGBQ2S + identity, and food insecurity were independently and significantly associated with higher severity depression compared to the counterparts. |

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| Middleton J, et al.,(105) 2021           | - Location: Northern Newfoundland and Labrador  
- Population: N/A  
- Methods: Review of electronic patient records and temperature data from Environment and Climate Change Canada weather stations | - Warmer temperature was significantly associated with the incidence rate of daily community clinic visits related to mental health. Reduced land use and land-based resources due to warm temperature were suggested to affect mental health. |
| Decaluwe B, et al.,(91) 2019              | - Location: Nunavik, Quebec  
- Population: 174 adolescents  
- Methods: Interview data from the Nunavik Child Development Study | - A higher number of binge drinking episodes were reported among adolescents who frequently endorse enhancement motives, while social and coping motives have been exclusively related to binge drinking episodes among males. |
| Collins PY, et al.,(94) 2019              | - Location: Arctic countries (USA, Canada, Scandinavian countries, Greenland, and Russia)  
- Population: 140 service providers, researchers, Indigenous community members, policy makers  
- Methods: Delphi methodology and face-to-face discussions. | - The cross-national RISING SUN initiative prioritized outcomes for suicide prevention interventions. |

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| **Fortin M, et al., (90) 2016**          | - Arctic Quebec  
- 248 Inuit women  
- Interviews at mid-pregnancy, and at 1 and 11 months postpartum | - The proportions of drinkers and bingers were 73% and 54% during the year prior to pregnancy and 62% and 33% after delivery.  
- 60% of women continued to drink alcohol during pregnancy. |
| **Pollock NJ, et al.,(101) 2016**        | - Newfoundland and Labrador  
- 745 suicide cases  
- Secondary analysis of Vital Statistics Death Database | - Suicide rates were elevated among females in the Inuit communities.  
- Suicide disproportionately affects Innu and Inuit communities in Labrador. |
- 17 youth (15–25 years)  
- In-depth conversational interviews | - Five key protective factors for mental health were: being on the land, connecting to Inuit culture, strong communities, relationships with family and friends, and staying busy. |
| **Fortin M, et al., (99) 2015**          | - Northern Quebec  
- Participants of two surveys combined  
- Analysis of the Santé Québec Health Survey (1992) and the Nunavik Inuit Health Survey Qanuippitaa (2004) | - Alcohol and drug use among Inuit increased significantly, particularly among young adults.  
- 60% of drug users consumed alcohol on a regular basis. |

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- 20 Northern health practitioners  
- Narrative interviews and consensual qualitative research. | - Many practitioners coped with challenges of Northern practice, yet still experienced the limitations of small communities and lack of resources in small communities to adequately address mental health support. |
| Kral MJ, (96) 2013                     | - Nunavut  
- 27 Inuit (17–61 years)  
- Interviews | - Relationships with girlfriends and parents were related to anger among Inuit male youth and embedded with suicides. |
| Tan JC, et al., (102) 2012             | - Nunavut, NWT, Labrador, and Northern Quebec  
- 3974 received calls  
- Quantitative and qualitative analysis of call records | - The majority of users were adult females who called to discuss problems primarily related to relationships and loneliness/boredom. |
| Wood DS, (93) 2011                    | - Nunavut  
- 23 communities  
- Analysis of community-level records of violent crimes known to the police | - Wet communities had higher rates of violent crime compared to dry communities. |

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| Haggarty JM, et al., (92) 2008          | - Nunavut  
- 111 Inuit (≥ 14 years) 
- Household survey | - 43.6% of the participants had suicidal ideation within the past week and 30% attempted suicide within last 6 months. 
- Higher overall suicidality scores were associated with higher anxiety, and alcohol abuse, but not with depression or gender. |
| Law SF, et al., (97) 2007               | - Nunavut  
- 110 clients 
- Retrospective chart review | - Interpersonal and socio-environmental stressors were precipitators of psychiatric crises such as suicide attempts. 
- Psychiatric issues appeared deeply interwoven with interpersonal, socioeconomic, and societal changes. |
| Haggarty JM, et al., (104) 2002         | - An Inuit community above 70° N.  
- 88 residents 
- Survey | - 22.6% of the community sample was found to be depressed. 
- 6.3% had seasonal affective disorder. |
| Kirmayer LJ, et al., (89) 1998          | - Nunavik, Quebec  
- 203 Inuit (15–25 years) 
- Secondary analysis of a community survey | - A psychiatric problem, recent alcohol abuse, and cocaine or crack use were the strongest correlates of attempted suicide for females, while solvent use and number of recent life events were the strongest correlates for males. |
| Kirmayer LJ, et al., (100) 1996         | - Northern Quebec  
- 14 interviews with Inuit (14–25 years) 
- Interviews | - Risk factors for suicide attempts included male gender, having a friend who had attempted or committed suicide, a history of being physically abused, a history of solvent abuse, and having a parent with an alcohol or drug problem. 
- Protective factors included a family history of having received treatment for a psychiatric problem, more frequent church attendance, and a high level of academic achievement. |

**SDH 4: Socioeconomic Status**

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<tr>
<td>Logie CH, et al., (112) 2019</td>
<td>- NWT</td>
<td>- Addressing poverty and violence was suggested to advance adolescent sexual health in the NWT.</td>
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<td>- 610 adolescents (13–17 years)</td>
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<td>- Cross-sectional survey</td>
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<tr>
<td>Baron M, et al., (111) 2019</td>
<td>- NWT, Nunavut, Northern Quebec, Northern Labrador</td>
<td>In comparison to people reporting poor health, people reporting good health were more likely to have a higher individual income.</td>
</tr>
<tr>
<td></td>
<td>- 850 adults (&gt; 50 years)</td>
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<td></td>
<td>- Analysis of Statistics Canada’s 2006 Aboriginal People Survey</td>
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<tr>
<td>Basham CA, et al., (108) 2019</td>
<td>- Canadian provinces and territories</td>
<td>Northern territories tended to have lower prevalence estimates than provinces for multimorbidity.</td>
</tr>
<tr>
<td></td>
<td>- Canadians (2,849 in the Northern territories and 108,075) in the southern provinces (&gt; 12 years)</td>
<td>Lower multimorbidity among households without a post-secondary graduate was found.</td>
</tr>
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<td></td>
<td>- Analysis of the Canadian Community Health Survey data</td>
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<tr>
<td>Young MG, et al., (114) 2017</td>
<td>- NWT</td>
<td>Several themes and subthemes related to participants' experiences at the emergency warming centre and success of the centre emerged including feeling safe.</td>
</tr>
<tr>
<td></td>
<td>- 9 respondents and 7 stakeholders</td>
<td></td>
</tr>
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<td></td>
<td>- Qualitative interviews</td>
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</table>

BMI: Body Mass Index; CFP: Community Food Program; CHR: Community health representative; CI: Confidential interval; FV: Fruits and vegetables; NNDF: Non-nutrient dense foods; NWT: Northwest Territories; OR: Odds ratio; SDH: Social determinants of health; SES: Socioeconomic status; TB: tuberculosis; TF: Traditional foods UAV: Unmanned aerial vehicles
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<thead>
<tr>
<th>First Author, Reference, Publication Year</th>
<th>Study Design</th>
<th>Findings</th>
</tr>
</thead>
</table>
| Galloway T, et al., (106) 2015            | - NWT, Nunavut, Northern Quebec  
- 2,595 Inuit adults (>18 years)  
- Food frequency questionnaire and 24-h dietary recall | - Associations between SES and diet quality differed considerably between men and women. |
| Schmidt R, et al., (110) 2015             | - Yukon, NWT, and Nunavut  
- 61 homeless women (≥ 18 years)  
- Interviews | - Factors including poverty and unstable housing were interconnected and multifaceted challenges related to women's service engagement.  
- Women called for integrated, trauma-informed, and women-centred services; and addressing of the social and economic factors that affect homelessness and mental health. |
| Zienczuk N, et al., (107) 2012            | - Nunavut, Northern Labrador, and NWT  
- 2,592 Inuit adults (≥ 18 years)  
- A cross-sectional health survey | - Higher education, employment, personal income, and private housing were significantly positively correlated with an at-risk BMI. |
| Hopping BN, et al., (109) 2010            | - Nunavut  
- 211 Inuit adults  
- Food frequency questionnaires | - Education was positively associated with fruit and vegetables consumption and negatively associated with TF consumption.  
- Households on income support were more likely to consume TF and non-nutrient-dense foods. |
| Young TK, et al., (113) 1996              | - NWT  
- 434 Inuit adults (>18 years)  
- Community health survey | - Obesity indices were associated with higher income, fluency in the Inuit language, and less time spent on the land.  
- Obesity was associated with higher SES among Inuit men, and with lower SES among Inuit women. |

**SDH 5: Cultural Continuity**

**BMI**: Body Mass Index; **CFP**: Community Food Program; **CHR**: Community health representative; **CI**: Confidential interval; **FV**: Fruits and vegetables; **NNDF**: Non-nutrient dense foods; **NWT**: Northwest Territories; **OR**: Odds ratio; **SDH**: Social determinants of health; **SES**: Socioeconomic status; **TB**: tuberculosis; **TF**: Traditional foods **UAV**: Unmanned aerial vehicles
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</tr>
</thead>
<tbody>
<tr>
<td>Newell SL, et al.,(117) 2020</td>
<td>- NWT, Nunavut, Northern Quebec, Northern Labrador - A total of 14,955 participants - Analysis of the Arctic Supplements of the Aboriginal Peoples Surveys (2001 and 2006)</td>
<td>- Cultural continuity has a significantly positive association with health. - Cultural continuity at a community level can potentially serve as a protective factor when faced with negative influences on health.</td>
</tr>
<tr>
<td>Glass CTR, et al.,(119) 2020</td>
<td>- NWT - Participants of Inuvialuit or Gwich'in descent boating experience (18–85 years) - Interviews and focus group discussions</td>
<td>- There was a need for collaboration on boating safety resources that reflect Northerners’ experiences and cultures, while promoting healthy behaviours.</td>
</tr>
<tr>
<td>Emanuelsen K, et al.(118) 2020</td>
<td>- NWT - 30 Inuit women - Semi-structured interviews</td>
<td>- Sewing was found to contribute to Inuit women's personal health and the community's collective health by promoting “pride and sense of accomplishment”, “cultural identity”, “relaxation, decompression, and socialization”, and “spirituality and healing”.</td>
</tr>
</tbody>
</table>

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<th>First Author, Reference, Publication Year</th>
<th>Study Design</th>
<th>Findings</th>
</tr>
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</table>
| Chatwood S, et al.,(115) 2017            | - Location: Arctic countries: United States, Canada, Norway and Finland  
- Population: 10 experts including healthcare professionals, informal caregivers, Indigenous leaders, and Elders  
- Methods: Mixed methods participatory process of consensus-building | - Nine Indigenous values in the healthcare setting were: humanity, cultural responsiveness, teaching, nourishment, community voice, kinship, respect, holism, and empowerment. |
| Hordyk SR, et al.,(121) 2017             | - Location: Northern Quebec  
- Population: 24 current and former interpreters from local health centres and tertiary care contexts  
- Methods: Informal and formal interviews | - Many interpreters have no formal training and have few resources (e.g., visual aids, dictionaries) to draw upon during medical consultations.  
- Many interpreters personally knew the clients and often felt overwhelmed by moral dilemmas when translating end of life information for patients and families. |
| Moller H,(120) 2013                     | - Location: Greenland and Nunavut  
- Population: 5 Greenlandic and 2 Nunavut communities  
- Methods: Participant observations, interviews, questionnaires, and reviews | - Student success depended on nurses and students possessing or having acquired "double culturedness."  
- Double culturedness refers to the ability to communicate, understand, negotiate and interact, using 2 ways of being in the world and 2 ways of learning and teaching. |

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<tr>
<td></td>
<td>- 50 community members and 66 high school and college students</td>
<td>- Narratives about community and personal change were primarily about family, intergenerational segregation, an increasing population, more trouble in romantic relationships among youth, drug use, and poverty.</td>
</tr>
<tr>
<td></td>
<td>- Interviews</td>
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<tr>
<td>SDH 6: Housing</td>
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<tr>
<td>Pepin C, et al., (123) 2018</td>
<td>- Northern Quebec</td>
<td>- The results did not show that childhood household crowding had a long-term effect on psychological distress.</td>
</tr>
<tr>
<td></td>
<td>- 220 children (8–15 years) born after at least 35 weeks of pregnancy, weighting a minimum of 2.5 kg, and without major birth defects</td>
<td>- Household crowding could be a risk factor only when in interaction with other elements related with poverty or housing or could be experienced as a difficulty for adolescents on other aspects than depressive symptoms and suicidal thoughts.</td>
</tr>
<tr>
<td></td>
<td>- People-per-room ratio, the Center for Epidemiologic Studies Depression Rating Scale for psychological distress measure</td>
<td></td>
</tr>
<tr>
<td>Ruiz-Castell M, et al., (125) 2015</td>
<td>- Northern Quebec</td>
<td>- Nearly 62% of Inuit families resided in crowded households and were placed at risk for food insecurity.</td>
</tr>
<tr>
<td></td>
<td>- 292 primary caregiver-child dyads</td>
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</tr>
<tr>
<td></td>
<td>- Interviews</td>
<td></td>
</tr>
<tr>
<td>Daley K, et al., (127) 2015</td>
<td>- Nunavut</td>
<td>- The transition from traditional semi-nomadic living to permanent settlement has influenced current water usage patterns and health and safety perceptions.</td>
</tr>
<tr>
<td></td>
<td>- 28 residents, 9 key informants</td>
<td>- Residents are concerned about increased exposure to and risks for waterborne health issues rooted from environmental, social, and cultural factors.</td>
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<td></td>
<td>- Semi-structured interviews</td>
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</thead>
<tbody>
<tr>
<td>Daley K, et al., (126) 2014</td>
<td>- Nunavut</td>
<td>- Water shortages and services interruptions limit the ability of some households to adhere to public health advice.</td>
</tr>
<tr>
<td></td>
<td>- 28 residents, 9 key informants</td>
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<tr>
<td></td>
<td>- Interviews and a review of government water documents</td>
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</tbody>
</table>

Kovesi T, et al., (122) 2007  
- Nunavut  
- 49 homes of Inuit children (< 5 years)  
- Indoor ventilation measure, record of respiratory infection  
- Reported respiratory infection was significantly associated with occupancy (OR 1.81 for each additional occupant, 95% CI 1.14–2.86).  
- Reduced ventilation and crowding may contribute to the observed excess of lower respiratory tract infection among young Inuit children.

Young TK, et al., (124) 1996  
- NWT and Nunavut  
- Unknown  
- Data from community-wide housing survey and data relating to physical and social health routinely reported to various service delivery agencies  
- Communities with worse SES are more likely to have a higher rate of health centre visits.  
- Compared with housing, SES was the stronger factor in predicting the rate of health centre visits.

SDH 7: Community Infrastructure

Akande VO, et al., (130) 2021  
- Nunavut  
- 16 Inuit adults  
- Photo elicitation interviews and one-on-one-semi-structured interviews  
- Barriers to healthy dietary choices and physical activity participation included limited infrastructure and community resources, affordability and availability of healthy and TF, weather conditions, and social networks.

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</tr>
</thead>
<tbody>
<tr>
<td>Baron M, et al., (129) 2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Nunavut</td>
<td></td>
<td>The main resources supporting health included living in houses adapted to aging health conditions, having access to community activities, spending time with children and on the land, and having social support.</td>
</tr>
<tr>
<td>- 20 Inuit (50–86 years)</td>
<td></td>
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<tr>
<td>- Interviews</td>
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<td></td>
</tr>
<tr>
<td>Akande VO, et al., (128) 2019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Nunavut</td>
<td></td>
<td>Physical activity levels represented by steps taken were low.</td>
</tr>
<tr>
<td>- 272 Inuit and non-Inuit adults (18–64 years)</td>
<td></td>
<td>- Improving the external physical environment and internal motivational regulation may improve physical activity levels.</td>
</tr>
<tr>
<td>- Seven-day pedometer, survey</td>
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Table 2
Themes and subthemes under each category of infectious diseases and social determinants of health (SDH) and selected quotes from the studies

<table>
<thead>
<tr>
<th>Infectious Disease 1: COVID-19</th>
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</thead>
<tbody>
<tr>
<td><strong>Theme 1: Regional Differences</strong></td>
</tr>
<tr>
<td>“[Northern Canada and Greenland] had no significant proliferation of the pandemic, registered only isolated cases, and posted few or no deaths. These remote territories implemented strict quarantines that included outright travel bans, self-isolation and closures. ... However, the areas belonging to this group are highly vulnerable to the COVID-19 pandemic given the remoteness, lack of healthcare infrastructure, and underlying socioeconomic and health issues prevalent in local communities, so these remain of particular concern as the pandemic continues.”(1)</td>
</tr>
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<table>
<thead>
<tr>
<th>Infectious Disease 2: H1N1 Influenza</th>
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<tbody>
<tr>
<td><strong>Theme 1: Community Response</strong></td>
</tr>
<tr>
<td><strong>Subtheme 1: Community Response</strong></td>
</tr>
<tr>
<td>“In general, the communities’ pandemic plans were divided into three phases” (37)</td>
</tr>
<tr>
<td>“By comparing the communities’ 1st and 4th generation pandemic plans, our results suggest that there was a vast difference between what was initially outlined in the plans and what their response actually comprised of” (37)</td>
</tr>
<tr>
<td><strong>Subtheme 2: Community or Region Specific</strong></td>
</tr>
<tr>
<td>“In Community C’s communication plan, it was added that, if necessary, practitioners of traditional First Nations medicine provide health teachings” (37)</td>
</tr>
<tr>
<td>“While adding community specific information to pandemic plans is important, it is also of great value to generally address the unique conditions of a region” (37)</td>
</tr>
<tr>
<td><strong>Theme 2: Future Pandemic Plans or Recommendations</strong></td>
</tr>
<tr>
<td>“It is recommended that all levels of government collaborate to create a consistent and complementary communication effort, especially when providing guidelines” (35)</td>
</tr>
<tr>
<td>“Another beneficial modification suggested was to partially close the community’s borders, so that a mode of receiving needed supplies and human resources could still function” (36)</td>
</tr>
<tr>
<td>“Although incorporating expert knowledge is imperative for pandemic planning at the national level, flexibility is required at the community level to allow for plans to be adapted to address communities’ realities” (37)</td>
</tr>
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<thead>
<tr>
<th>Theme 3: Public Health Response</th>
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<tbody>
<tr>
<td><strong>Subtheme 1: Bureaucratic Confusion</strong></td>
</tr>
</tbody>
</table>

CHN: Community health nurse; ICS-TB: International Circumpolar Surveillance Tuberculosis Working Group; IGRA: Interferon gamma release assay; IR: Incidence rate; LTB: Latent tuberculosis; LTBI: LTB infection; NWT: Northwest Territories; OR: Odds ratio; SDH: Social determinants of health; SES: Socioeconomic status; TB: Tuberculosis; TST: Tuberculin skin test
**Infectious Disease 1: COVID-19**

“In contrast, federal and provincial participants from one community were in disagreement. Although the provincial representative stated that they followed the provided guideline, federal participants believed that the antivirals were not efficiently distributed” (35)

“Some participants reported that there was confusion about which health care facility was responsible for receiving and distributing antivirals” (36)

**Theme 4: Hospital Admission**

**Subtheme 1: Admission Rates**

“During 2009 there were 348 admissions for lower respiratory tract infection among 293 infants” (34)

“The rate of admission for respiratory syncytial virus infection per 1000 live births in the Northwest Territories was 19.7 compared to 75.3 in Nunavut and 176 in Nunavik, with the highest of 195.1 in the Kitikmeot Region” (34)

**Subtheme 2: Contributing Factors**

“Longer length of stay was associated with isolation of more than 1 virus versus 1 virus and with the presence of underlying risk factors. Length of stay decreased by 32.2% for every 30-day increase in patient age” (34)

“Contributing factors may include lower unemployment rates and higher per-capita income in the Northwest Territories, which influence food security and nutrition and, consequently, rates of lower respiratory tract infection. The proportion of Inuit in Nunavut and Nunavik is 80%-90% compared to 11.1% in the Northwest Territories, which suggests that an important risk factor may be ethnicity” (34)

**Theme 5: Pandemic Experience**

**Subtheme 1: Effective Strategies**

“Participants reported that screening the general public for influenza-like illness using health questionnaires and declarations at public places was successful during [the 2009 H1N1 influenza pandemic].” (36)

“The majority of participants said that closing down schools and childcare centres in the community were effective mitigation measures that were employed during their [2009 H1N1 influenza pandemic] response” (36)

“Participants generally reported that canceling or postponing events was more effective than simply restricting attendance since no human or other resources were required to screen people attending the event.” (36)

**Subtheme 2: Ineffective Measures**

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### Infectious Disease 1: COVID-19

“Anecdotal commentary indicated that these measures had low rates of compliance, as some community members doubted the worthiness of these measures, and were difficult to enforce, especially if other travel methods were available (e.g., Winter road, boat).” (36)

“For instance, it was noted that one community was only distributed half of their allotted vaccines in a timely manner.” (36)

#### Subtheme 3: Key Informant Perspective

“Participants reported that 30 of the 41 mitigation measures were used in some form or the other during their response to the [2009 H1N1 influenza] pandemic” (36)

“Participants reported that mitigation measures were considered to be effective particularly if the measures aided in decreasing virus transmission” (36)

“Risk population and increasing community awareness about influenza pandemics. However, participants reported that some of the measures that they considered to be effective were not necessarily feasible to implement given the unique conditions experienced in their communities” (36)

#### Subtheme 4: Limited Services or Resources

“Representatives from each government body agreed that there was a lack of human resources, especially nurses, during the pandemic response in each study community.” (35)

“Although lack of required supplies and trained personnel were reported issues” (36)

“Shortages of qualified personnel to immunize and lack of adequate education hindered the distribution of vaccines in the communities” (36)

### Infectious Disease 3: Tuberculosis (TB)

#### Theme 1: Associated Factors

“Unadjusted analyses demonstrated that age, education, smoking tobacco, crowded housing conditions and Inuit ethnicity and statistically significant associations with LTBI status” (38)

“After adjustment for all measured SDH, age, crowding, and Inuit ethnicity remained statistically significant determinants of LTBI status” (38)

“Older age and receiving a TST during employment screening were associated with non-initiation of treatment while only older age was associated with noncompletion of treatment.” (39)

“A reduced risk of having a positive result was associated with female sex, non-Inuit ethnicity, and obtaining a TST due to employment screening, school screening or physician or self-referral.” (39)

#### Theme 2: Extend of the problem

#### Subtheme 1: Number of Cases

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Infectious Disease 1: COVID-19

“For 2006–2012, 7213 cases of active TB were reported across the 10 ICS-TB participating jurisdictions. Three ICS-TB jurisdictions had an average annual crude TB IR of > 100 cases per 100 000 population: Nunavut, Nunavik, and Greenland” (40)

“The highest proportion of laboratory-confirmed cases, including all smear and/or culture-positive cases, was reported in Alaska followed by Yukon, and Nunavut.” (40)

“19.1% of referred patients were diagnosed with LTBI during a 51-month period in a routine screening program in a remote Canadian arctic region with predominantly Inuit population.” (39)

Subtheme 2: Treatment

“The proportion of case on an RMP-INH-PZA-EMB (RIPE) treatment regimen varied considerably across jurisdictions. The highest proportion of cases on the RIPE treatment regimens was observed in Greenland, followed by Alaska and the Northwest Territories. The jurisdiction with the lowest proportion of cases on a RIPE regimen was Yukon and Arkhangelsk. Unless drug resistance was detected, the other jurisdictions mainly used different variations of drug combinations of RMP, ING, PZA, EMB and streptomycin” (40)

“The most common reason for not offering treatment was discordance between TST and IGRA (46 of 59 patients were not offered treatment. Treatment was started by 246 patients which is 75% of the 328 patients offered treatment and 56% of the 439 patients with LTBI. Treatment was completed by 186 (75.6%) of the 246 patients who initiated treatment. The most common reasons provided for not completing treatment were irregular attendance (16 of 60 non-completers), moving (15 of 60 non-completers) and adverse effects of treatment (14 of 60 non-completers).” (39)

“Older age and receiving a TST during employment screening were associated with non-initiation of treatment while only older age was associated with non-completion of treatment” (39)

Theme 3: Intervention

Subtheme 1: Intervention Type

“In four communities in Nunavut with populations ranging from 500 to 1900, over 40 youth participated in the Taima TB Youth Education Initiative” (41)

Subtheme 2: Barriers

“The identified barriers to implementing the research interventions with Inuit youth in remote communities fell into two categories: barriers to youth learning and barriers to local implementation” (41)

“Diverse literacy skills within this group made reliable written and video footage evaluation difficult” (41)

“Data for people presenting to health centre for TB testing (passive screening) proved to be impossible to obtain in three of the four communities. Many of the health centres in the project communities do not collect this data or do not distinguish in their data collection between passive and active testing” (41)

Subtheme 3: Future Recommendations

CHN: Community health nurse; ICS-TB: International Circumpolar Surveillance Tuberculosis Working Group; IGRA: Interferon gamma release assay; IR: Incidence rate; LTBI: Latent tuberculosis; LTBI: LTB infection; NWT: Northwest Territories; OR: Odds ratio; SDH: Social determinants of health; SES: Socioeconomic status; TB: Tuberculosis; TST: Tuberculin skin test
Infectious Disease 1: COVID-19

“After the first community, the evaluation process was adapted to include the video interviews used in the other three communities” (41)

“This suggested the videos were a useful way of learning about TB, were relevant to this milieu, offered new information, and could be used for future TB teaching” (41)

“Age did seem to affect the results in that the older youth seemed to be fair better suggesting that future studies should likely adapt the activities to a more age specific target group” (41)

“Being sensitive to Inuit culture and tradition is important for ensuring that interventions are acceptable to culturally distinct communities.” (41)

Subtheme 4: Outcome

“Knowledge uptake by the youth participants was moderate across the communities” (41)

“In communities where the initiative was implemented by local health educators, knowledge uptake scores were lower, but still satisfactory. Scores were better in older youth groups compared to the younger youth.” (41)

SDH 1: Healthcare Access

Theme 1: Service Providers

Subtheme 1: Cultural or Contextual Awareness

“Cultural safety and relationship development between patients and nurses is a key in facilitating patients using primary healthcare services as a preventative measure.” (43)

“For the most part, they had expected that, because of its remote location and its First Nations population, the community would be “different” in some ways from the communities in which they customarily lived and worked. Indeed, several nurses noted that it was the difference, the opportunity to experience First Nations “cultures” and the sense of “adventure,” that had attracted them in the first place. Often, however, the nurses had not been prepared for the contextual contrasts they encountered on arriving in the community. (44)

“... the nurses were faced with an exceptionally challenging patient population in terms of complex disease management and co-existing social and health issues. Community residents lived with everyday risk factors for poor health that would be considered unacceptable in mainstream communities, such as overcrowded housing conditions without running water. Nurses were expected to provide primary care in a setting that was defined not only by health and social inequities but also by an overwhelming burden of illness and injury.” (44)

Subtheme 2: Limited Number of Providers

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Infectious Disease 1: COVID-19

“Staff shortages were discussed as a concern in relation to the ability of health care staff to focus on chronic disease care over acute care. As one nurse explained: Right now there's nobody here to run the diabetes program, there's only 2 full-time nurses here right now, so things like immunizations, prenatal, you know acute stuff, gets done before chronic stuff.” (45)

Burnout

“The high visibility of CHNs in small communities can lead to staff feeling like they are constantly working, with no separation between personal life and work. Without support from other staff members and clearly defined roles, nurses in remote areas can often feel as though they work 24 hours a day, with no respite. That amount of work for any profession is unadvisable and, in the case of northern medical providers, can lead to poor mental well-being and burnout.” (43)

“One nurse described her initiation to the work as follows: “When I came here, everything seemed to be stressing me out. It was the isolation, being in a different culture…but the work aspect of it had me so stressed out that it was affecting everything else.” Contextual and practice issues such as these contributed to a high turnover rate among nursing staff at this site. A review of relevant documents revealed that over 70 nurses had been employed in the nursing station in the 2-year period immediately preceding data collection.” (44)

Turnover

“Understaffing, low retention and a high turnover rate of [primary healthcare service providers] is a chronic persistent problem throughout the [Northwest Territories].” (46)

“Staff turnover for remote nursing is recognized as a serious challenge, with vacancy rates between 37 and 57% across the regions in Nunavut.” (47)

Subtheme 3: Limited Training

“Nursing stations are often staffed with “people [who] have less and less skills because there are [no] formal settings to get skills for this type of setting.” Participants explained that northern nurses used to graduate from specialized training programs, which prepared them for the demands of work in remote communities. Nursing shortages have forced the communities in [the Sioux Lookout Zone] to rely more on short term replacement nurses (from agencies) who do not necessarily receive such training.” (45)

“Hiring practices do not always allow for overlap between the previous staff member and the incumbent, “If a position number is filled they can’t put another person into that position while that position number is filled so I have to wait until an experienced nurse has left this building to bring an inexperienced nurse in and that’s not the way you learn this job” (Interview 0301). Without overlap time to do on-the-job training, new employees may be left feeling overwhelmed and under-supported.” (43)

Subtheme 4: Patient-Provider Relationships

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Infectious Disease 1: COVID-19

“Some respondents related instances when they felt that health service providers failed to listen or respond appropriately to patients’ descriptions of symptoms, resulting in negative outcomes for patients.” (50)

“According to patients and family members, the most satisfactory interactions with service providers were with individuals who have served for many years in the community and were therefore highly knowledgeable about the language, customs, families and community ways.” (50)

“In the absence of relational engagement, the process of care was characterized by a sense of disengagement within nurse-patient encounters, which was one factor creating gaps in continuity of care.” (44)

Communications

“One participant described examples of Inuit forms of non-verbal communication that might not be properly interpreted by caregivers who lack awareness of local dialect or gestures.” (50)

“As the vast majority of Nunavummiut speak Inuktitut as their first language and few health care providers are fluent, language challenges may also contribute to misunderstandings.” (47)

Theme 2: Healthcare Service Availability

Subtheme 1: General

“The need for public health is highlighted by the rapid changes in lifestyles and the accompanying modern lifestyle-related diseases.” (46)

Subtheme 2: Cancer

“Participants expressed a desire to see a greater range of cancer screening and diagnostic services offered within the territory.” (50)

“After controlling for demographic, socio-economic and geographic factors, we find that Inuit women are significantly less likely to have had a Pap smear test in the previous three years compared to non-Aboriginal female residents of Canada’s north (OR: 0.63; CI: 0.40–0.98). Interestingly, distance from a hospital is positively associated with the incidence of Pap smear testing even though distance from a hospital is negatively correlated with having a visit to a doctor. The implication is that in more remote areas, community health centers typically staffed by nurses are important providers of regular screening for cervical cancer.” (56)

Subtheme 3: Diabetes

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Infectious Disease 1: COVID-19

“Providers frequently lamented significant environmental constraints: community isolation, poverty and rapid social change away from a traditional to sedentary lifestyle were commonly referenced. The impact of these social determinants of health were often discussed in relation to the patients’ ability to properly manage their diabetes or engage in their care: “Where else do people not have running water, unpaved roads, no vegetables or they’re three times the normal price?” (Nurse). These issues are separate from the health system, but they do affect the likelihood that people will (or can) follow diabetes guidelines as recommended by health professionals.” (45)

“All storytellers described diabetes as a relatively new phenomenon among Inuit.” (51)

“There was a range of levels of independence among storytellers regarding their health care decisions. Two storytellers made some of their own choices about medication regimes and blood sugar monitoring while a third reported exclusive reliance on their health care team for direction. This suggests that there were varying levels of confidence and knowledge about diabetes.” (51)

Subtheme 4: Medical Travel

Arrangements for family

“Medical travel imposed significant burdens on families and communities in the forms of childcare, missing paid work, time away from family, and the financial costs of travel, only some of which was recouped through health insurance benefits.” (50)

“The single biggest challenge reported was making arrangements for children, pets and other household responsibilities while away” (63)

Communication

“Respondents noticed limited information provided before travel, and unclear process of determining itineraries.” (63)

Cost

“During the weeks away from home mothers spent a great deal of money on baby sitters and on telephone calls to their children to reassure themselves. There was the additional cost of airfare if the partner came out too and there was the cost of the partner’s time off work or away from hunting to look after children.” (65)

Limited equipment

“In addition to decreasing length of stay, many other undesired side effects of intubation and invasive ventilation are avoided with noninvasive ventilation. These include risks of failed intubation in rural and remote settings with minimal back up and limited equipment, upper airway trauma, barotrauma and volutrauma on the lungs, exposure to sedative medications and paralytics, increased risk of ventilator-associated pneumonias, and increased long-term rates of poor compliance and chronic lung disease.” (66)

Logistics

“Respondents described the impact of delays between obtaining approval and receiving care: ‘By the time [the patient] found out that he had cancer, it had metastasised already. Medical information took forever to reach us.’” (63)

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Infectious Disease 1: COVID-19

“Jurisdiction and responsibility for care Reciprocal billing and aligning policies and procedures in the different health jurisdictions were described as recurrent obstacles. Medical travellers and non-clinical programme staff were unclear about what services were covered, and what to do when patients were turned away.” (63)

Remoteness or weather

“Because of the remote geographic location of most communities, weather can impact medevac decision-making.” (43)

Unfamiliar environment

“These feelings were aggravated by the difficulties of living in a residence with strangers, an unfamiliarly hot environment (summer in the south) with no air conditioning and unfamiliar food.” (65)

“Of respondents who reported difficulties, 5.0% identified that travel to an unfamiliar city was the most challenging. The city’s size and range of services was described as overwhelming, especially in comparison to Northern communities. The ability to navigate complicated logistics had an impact on access to care.” (63)

Communication between levels of care

“Limited communication between various levels of care and from decision makers could impact care. Respondents noted that healthcare providers in Edmonton are not always aware of the care that is available in the patients’ home communities. Continuity of care is a challenge given that remote and isolated communities rely on visiting healthcare providers from Southern centres, and there is a high turnover among providers.” (63)

Patient-centred care during travel

“When parents in Community B discussed the events around their baby's birth their perception was that they were allowed to make few choices themselves. They felt the majority of decisions were made by health professionals without their input. Lack of choice was particularly evident for the place of delivery and its conduct.” (65)

“The first had problems when she was unable to get assistance with breast feeding, despite repeated requests for assistance, resulting in engorged breasts and cracked nipples on discharge. Before leaving the city she was unable to find anyone to help her because she was unaware of whom to contact.” (65)

“Respondents described the benefit of welcoming and safe healthcare environments that provide high-quality, trauma-informed and culturally appropriate care. Healthcare providers and staff that exhibited cultural competence were described as providing better support to patients.” (63)

Subtheme 5: Specialists through eConsult

“The estimated total societal savings resulting from eConsult in Nunavut were $180,552.73, or $1,100.93 per eConsult. Excluding the costs of added referrals from the cost analysis increased the estimated societal savings to $195,373.71 or $1,191.30 per eConsult.” (61)

Subtheme 6: LGBTQ2S+

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Infectious Disease 1: COVID-19

“Stakeholders identified the need to better understand the needs of Indigenous LGBTQ youth in the NWT who may not be accessing mainstream LGBTQ-specific community groups or events to the same degree as non-Indigenous LGBTQ youth.” (58)

_**Stigma, shame, feeling judged**_

“In the meeting, LGBTQ youth discussed community norms that devalued same sex identities and stigma surrounding LGBTQ-specific services.” (58)

**Subtheme 7: Emergency Response**

“Roughly 2/3 of volunteers reported not having received any first aid training in the past five years, with many members reporting anxiety around potentially dealing with medical conditions perceived as complex (e.g. anaphylaxis or cardiovascular compromise).”(49)

“Volunteers also expressed the emotional toll of responding to [search and rescue] incidents in the context of small communities where everyone knows one another, contributing to burnout and high turnover rates.”(49)

**Subtheme 8: Women’s and Pre/postnatal Care**

“They felt the majority of decisions were made by health professionals without their input. Lack of choice was particularly evident for the place of delivery and its conduct.”(65)

“[The family doctor] didn’t really provide me with information at the first appointment...I wasn’t sure what to ask for ‘cause I didn't know anyone who had gone through it and I wasn't really wanting to kind of tell anyone what was happening.” (68)

**Subtheme 7: Pharmacy**

“In remote communities without retail pharmacies, weather delays and retail pharmacy dispensing times can delay pharmacy deliveries by anywhere from two to ten days. These delays in many cases would significantly impact patient care.” (47)

“Even in situations when a prescriber is within the community, it has been noted that understaffing (a common issue in the north) and/or high patient loads can cause [community health nurses] to dispense medications from ward stock rather than seek out providers for prescription authorizations.” (47)

**Theme 3: Policies**

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“The low perceived value on obesity prevention efforts may be linked to a more focused attention on other pressing social/health issues that were prioritized locally during the community-based needs assessment and priority setting exercises in the face of limited resources. Findings from the needs assessment (unpublished) indicated that while obesity was not identified as a priority, food insecurity, alcohol abuse, and tobacco smoking were ranked as top three priorities in many communities and are currently receiving considerable attention from NDH. The limited community level support may have combined with other factors including financial limitations to trigger suboptimal efforts on obesity prevention.” (60)

“Organization-level commitment to implementing obesity prevention policies and programs was generally low. Research evidence in the field has suggested that a lack of organizational readiness for change may account for as many as half of all unsuccessful change initiatives in a variety of fields including healthcare.” (60)

“In this category, providers most often highlighted the fragmentation of care. One doctor explained the management structure as follows: It used to be that everyone was an employee of Health Canada, but now the support staff are employees of the band, the nurses are employees of Health Canada, and I am an employee of McMaster [University]. So none of us answer to the same boss...You know, the accountability is in 3 different directions.” (45)

SDH 2: Food Security

Theme 1: Food Security Rates

Subtheme 1: Household Level

“Food insecurity in general and more severe food insecurity in particular were more prevalent among Inuit households completing the survey than non-Inuit households. Approximately 45% of Inuit households surveyed in both September and May were considered food insecure compared to only 5% of non-Inuit households in September and 4% in May.” (71)

Subtheme 2: Individual Level

“The prevalence of food insecurity and severe food insecurity was higher (P < 0.001) among those not completing a secondary education and among those with an income <$20,000 CAD compared with those of greater education and income.” (73)

Community food program users

“More than two thirds of the [community food program user] participants (70%) had experienced times in the last year when there was not enough food at home and it was not possible to access more. Coping strategies at these times included: switching to less preferred and lower quality foods (70%), reducing portions for oneself (64%), reducing portions for others in the household (45%), selling things to access money for food (42%) and sending household members to eat elsewhere (28%).” (79)

Subtheme 3: Suggested strategies to improve food security
Infectious Disease 1: COVID-19

“Community members expressed eagerness to find alternatives to both traditional food species and market foods. Long-term food storage and gardening were both suggested as possible solutions to food security in Old Crow.” (70)

“Many participants discussed the importance of increasing independence and self-sufficiency so that they didn’t have to rely on food transported from the south. They wanted to advocate for food security initiatives and put some of the responsibility for improving food security towards community leaders.” (74)

“Managers, harvesters, and users alike suggested that financially supporting and/or employing harvesters through the community freezer initiative would be an option available to help people get back to the land, while at the same time promoting wild food consumption and helping to maintain a flow of wild foods in their community.” (74)

Theme 2: Food Accessibility

Subtheme 1: Purchase, Cost, and Affordability

“With the decline in the traditional food supply, the community is eager to consider alternatives. Market foods are available and already form a significant part of the local diet, but share problems with quality and cost with other northern communities. Participants expressed concerns with the nutritional quality of market foods, especially the poor quality of fresh fruit and vegetables. Food costs were another major concern, with this being blamed on Air North freight charges.” (70)

“Cost associated with the purchase of fruits, vegetables and dairy products made them inaccessible.” (79)

“Since the community is isolated and primarily accessible only by plane, the cost of purchasing marketed food is high. As a result of the length of time required for transport, variety is limited, the quality of fresh produce is poor, and perishable foods quickly deteriorate in quality.” (83)

Limited income

“Household income [was] perceived by many as insufficient to support living/hunting costs.” (80)

“When asked about the main challenge to achieving a sense of food security at the household level, 35% of participants answered unemployment. Closely following unemployment was income support being too low or not having enough money (26%) and the need to support other members of the family or household crowding (14%). The high cost of food was the main difficulty for 12% of respondents.” (78)

Subtheme 2: Social Network or Food Sharing

“When asked how they adapt when there wasn’t enough food, the majority of participants mentioned food sharing. Food sharing with family was the most common, followed by food shared between community members and then food shared with friends. Food sharing with family included immediate family as well as relatives, even if the relatives lived in another community. Food sharing was seen as a normal part of daily life and occurred more often during hunting seasons when game meat was made available by hunters. Most of the participants described that the food shared was traditional game meats.” (74)

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Infectious Disease 1: COVID-19

Theme 3: Food Availability

Subtheme 1: Food Programs

“[Community food programs] were highly valued among users, with 82% reporting that they regularly help alleviate hunger, while the absence of other options for accessing food during times of need was widely noted.” (78)

“For users, the [community] freezer temporarily connects them to their traditional, land-based lifestyle by making all that is beneficial to them from their traditional territory more accessible.” (85)

“[Community] gardens were regarded by community members as a means to acquire produce at a cheaper price, especially potatoes, which are favoured but very expensive in Fort Albany.” (86)

“The school snack/breakfast program emerged as a valued resource that currently supports healthy eating. However, it could be expanded and enhanced with increased resources (e.g. personnel, time, money and food variety).” (83)

Subtheme 2: Hunting or traditional food knowledge

“There was generally concern expressed that the younger generations, along with Vuntut Gwitchin living in Whitehorse, are losing their connection to traditional culture. It was suggested that the school and parents should be encouraged to provide more education in traditional ways—both sharing the harvest and traditional food handling and preparation methods.” (70)

“The loss of knowledge on how to prepare [traditional food] was identified as a challenge for some; one Photovoice participant explained not knowing how to prepare geese which had been given to her by family members.” (79)

“Participants from both communities reported that the health of the animals has declined, and the taste and texture of caribou and fish had changed. Participants from Kugaaruk cited the reason as being pollution from exploration, or using wooden storage containers for the fish instead of using ice.” (87)

“Residents spoke about travelling during unstable/unpredictable ice conditions, which were occurring with greater frequency; this created anxiety and unsafe travel conditions regardless of the financial costs incurred, which led some users to opt out of harvesting activities.” (85)

“Barriers mentioned included the loss of culture as a reason for no more hunting; less [personal] time for hunting, fishing and cooking traditional food due to employment, and concern about environmental contaminants in hunted food.” (74)

“The general trend is that harvest levels for some of the most important traditional foods, including caribou, geese, fish, and whales, are declining due to changes in migration patterns and population numbers (availability), changes in the ability to travel to harvesting areas (access), or declines in species health (quality)” (88)

Subtheme 3: Limited food availability

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**Infectious Disease 1: COVID-19**

“Living in the north ... we don't always get the right foods, meaning vegetables, fruits, and dairy products within our store. ... The meats are not very selective here because we don't know [when] the shipments arrive ... by the time we know most of the meat is outdates. So, I think that we are limited here.” (75)

**SDH 3: Mental Health**

**Theme 1: Alcohol and Substance Use**

“Although both solvent and alcohol abuse were associated with suicide attempt in the sample as a whole, the link to solvent abuse was much stronger in males and increased the odds of attempt by 4.4 times.” (89)

“Over the entire 21-year cross section that was considered, communities in Nunavut that prohibited alcohol reported fewer violent crimes compared to those where the importation of alcohol was legal.” (93)

“Some negative feelings like boredom were associated with negative behaviours, such as alcohol and substance abuse. As one young woman commented, “that's what everyone who's drinking says- they drink 'cause there's nothing else to do... One of my friends always says that he smokes dope so that the day don't seem so long.” (95)

**Theme 2: Family and Support Networks**

“Suicide attempters were signicantly more likely to report parents with a drinking or drug problems, having friends who had attempted or committed suicide, use of solvents in their life time, and having had personal or mental health problems during the previous year.” (100)

“Inuit more generally spoke about suicide in terms of aloneness, romantic relationship problems, and family relationship problems.” (96)

“The most common stressor was family conflict/stress (35%, n = 38), closely followed by marital relationship stress (e.g. breakup-ups; 26%, n = 29)” (97)

**Theme 3: Gender**

“Results differed by sex. Among males, differences were observed within all three categories of drinking motives (enchantment, social, coping), while only one category adolescent females (enchantment) was revealed to be significant.” (91)

“The gender divide in suicide mortality was similar in Labrador and newfoundland because males accounted for the majority of deaths (n = 110; 85.9% and n = 5222; 84.6%) and had a higher ASMR [age standard mortality rates] than did females in both regions.” (101)

“Distress call were made more frequently by females (n = 1,674) than by males (n = 1,184).” (102)

**Theme 4: Seasonality**

“The arctic months from October to March accounted for (73%) (n = 81) pf the total referrals, while referrals in the summer months from July to September accounted for only 15% (n = 17).” (97)

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Infectious Disease 1: COVID-19

SDH 4: Socioeconomic Status (SES)

Theme 1: Income

“Women described how lack of resources, instability and discrimination affected their ability to make an adequate income. Most women relied on Income Support at levels that do not match the high cost of living in the Arctic.” (110)

“Using the lowest income category as the reference category (≤ $20,000), odds of an at-risk BMI increased with increasing categories of income: OR = 1.82 (95% CI 1.47, 2.27) and 3.66 (95% CI 2.57, 5.21) for those $20,000–60,000, and $60,000, respectively.” (107)

“In the ‘poor health’ profile… less than one-third had an individual income superior or equal to $20,000, and lived in a community with a high socio-economic level.” (111)

Theme 2: Employment

“For both males and females, employment was associated with significantly greater total energy intake, fibre intake, and lower intake of [traditional foods].” (106)

“Employment and income support were both associated with increased traditional food consumption… employment may increase financial ability to purchase traditional foods from hunters or through local networks, and also supports the cost of motor vehicles and fire arms which require fuel, ammunition, and maintenance, hunting has become a costly endeavor.” (109)

“Higher education, employment, personal income, and private housing were all significantly associated with an at-risk BMI.” (107)

Theme 3: Education

“A few noted that they had been encouraged to go back to school, but none suggested that they were currently attending classes. On respondent said: ‘…its not easy being homeless and trying to go back to school… and not having anything to eat or anywhere to wash your clothes or have a shower.’” (114)

“Many women interviewed had not completed high school… Although a few described completing high school as adults, for many, their current unstable living conditions made it challenging to undertake further education.” (110)

“For women, acculturation appears to be attended by higher educational attainment which results in lower, rather than higher, risk of obesity and metabolic disease.” (106)

SDH 5: Cultural Continuity

Theme 1: Holism

“A holistic view of a person’s ties to land, home, traditions, values, distinctive roles and responsibilities and boundaries/possibilities.” (115)

“… emphasizes interconnections between the quality of our mental, physical, emotional and spiritual lives.” (115)
### Infectious Disease 1: COVID-19

#### Theme 2: Relationship

“Thereby far the most prominent theme across all interview questions/questionnaire items, and interrelated with most other themes, was the central importance of family and kinship. Being with family, speaking with family, visiting, going on the land together, sharing food together, and many other family-related activities were closely associated with wellness, happiness, health and healing.” (116)

“Increasing levels of community involvement through either sporting events, community events or attending public meetings were statistically associated with a 17% increase in the odds of having good health (p < 0.01).” (117)

#### Theme 3: Community voice

“Community members’ shared histories, experiences, language(s) and economy/trades shape how we conceive health, experience health care, develop trust in health care systems and interact with Western medical systems. Access to quality health care for all members of the community is crucial.” (115)

“As soon as they see a [familiar] face, it hits close to home.’ Richard, a local hunter and recreational boater, also felt that engaging in safe boating practices was important as a community. He explained, ‘[Safety] comes back to the responsibility of the community as a whole. We can all work together to make this work.’” (119)

#### Theme 4: Cultural responsiveness and consideration

“Cultural sensitivity by promoting a knowledge exchange among health-care workers, researchers, and communities that incorporates a holistic view of the interconnectedness of traditional spiritual and environmental laws and an understanding of the natural order.” (115)

“However, because Inuit nurses and students are double-cultured, they are able to negotiate the cultural gaps between Inuit and Southerners, including language, body language and differences in pedagogical approaches.” (120)

#### Theme 5: Nourishment

“This value recognizes the importance of water and food as nourishment to achieve balanced health, emphasizes local/traditional food and the sharing of food and recognizes the need to use resources wisely and to ensure equitable access.” (115)

“Household harvesting activities and satisfaction with access to country food were both positively associated with the odds of better health by 11% and 54%-57%, respectively, with consumption being significantly associated (p < 0.01).” (117)

#### Theme 6: Language interpretation

**Subtheme 1: Ethical/cultural dilemmas**

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“There were significant moral conflicts, especially when the values of the health care providers clashed with those of the communities, families, and interpreters themselves. Interpreters described feeling caught between the expectations of the patient/family on one side and the health care providers/institution on the other. These encounters could produce moments during which no apparent “right” solution would emerge, leaving interpreters feeling isolated in the middle, an experience one described as “a very lonely experience.” Interpreters were left with deep emotional distress and without guidance in how to resolve such conflicts.” (121)

“For example, interpreters are often expected by the health care team to transmit news of death and terminal diagnoses. Such tasks are traditionally assigned to community leaders and elders, known locally as Tutsalukkaijiit. These leaders and elders are recognised as having attained the life experience that equips them for the emotional weight of responding to family grief, and the wisdom to guide this process. Several interpreters described feeling overwhelmed when the health care providers assigned them such a task, feeling that they would be contravening local custom and social norms.” (121)

Subtheme 2: Limited training and resources

“Inuit interpreters described lack of linguistic training and resources as a major challenge in their work. While the anatomical knowledge they had attained through hunting, schooling and various media (e.g., television, radio and internet) had served them well, many described their own knowledge as inadequate.” (121)

“They also spoke of the need for professional recognition of their services and wished for the opportunity to receive this recognition based on the training and experience they have had while working in the field.” (121)

Subtheme 3: Low job retention

“A management problem common across these diverse health contexts is low job retention and absenteeism of the northern attendants. … [It] is emotionally stressful to interpret difficult news and regulate conflict between patients, families and health care providers; there is little to no on-the-job linguistic training and supplementary interpreting resources; and the wages and benefits are not competitive compared to other local employment (e.g., with schools or the municipality.” (121)

“Those who provided interpretation services in these contexts are employed as “préposé en établissement nordique” – or “northern attendants”. These northern attendants speak English and/or French as well as Inuktitut. Their job description includes tasks such as cleaning, sterilising equipment, feeding and washing patients, as well as interpretation.” (121)

SDH 6: Housing

Theme 1: Air Quality

Subtheme 1: Ventilation

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Infectious Disease 1: COVID-19

“Six houses (13% of 46) had ventilation below the recommended minimum of 0.35 changes of air per hour” (122)

“Houses in Qikiqtaaluk Region were small and crowded relative to most Canadian homes, and they had reduced ventilation both in absolute terms and relative to the number of occupants. Ventilation was reduced in about 80% of the houses evaluated, with mean and peak CO2 levels commonly exceeding recommended values” (122)

Subtheme 2: Health Implications

“Twenty-one of the children (43%) were reported to have been admitted to hospital in Nunavut and 11 (22%) to have required transfer to a tertiary centre” (122)

“Reported lower respiratory tract infection was significantly associated with mean and maximum indoor CO2 concentrations” (122)

“Reported asthma was associated with increased maximum indoor CO2 but not with other measures of ventilation” (122)

Theme 2: Overcrowding

Subtheme 1: Prevalence

“The prevalence of household crowding was high at T1 [between 2005 and 2010], with a little over six out of 10 children living in households characterized nu a PPR above 1. This prevalence decreased to four out of 10 at T2 [between 2013 and 2016].” (123)

“On average, there were 6.6 individuals per house, with a median of 6 individuals. The prevalence of overcrowding was high, with 6 out of 10 households with more than 1 person per room” (125)

“It can be seen that the housing factor is poorly correlated with any of the three outcome variables [morbidity, breach of safety, social problems]” (124)

Subtheme 2: Other Impacts

“[A] paradoxical relationship between housing and number of fires and admission to correctional institutions were observed: the better the housing, the more fires and incarcerations for offences” (124)

Subtheme 3: Physical Health

“Crowding was measured by person per room was associated with LTBI after adjusting for all the other SDH measured” (38)

“The use of health centre visits turned out to serve quite well as an overall indicator of morbidity, being correlated with most housing and SES indicators.” (124)

Subtheme 4: Psychological Health

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Infectious Disease 1: COVID-19

“At T2, nearly one-third of the adolescents reached a clinical level of depressive symptoms. Also, nearly one out of five adolescents had suicidal thoughts during the year preceding the interview” (123)

“Our results did not show any long-term effects of household crowding on adolescents’ psychological distress” (123)

“In this study, household overcrowding was not found as a risk factor of psychological distress by itself, but could be part of a wider and complex combination of health determinants of Nunavik Inuit adolescents.” (123)

Theme 3: Water

Subtheme 1: Water Supply

“Our data collected at the household level, revealed that, while these relatively low domestic water quantities are adequate for some families, those living in overcrowded households are accessing water at levels more typically seen in developing countries such as India, Bangladesh and some East African nations. Although some people are coping by retrieving water independently or sharing between households – as is customary for Inuit – for some subsections of the population, water shortages are limiting their ability to follow public health standards and negatively impacting their overall well-being.” (126)

Subtheme 2: Availability

“That 15 of the 28 households reported being without domestic water at least once per 2–4 weeks.” (126)

“Participants did in fact report that households with young children often require more water than they receive” (126)

“Our research revealed, however, that many distributions system challenges still exist and that some households in the case study community are not receiving adequate quantities of municipally delivered water.” (126)

Subtheme 3: Dealing with low supply

“Participants identified three coping techniques used to deal with municipal water delivery delays” 1)retrieving their own water, or ice, from local rivers and lakes, 2)relying on neighbours and extended family to share available water and 3)altering their daily activities based on water availability” (126)

“Many participants conveyed their preference for independently retrieving water as per traditional practices, regardless of a delay situation, which alleviated their dependence on municipal services” (126)

“Despite noting their frustration, some participants accepted that periodically not having water at your home was part of everyday life.” (126)

Subtheme 4: Impact of low supply

CHN: Community health nurse; ICS-TB: International Circumpolar Surveillance Tuberculosis Working Group; IGRA: Interferon gamma release assay; IR: Incidence rate; LTB: Latent tuberculosis; LTBI: LTB infection; NWT: Northwest Territories; OR: Odds ratio; SDH: Social determinants of health; SES: Socioeconomic status; TB: Tuberculosis; TST: Tuberculin skin test
**Infectious Disease 1: COVID-19**

“Domestic water delays and shortages exceeded the notion of inconvenience for some participants, and began limiting their ability to adhere to hygiene related public health practices and routines.” (126)

“As a result, their health and well-being may be negatively affected if they are not capable of supplementing their domestic water supply by other means. In particular, the consequences of shortages and interruptions are more severe for participants in overcrowded housing, families, with young children households dealing with existing communicable infections.” (126)

**SDH 7: Community infrastructure**

**Theme 1: Physical resources**

“[In] the winter the sidewalks are not as maintained. In the summer you could sort of go anywhere, and everywhere quicker as compared to walking in deep snow, or snow banks to go around” (130)

**Theme 2: Communication resources**

“These types of information are usually relayed through the local FM radio, which used to be the main mode of public communication in Arctic communities ...” (129)

CHN: Community health nurse; ICS-TB: International Circumpolar Surveillance Tuberculosis Working Group; IGRA: Interferon gamma release assay; IR: Incidence rate; LTB: Latent tuberculosis; LTBI: LTB infection; NWT: Northwest Territories; OR: Odds ratio; SDH: Social determinants of health; SES: Socioeconomic status; TB: Tuberculosis; TST: Tuberculin skin test

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**Infectious Diseases**

COVID-19: Two papers analyzed COVID-19 case and mortality data in Arctic countries and concentrated on spatiotemporal trends and regional differences.(1, 33) Between February 21, 2020, when the first COVID-19 case was documented in the Arctic, and July 1, 2020, Arctic Canada only had isolated cases and no significant outbreaks. (1) (33) The authors attributed this to the remoteness, strong public health guidelines, strict quarantine requirements, and knowledge that existing SDH challenges, including limited healthcare, existing SES, and health concerns could make Indigenous communities in the Arctic highly vulnerable.(1) Arctic Canada endured the second wave in November and December 2020 with limited fatalities again due to strict public health measures and the fact that many Indigenous community members were on the land at this time (i.e., in minimally populated areas where hunting, fishing, and foraging occur).(33)

H1N1 Influenza: This category included five papers that yielded five major themes: hospital admission (1),(34) pandemic experience (2), (35, 36) community response (1),(37) public health response (3),(35–37) and future pandemic plans or recommendations (4).(23, 35–37)

One study examined infant hospitalization due to respiratory tract infection in Inuit regions during 2009 and found that H1N1 infection accounted for 12.1% of admissions.(34) Pandemic experience related to strategies and measures put in place to curb the spread of infection, including screening at healthcare facilities, closing down public/community centres, and postponing large gatherings.(36) Low rates of
adherence by community members and unsuccessful distribution of vaccines were noted as a hindrance to measures being effective. Similarly, limited resources, especially personnel (i.e., nurses), were identified as a barrier to curbing the spread of infection during the H1N1 influenza pandemic. Community response encompassed specific plans implemented in phases by the communities. These phases and plans tended to be dynamic from initial implementation to the end of the pandemic. Authors also noted the need for community- or region-specific responses. Future pandemic recommendations were focused on communication and adaptability at all levels, from community to governments, and made to ensure that information dissemination was effective, response plans clearly outlined level of accountability, and plans were responsive to communities’ evolving needs throughout the course of the pandemic. Critical public health responses during the pandemic included surveillance, distribution of antiviral medications, and access to health services. Effective communication between governments and health systems and clarification regarding roles and responsibilities at each level were identified as areas for improvement.

Tuberculosis: Five papers pertained to TB. Factors significantly associated with TB status were sociodemographic (age, education, and ethnicity). One study found a homeless shelter and a gambling house hosted super-spreading events in Nunavut and suggested the important roles socioeconomic factors play in the transmission of TB. Nunavik, an Inuit region in Northern Quebec, had a TB incidence rate of 199.5/100,000. In 2021, TB among Inuit (170/100,000) was 300 times more prevalent compared to non-Indigenous populations (0.5/100,000). A 51-month cohort study in Iqaluit, Nunavut noted a latent TB infection rate of 19.1%; more than half (53.0%) of patients with latent TB was Inuit, while 28.6% was non-Inuit (ethnicity of the remaining 18.5% of patients was unknown). Of Inuit offered prophylactic treatment, 75% initiated treatment, and of Inuit who initiated, 76% completed 100% of the doses prescribed. One study implemented interventions for TB prevention among youth and utilized training videos, which seemed to be an impactful way of learning for Indigenous youth. However, the authors suggested future studies are needed to target specific age groups while remaining sensitive to Indigenous cultures and traditions.

SDH

Healthcare access: Twenty-seven papers were identified and featured three areas of discussion: service providers, healthcare service availability, and healthcare policies. Strong patient-provider relationships were associated with positive health outcomes. Developing strong relations was dependent upon healthcare providers’ level of community engagement and ability to communicate clearly and respectfully, both verbally and through use of body language. Acknowledging the role of SDH when providing care was important for healthcare providers to build relationships with patients, as one physician expressed, “[Patients are] working on more basic issues than checking where their blood sugars are at” (p. 556). Nurses coming from Southern Canada were often unprepared for the cultural context and institutional procedures of the
High demands of providers and staffing shortages created provider burnout, high turnover rates, and barriers to effective training, which hindered culturally safe care and impeded continuity of care. Understaffing resulted in shifting focus towards acute care and away from managing chronic diseases, such as diabetes. Service providers reported feeling overworked 24 hours a day without adequate support and burnt out, particularly nurses from Southern Canada who experienced difficulty adjusting to Arctic culture. Physicians practicing in northern territories identified limited involvement in making healthcare policy, limited cultural safety, discontinuity of care, tasks outside scope of practice, high turnover, and limited support as contributors to physician burnout. Building supportive relationships with colleagues and the community and spending time on the land and outdoors were reported to mitigate physician burnout.

Availability of and access to healthcare services were discussed in 13 articles pertaining to general access, services specific to diseases such as cancer and diabetes, medical travel and virtual consultations, services embracing LGBTQ2S+, and abortion and pharmaceutical services. Indigenous community members were more likely to consult with community nurses than with physicians, due to the limited number of physicians in Indigenous communities. In the current healthcare system, health centres in remote and isolated northern communities are staffed by nurses that provide primary health care and provide physician services by visiting physicians or medical travels of patients to a regional centre. Inuit women had lower rates of cervical cancer screening and mammography compared to non-Indigenous women. Remote communities had limited access to services as some cancer screening programs were unavailable at the community level and required travel to access. This often tended to delay diagnosis and treatment. People with diabetes advocated for more culturally appropriate and relevant forms of healthcare and for information available in Indigenous languages.

Medical travel is a key part of healthcare in the Arctic. A 2010 study reported that while 94% non-Indigenous adults across the Canadian Arctic lived within a linear distance of 50 km from a hospital, 50% of Inuit lived more than 400 km from a hospital, and were required to travel to access critical healthcare services. About half of medical travel was undertaken by people from remote communities travelling to regional centres with a hospital, either within the territory of residence or in neighbouring provinces in Southern Canada. Twenty percent of medical travelers went from regional centres to large urban centres in the provinces, and another 20% travelled from remote communities with only primary care to large urban centres such as Ottawa, Ontario and Edmonton, Alberta. Time spent at each facility differed based on the treatment required: from an average of nine days in Edmonton, Alberta to over a month in Ontario among Inuit cancer patients and escorts from Nunavut. From 2011–2016, Northwest Territories and Nunavut averaged 23,012 and 21,578 annual medical trips, respectively, and 10% of medical travels were emergency medevacs, which accounted for 49% ($9.5 million) and 35% ($24.8 million) of the total medical travel costs of the Northwest Territories and Nunavut, respectively. Patients faced costs associated with paying for childcare and telephone calls while away from home. Patients’ partners incurred air travel costs to support the partner, and lost wages associated with taking time off work or hunting to care for children. Medical travel had numerous challenges including:
arrangements for family,(50, 63, 65, 67) communication,(63, 65, 67) limited equipment,(43, 66) logistics, (63, 67) impersonal policies,(63, 65, 67) remoteness and weather,(43, 67) and facing unfamiliar environments during care.(63, 65, 67) Patients felt overwhelmed by having to stay with strangers in shared residences, grow accustomed to the weather in Southern Canada, and eat unfamiliar food.(63, 67)

One study (61) examined virtual consultations as a solution to overcoming barriers to accessing care without the need for medical travel. It was estimated that virtual consultations could result in a total saving of $180,553, or $1,101 per session.(61) The utilization of technology such as robots to provide remote physician presence in Arctic communities was suggested as a feasible and cost-effective option to improve healthcare access.(69)

For LGBTQ2S+ community members, limited availability of inclusive care was a barrier for accessing healthcare. Studies documented that individuals felt dominant norms devalued non-binary identities and LGBTQ2S+ health information and services.(52, 58) Stigma surrounding non-binary relationships was a barrier for seeking out information regarding safe sex efficacy and discussing it with one’s partner, particularly in small communities where residents know each other and achieving confidentiality may be difficult.(59)

Emergency response systems referred to an ability to immediately respond to medical emergencies in the studies. Arctic conditions and limited or challenging roadways complicated the availability of these services.(62) Arctic search and rescue was found to rely heavily on volunteers, who were often undertrained and burnt out.(49) The high emotional toll on search and rescue volunteers was identified as a cause of high volunteer turnover.(49) One article focused on the lack of funding resources for local emergency response within communities.(46)

Papers also examined the availability of and access to specialist services such as women’s health services, including abortion (68), pre- and post-natal care,(65) and pharmaceutical services.(47) Women faced significant challenges when accessing abortion services due to complicated processes that lacked transparency, leading to financial and emotional stresses.(68) The variety of birthing and postnatal services to accommodate women’s preferences were also limited in the Arctic. Some women struggled with the limited options available and felt left out of decision making.(65) Pharmacies faced challenges with resources and medications were often delivered later than required in remote communities.(47) Difficulties contacting patients to pick up prescriptions and limited understanding of medications affected patient adherence to treatment regimens.(47)

Policies that may affect healthcare access in terms of obesity(60) and diabetes care(45) were explored with key informants. Participants identified systemic barriers to care experienced by parents, including fragmented and scattered healthcare delivery and responsibilities concerning diabetes care.(45) Obesity prevention was identified as the area of least priority by the healthcare system and also a barrier to providing adequate access to care.(60)

Food security: A total of 19 articles were included: ten papers presented on the prevalence of food insecurity,(70–79) 11 on food accessibility,(70, 74–76, 78–84) and 13 on food availability.(70, 74, 75,
Over 40% of individuals in an Inuit community had low or very low food security. At the individual level, food insecurity was associated with: an annual income of less than $20,000 CAD, an at-risk adiposity level, limited formal education, living with three or more family members, unemployment, and having few hunters or fishers in the family. The majority of community members utilizing community food programs (e.g. food bank) experienced not having enough food in the past year. Coping strategies included eating less preferred food, reducing amount of food consumed, and selling belongings for money to get food. At the household level, food insecurity was more common in Inuit households (45%) compared to non-Inuit households (4%). Studies found a higher prevalence of severe food insecurity in Inuit households (27%) compared to First Nations households (17%), although overall food insecurity was more common in First Nations households (70% compared to 63%). Factors associated with household food insecurity were: the family member in charge of food preparation being 40 years of age or younger, unemployment, suboptimal housing conditions, absence of an active hunter in the family, and having children in the household.

Food accessibility was subcategorized into purchase/cost/affordability and social network/food sharing. Although an individual’s ability to achieve food security considerably varied by region, high costs of food and limited food options were common challenges. With traditional food supplies decreasing, market foods were considered as alternative food sources but were often unaffordable or of low quality and nutritional value. Remoteness resulted in long transportation times, compromised food quality, particularly of perishable foods such as fresh produce and dairy products, high food costs, and limited variety. Market foods were two to three times more expensive in the North than in southern regions of Canada, despite government subsidy programs. Traditional/country foods was reported to be affordable and easily accessible by Dene/Métis women, while Inuit women found otherwise. Difficulty accessing both market and traditional/country foods was further aggravated among low-income individuals or families. School snack/breakfast programs were reported to increase students’ access to healthy food although could be improved by increasing the variety of food.

Food sharing with networks of family or community members was identified as a means to secure traditional/country foods. Having extended family members, elderly or hunter household members, and someone to supply traditional/country food in the family network was an advantage for accessing traditional/country foods. Households headed by a single young woman were marginalized in such networks, although households headed by a single elderly woman were not, as the children were often old enough to hunt and provide traditional/country foods for household consumption. Individuals or households with the ability to provide compensation or hunting supplies for food were more likely to receive traditional/country foods from others.

Studies identified limited market food availability in remote communities. Traditional/country foods were less available in larger communities. Complex reasons for the limited availability of
traditional/country foods were categorized into the ability to hunt (74, 78–80, 82, 85, 86) and environmental factors.(70, 74, 81, 85, 88)

Hunting had become difficult for several reasons and affected traditional/country food availability. First, knowledge related to harvesting and preparing traditional/country food was being lost in Arctic communities, particularly in younger generations.(80) Increased formalized employment restricted individuals from hunting due to limited time available.(80) Costs of hunting supplies such as guns and gas were perceived to be high.(74, 79, 80, 85, 86) Hunting was not always successful, making hunting less economically efficient and less enjoyable.(74) Available supports, such as funding for hunting equipment, were less than what was needed.(80)

Climate changes and the impact on traditional food availability (e.g. increased rainfall, less extreme winter) were commonly observed across Arctic communities. (85, 87, 88) These changes provided access to lands that were historically inaccessible, and increased hunting grounds and vegetation growth, which fattened caribou,(87) but also resulted in unstable and unsafe hunting conditions, and changes in health, abundancy, behaviours, and migration patterns of animals.(70, 74, 81, 85, 87, 88) Contamination was also perceived to affect animal health and the taste and texture of harvested food.(74, 87)

Mental health: Seventeen articles focused on mental health, and four major factors of mental health were identified: alcohol and substance use (4),(89–93) family and support networks (5),(94–98) gender (7), (91, 97, 99–103) and seasonality (3).(97, 104, 105).

A history of substance use and having a parent with an alcohol or drug addiction were reported as factors related to suicide attempts.(89) Alcohol use was reported among 60% of pregnant Inuit respondents in Northern Quebec.(90) Binge drinking was identified as a major public health concern in some communities in Nunavut and Northern Quebec.(91, 92)

Research on family and support networks produced mixed findings. Some studies found families and friends played a key role in contributing positively to mental health,(94, 95) and support networks helped community members feel engaged with and connected to community.(95, 98) Others found family and support networks could adversely affect mental health; of Inuit receiving psychiatric consultation, 35% reported family conflict/stress, 26% marital and relationship stress, and 26% family member abuse.(97) High levels of suicide within groups could create a ‘social logic’ to suicide, which could be internalized by the community and repeated by others.(96) Physicians were reported to be the major source for psychiatric consultations,(97) although about two thirds of psychiatric care clients in Iqaluit reported having no previous professional psychiatric support,(97) which is in line with the aforementioned limited number of general physicians.

Gender was described as a male-female dichotomy and reporting on LGBTQ2S+ persons was scarce.(91, 97, 99–102) Although rates varied based on community and time, suicidality was more common among men.(100, 101) Male Inuit youth were 17% more likely than female youth to have previously attempted suicide.(100) Women (n = 1,674) were more likely than men (n = 1,184) to call a crisis line.(102) A study
among adolescents found the odds of having a severe type of depression were twice among female cisgender, compared to LGBQ2S+ and food insecure adolescents. (103) 

Studies found seasonal variations in mental health. Winter months (October-March) accounted for around three quarters of the total psychiatric consultation referrals for Inuit clients. (97) Seasonal mood changes including seasonal affective disorder appeared to be more frequent among Inuit in the Canadian Arctic compared to other settings. (104) In the context of climate change, warmer temperatures affected quantity and quality of snow and sea ice in the winter, preventing Inuit from spending time on the land, potentially contributing to increasing mental health-related visits to clinics. (105) 

Socioeconomic status (SES): Nine studies pertained to SES. (106–114) Income, employment, (106–112) and education, (106, 108, 109, 113, 114) were coded under SES. Studies showed that these SES indicators were associated with health behaviours, (106, 109, 112) such as eating patterns and safe sex practices, (106, 109, 112) and health outcomes, such as chronic conditions, (107, 108, 111, 113, 114) in Arctic communities. Individuals with low SES were disproportionately faced with challenges related to other SDH such as food and housing security. (110, 114) 

Cultural continuity: Seven studies were categorized into six cultural aspects: one into holism (115) four each into relationship, (115–118) sense of community, (115, 117–119) and cultural responsiveness and knowledge, (115, 116, 118, 120) three each into nourishment, (115, 117, 118) language. (117, 120, 121) 

Holism has been described as viewing a person in relation to land, traditions, home, values, roles and responsibilities in the world and as recognizing the interconnections between the physical, mental, emotional, and spiritual aspects of a person's health. (115) 

Relationship refers to connections between individuals and communities and related aspects such as respect (115, 118) and communication. (116) Relationships with family and kinship were found to be closely associated with one's well-being, health, and healing. (116) Changes in childbearing and parenting practices and segregation of generations often appeared to result in cultural discontinuity and confusion in one's cultural identity. (116) Relationships with other community members through community events were related to good health. (117) Although modern technologies, such as telephone and radio, introduced different ways of communicating, face-to-face communication was preferred, and linked to positive emotions, well-being, and healing. (116) 

Community members share histories, cultures, perceptions of health, experiences with healthcare, interactions with the healthcare system, and insights regarding community health needs. (115) Members of northern remote communities highlighted a need for northern-based resources that reflect local cultures, experiences, and stories in risk management messaging. (119) In Inuit self-governed regions, satisfaction with local Inuit governments was associated significantly with better self-rated health. (117) 

Cultural responsiveness and knowledge have been identified as important to health, (116, 118) yet these factors are at times overlooked by non-Inuit care providers. (120) Inuit nurses and nursing students could
help alleviate cultural tensions in the healthcare system through “double culturedness” that enables Inuit nurses and nursing students to learn, teach, communicate, and interact in both Inuit and Western ways. (120) The exchange of knowledge between healthcare providers and communities “that incorporates a holistic view of the interconnectedness of traditional spiritual and environmental laws and an understanding of the natural order.” (p. 10) was suggested to promote cultural sensitivity in the healthcare system. (115)

Achieving nourishment through traditional foods and water, respecting the sources, and sharing with others are important aspects of the cultures of Arctic Indigenous communities. (115) Harvesting, consuming, and feeling satisfied with traditional foods were positively associated with reporting good health. (117) Spiritual and emotional nourishment through sewing was found to promote health among Inuit women. (118)

Having access to services available in a local Indigenous languages in Arctic communities has been reported to be positively associated with self-rated health. (117) In one study, Inuit nursing students recognized a disconnection between healthcare education and Inuit language and felt the students needed an interpreter to properly care for Inuit patients because the students had not learned medical vocabulary in Inuktitut. (120) Healthcare professionals practicing end of life care in the Arctic were also reported to rely heavily on interpreters when discussing care options with patients and families and providing cultural and emotional support. (121) Despite the necessity of and high demand for interpreters, low job retention and absenteeism were common among interpreters due to emotional stress, limited formal training and resources, lack of recognition of interpreters’ tasks, and ethical and cultural dilemmas. (121)

Housing: In seven studies that examined housing as the living environment of community members, three main themes were apparent: one study investigated air quality, (122) three overcrowding, (123–125) and three water. (125–127) Thirteen percent of houses surveyed had low ventilation, increased CO2 levels, and poor air quality, which were associated with illness such as respiratory tract infections. (122) The poor air quality was in part due to overcrowding. (122) Studies found a high prevalence of overcrowding led to negative consequences, such as food insecurity, increased fires, and increased health centre visits. (123–125) Studies showed many distribution challenges and delays with water supply for households. (125–127) One study reported over half of the households in one community in Nunavut were without water at least once every two to four weeks. (126) Community members coped with delays by personally retrieving water, sharing water amongst families and neighbours, and changing activities based on water availability. (125, 126)

Community infrastructure: Three papers explored broader infrastructure within remote communities. (128–130) Infrastructure was discussed as both physical (e.g. steep stairways to homes and buildings, lack of ramps) and communication resources. (129, 130) Elders in one community relied on an FM community radio station for news about the community and services; however, the radio station had been
down for several months.(129) Physical community infrastructure such as roads and lighting could affect walkability and help reduce body mass index (BMI).(128)

**Discussion**

This scoping review summarized the current scientific literature about selected pandemics (COVID-19, H1N1 influenza and TB) and SDH (healthcare, food security, mental health, SES, cultural continuity, housing, and community infrastructure) in Indigenous communities in the Canadian Arctic. Herein, the relevance of previous pandemics and associations with SDH identified above to the current COVID-19 pandemic in the Canadian Arctic are discussed.

**Infectious disease and Indigenous communities in the Arctic**

Infectious diseases have persisted as factors affecting Indigenous health. In Greenland and Canada, Inuit ethnicity correlated with higher rates of TB in comparison to people of other ethnicities.(20, 131) In the United States, American Indians and Alaska Natives were 13 times more likely to die from TB in comparison to White Americans.(132) During the 1918–1919 influenza pandemic, in both Alaska and Labrador, mortality was substantially higher than the worldwide average.(21) Through the course of the 2009–2010 H1N1 pandemic, Indigenous communities in the Canadian Arctic (23) and Alaska (133, 134) experienced higher prevalence and impacts than non-Indigenous communities. COVID-19 is a respiratory disease like TB and similar implications have been documented among Indigenous communities.(2, 135–138) Recent restrictions and proscriptions in place to prevent COVID-19 may present greater challenges in Indigenous communities than non-Indigenous populations in the Arctic due to existing socioeconomic, geographical, transportation, food security, water security, and housing barriers combined with a culture of holism and interconnectedness that includes traditional gatherings.(139) Targeted, evidence-based, community informed and led responses are urgently needed.

**SDH**

COVID-19 and the social, economic, and health impacts of the related restrictions could exacerbate the already existing SDH, increasing vulnerability to COVID-19 and other health implications in many Arctic communities. Medical travel has become increasingly complex during the pandemic. Restrictions and suspension of non-urgent care may reduce the spread of COVID-19, although at the same time have long-term negative implications, such as reduced cancer survival due to delayed diagnoses,(140) and permanent vision impairment or blindness due to postponed eye care.(141) Delaying non-urgent health services has been outlined by the Northwest Territories and Nunavut in pandemic response plans.(142, 143) The territories seek to maintain medical travel(143) and urgent medical travel has continued, although accessing healthcare services remains a concern with the surge in active COVID-19 cases in Alberta, a destination for northern residents embarking on medical travel.(142, 144) Future research is
needed to explore the impact of COVID-19 on medical travel and the short-, medium-, and long-term effects of delayed access to care.

The H1N1 influenza pandemic highlighted an increased need for psychological support for healthcare providers. COVID-19 likewise has evoked fear, uncertainty, frustration, anger, helplessness, and sadness among nurses in Southern Canada. Healthcare providers in the Arctic already reported high levels of stress and burnout prior to the COVID-19 pandemic – a fact that has serious implications for access to quality care for Arctic communities, yet inquiries into the impact of the COVID-19 pandemic on the mental health of Arctic healthcare providers is largely non-existent. As the pandemic continues, it will be critically important to support healthcare providers’ mental health, thereby enhancing the ability to provide quality care while protecting against burnout. Supports could also include education related to culture and traditions of the Indigenous communities, promoting integration, and meaningful connection to the communities within which the providers are employed.

The adverse impact of the COVID-19 pandemic restrictions on mental health has also become a pressing concern in the general population. Anxiety, depression, stress, insomnia, compulsive behaviours, phobias, and life dissatisfaction have all been reported in general public and healthcare providers. The rate of suicide among Inuit and prevalence of alcohol use were high, which are generally understood to be rooted in a history of colonization and continued colonialism, forced assimilation, and resulting intergenerational trauma. Some studies in this review identified the impact of seasonality on mental health in Canadian Arctic communities. Recent studies observed seasonal variation in transmission of COVID-19 as outbreaks are more common in winter months particularly at higher latitudes. Special attention to mental health and seasonal variation of COVID-19 transmission among Indigenous community members in the Arctic is imperative. The scarcity of resources in the midst of the pandemic may be a specific cause of uncertainty and fears. Social distancing advisories during the present pandemic may have the potential to complicate access to support networks, connecting with families and Elders, and cultural practices, and affect mental health within Indigenous communities in the Arctic. It was suggested to Indigenous community members to go on the land and engage in traditional activities to cope with the pandemic. Studying stressors and resilience strategies will be important for understanding how COVID-19 is shaping the landscape of mental health in the Arctic.

Historically, colonial and assimilation practices continue to contribute to ongoing health inequity and adverse health experiences and outcomes for Indigenous peoples. Today, many Indigenous community members subsequently find there is limited acknowledgement of language, lands, traditional foods, traditional knowledge, holistic views of health, and self-determination when accessing healthcare. COVID-19 mitigation measures may have further adversely affected the practices of Indigenous cultures, such as gathering and visiting, which are critical for strengthening relationships with family and community and holistic traditional nourishment through the sharing of foods. Ceremony and generational connections are critical elements of Indigenous cultural wellbeing in the Arctic. The importance of culturally safe care to improve general health and promote healthcare utilization for managing chronic conditions has been highlighted. In the presence of a contagious
disease such as COVID-19 that has exempted no one, culturally appropriate care becomes even more important for the effectiveness of public health measures and rapid acceptance by the communities. Listening to and understanding Arctic Indigenous community members’ experiences with and perceptions of public health messages and overall health system responses during the pandemic should inform the development of culturally safe, appropriate, and relevant public health measures and community level messaging in the current and future pandemics.

The COVID-19 pandemic has affected food production, distribution, and transportation, and exacerbated food insecurity worldwide.\(^{164–167}\) Studies in the Arctic identified a young age of the main provider, low income, and low educational attainment as factors positively associated with food insecurity during the pandemic.\(^{165, 166, 168}\) In Canada, the prevalence of food insecurity has historically been higher in the northern territories (49.4% in Nunavut, 15.9% in the Northwest Territories, and 12.6% in Yukon compared with the national rate of only 8.8% in 2017/18).\(^{169}\) During the current pandemic, 14.6% of Canadian households in southern provinces experienced food insecurity,\(^{168}\) but the prevalence in northern communities is unknown.

Moderate or severe food insecurity may have significant biological implications including malnutrition, suboptimal immunity, and increased susceptibility to infections. Inuit traditionally had diets rich in vitamins A and D,\(^{170, 171}\) and have recently undergone a dietary transition that has resulted in reduced consumption of traditional/country foods and intake of nutrients important for immunity.\(^{170–174}\) Food insecurity may also hinder individuals from adhering to public health guidelines when working or accessing community food programs.\(^{175}\)

Housing and infrastructure play an important role in containing and managing infectious disease outbreaks at individual, household/family, and community levels. Studies showed that overcrowding and poor quality housing had negative implications on health in general,\(^{176, 177}\) and could increase vulnerability to the spread and impact of infectious diseases.\(^{138}\) Infrastructure needs to account for the uniqueness of location and be tailored to balance the demands of geographical location with the needs of residents. The physical distancing measures stress the importance of access to uncrowded spaces, and the implication of overcrowded housing on COVID-19 experiences in remote Arctic communities should be further studied. Other aspects of living environment and infrastructure, such as roads, public lighting, and even phone and internet access could affect access to information and services during the pandemic and merit investigation.

Though we believe this review sets the stage for future action as well as research into infectious disease and SDH in Arctic Indigenous contexts, there are several limitations. First, the literature search was limited to the selected databases through the University of Alberta, the selected search terms, and studies published in English, and may not have identified all existing literature. However, we consulted two publications regarding SDH and carefully deliberated the search terms. English and French are the two Canadian official languages, and the authors believe that searching for articles published in a language other than English or French would not have yielded different search results. Second, a few SDH that may
have implications for COVID-19 were excluded from this review. For instance, the SDH of the environment and isolation are unique in the Arctic setting. However, these SDH were presented in relation to other SDH and the authors believe this review provides context to these excluded SDH in some extent. The SDH of discrimination was also omitted. Ongoing systematic racism is rooted in the history of colonialism and shapes many aspects of other SDH among Indigenous peoples in Canada, which explain why the author’s found discrimination was interwove with other SDH in literature. A review on the impact of discrimination on prevention and management of infectious diseases among Indigenous peoples in Canada is necessary to address this gap. Last, this review focused on the Canadian Arctic. Prior to the pandemic, the common concern Arctic Indigenous communities worldwide experienced was much more adverse health outcomes than non-Indigenous populations.(178) However, Arctic nations are heterogeneous and have unique health settings and differing impacts of SDH. Indigenous communities in Greenland show higher rates of binge drinking, smoking, overweight/obesity, and suicide mortality and a shorter life expectancy.(178) In Arctic Russia, Indigenous communities have lower social and ethnic health indicators and score lower in the dental health index.(178) Sami in Northern Scandinavia had similar health indicators compared with non-Indigenous people, except for Sami reindeer herders in Sweden and Sami-speaking patients in Norway that showed lower confidence in and satisfaction with primary healthcare services.(178) Alaska Natives in the United States and Inuit in Northern Canada have lower socioeconomic status, shorter life expectancy at birth, higher rates of smoking, overweight/obesity, and TB, and higher suicide mortality rates compared to the general populations.(178) This is likely to have gotten much worse due to the pandemic. Given the global impact of COVID-19, further review and discussion concerning the implications of SDH on the COVID-19 pandemic in other Arctic countries is needed.

While the rest of Canada experienced the first few waves of COVID-19 transmission in 2020, northern territories saw significant spikes starting 2021; currently the rate of total cases is the highest in the Northwest Territories (10,905/100,000 population compared to the national rate of 7,706/100,000, as of January 21, 2022).(179) Since declaring a state of public health emergency, restrictions and special requirements for travel and gathering may have greatly impacted residents in the Arctic, particularly Indigenous residents whose culture embraces sharing and gathering. Experiences with containing the spread of the virus may be substantially different and more challenging in the Arctic given SDH are affecting the communities disproportionately.

Conclusions

COVID-19 continues to affect the lives of many people and healthcare systems worldwide. Previous pandemic events have informed strategies to mitigate the impact of the unprecedented COVID-19 pandemic; however, SDH still present many unique challenges to the health and management of COVID-19 in Indigenous communities in Arctic Canada. COVID-19 brings a double-edged sword to Indigenous communities in Arctic Canada; one end presents challenges related to preventing the spread of COVID-19 with the already-existing SDH, and the other end presents the impacts of restrictions against COVID-19 aggravating SDH. There is an urgent and necessary need to understand the experiences and
consequences of COVID-19 in Arctic Indigenous communities and document response strategies that have been successful or need improvement to inform current and future pandemic response policies and programs.

**Abbreviations**

Social determinants of health (SDH), Socioeconomic status (SES), Human immunodeficiency virus (HIV), Sexually transmitted infections (STI), Tuberculosis (TB), Body mass index (BMI).

**Declarations**

**Ethics approval and consent to participate:** As this scoping review did not involve human participants, ethical approval was not required.

**Consent for publication:** Not applicable.

**Availability of data and materials:** All data generated or analysed during this study are included in the published article.

**Competing interests:** The authors declare they have no competing interests.

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**Authors’ contributions:** FK developed the conception and methodology of the Review, and drafted and finalized the paper. SLJ conducted literature search, analyzed the data, and drafted the paper. SD and DI analyzed the data and drafted the paper. JM and GO conducted literature search. AR, SP, HM, GF, BE, LML, DK, CM, DD, SIF, AW, CR, KR, HJC, RF, RO, and SS critically reviewed the paper. SS oversaw all aspects of the project. Each listed author approved the final version submitted for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Figures
Figure 1

PRISMA 2009 flow diagram