Journal of Community Health
https://doi.org/10.1007/s10900-024-01366-1

ORIGINAL PAPER

High Adherence to COVID-19 Public Health Preventive Measures in Indigenous Communities in the Canadian Northwest Territories

Rachel Harris[1] · Fariba Kolahdooz[1] · Afsaneh Omidimorad[1] · Adrian Wagg[2] · Carolyn Gotay[3] · Debbie DeLancey[4] · Kami Kandola[5] · André Corriveau[6] · Sami Pirkola[7] · Arja Rautio[8] · Stephanie Irlbacher-Fox[9] · Sangita Sharma[1,10]

Accepted: 21 May 2024

Abstract
The aim of this project is to explore perceptions towards and adherence to COVID-19 public health preventive measures in Indigenous communities within Northwest Territories, Canada. Utilizing a cross-sectional study design the project took place within ten Northwest Territories communities between 1st April and 30th November 2021. Convenience sampling methods were utilized and adhered to public health restrictions. Self-identifying Indigenous adults (≥ 18 years old) were invited to complete a semi-structured interviewer-administered questionnaire. Participants ($n = 287$; 33.1% men, 66.6% women) had a mean age of 41.6 years (SD ± 13.5). Preventive measures were practiced by 98.6% of participants. Most participants reported often or always practicing three measures: avoiding gatherings (67.2%), avoiding usual greetings (63.3%), and limiting contact with high-risk individuals (71.4%). Most participants reported rarely/never practicing self-isolation (67.5%) and self-quarantining (76.5%) measures. Significant associations existed between the August 2021 COVID-19 outbreak and self-quarantining ($p = 0.0023$), self-isolating ($p = 0.0023$), and going onto the land ($p = 0.0001$). Participants found masking and travel restrictions challenging. Sadness and loneliness resulted from limited access to Elders. Kinship and community safety were important to Indigenous community members and influenced COVID-19 preventive measure utilization. The findings can inform culturally specific COVID-19 public health policy development.

Keywords Community safety · Masking · Preventive measures · Public Health

Introduction

The coronavirus disease 2019 (COVID-19), an infectious disease caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), began spreading globally in December 2019. Compared to previous infectious disease outbreaks, including SARS in 2002–2003 and the Middle East respiratory syndrome (MERS) in 2012–2013, COVID-19 has a higher transmission capacity [1] via aerosolized droplets and fecal-oral routes [2]. To reduce the spread of

✉ Sangita Sharma
gita.sharma@ualberta.ca

1 Indigenous and Global Health Research Group, Department of Medicine, College of Health Sciences, University of Alberta, Edmonton, AB, Canada

2 Division of Geriatric Medicine, Department of Medicine, Faculty of Medicine & Dentistry, College of Health Sciences, University of Alberta, Edmonton, AB, Canada

3 School of Population and Public Health, Faculty of Medicine, University of British Columbia, 2206 E Mall, Vancouver, BC, Canada

4 Aurora College, North Slave Campus, Yellowknife, NT, Canada

5 Department of Health and Social Services, Government of Northwest Territories, Yellowknife, NT, Canada

6 Independent public health consultant for Northwest Territories and Nunavut, Yellowknife, Canada

7 Faculty of Social Sciences, Tampere University, Tampere, Finland

8 Faculty of Medicine, University of Oulu, Oulu, Finland

9 Hotıì ts'eeda Northwest Territories SPOR Support Unit, Yellowknife, NT, Canada

10 Canada Research Chair in Population Health, Division of Endocrinology and Metabolism, Department of Medicine, Faculty of Medicine and Dentistry, College of Health Sciences, University of Alberta 1-126 Li Ka Shing Centre for Health Research Innovation, Edmonton, AB, Canada

Published online: 14 October 2024

COVID-19, the World Health Organization (WHO) recommended several [3] non-pharmaceutical self-imposed behavioural COVID-19 preventive measures including handwashing [4], mask-wearing, and social distancing [5]. These measures have been shown to reduce COVID-19 incidence [6] if efficacy exceeds 50% [7]. Other measures, such as curfews and travel restrictions, have been imposed by laws.

Of the three territories in northern Canada, Northwest Territories (NWT) is the second-largest, is the most populous [8], and has the second-highest Indigenous population proportion (51%) [9]. COVID-19 was declared a public health emergency in NWT on March 18th, 2020 [10]. The Government of Northwest Territories recommended masking in April 2020 and mandated it within public spaces in May 2021. Gatherings of any size were prohibited in NWT in March 2020, although these measures were lessened with time [11].

The Government of Canada has also supported Indigenous families in NWT in spending time on the land during the COVID-19 pandemic, helping to maintain both physical distancing [12] and cultural land connection. Importantly, during previous pandemics, Indigenous community members benefitted from connecting with the land [13]. Such connection is foundational to Indigenous ways of knowing (epistemology) and being in the world (ontology) [14] and underlies Indigenous identity and spiritual well-being [15]. Kinship, community belonging, and social connection are also foundational to the Indigenous worldview in Canada [16] and may have further supported preventive measure practices and well-being during the COVID-19 pandemic in Indigenous communities.

Data on the response towards COVID-19 preventive measures in Indigenous communities within NWT is scarce. As such, the project collected data on the broader impact of COVID-19 on Indigenous communities within NWT, and aimed to explore perceptions towards and adherence to preventive measures. The results of the project can help to inform COVID-19 public health recommendations in the Canadian Arctic and other circumpolar Indigenous communities.

Methods

Project Design and Setting

Utilizing a cross-sectional design, the project took place in ten communities in NWT varying in size, remoteness, and infrastructure. The three large communities (> 1000 people) have year-round road access and community health centres, and one community has a hospital. The three medium-sized communities (300–1000 people) have year-round road access and community health centres. The small communities (< 300 people) are geographically isolated and without year-round road access, and only some have health centres.

The project utilized the community-based participatory research (CBPR) model [17], which encourages positive social change by including Indigenous communities in all aspects of the research process.

At the time of data collection, masks were mandatory in indoor public spaces, working remotely was strongly encouraged, the deferral or cancellation of non-essential travel was recommended, and self-isolation following out-of-territory travel was mandatory [18]. Data collection adhered to these restrictions and recommendations.

Population and Recruitment

Participants were self-identifying Indigenous adults ≥ 18 years of age who had lived in one of the communities for two months prior to the start of data collection. Local research assistants (RAs) were trained in each community to recruit and interview participants. Recruitment utilized community-specific strategies, including the direct calling of community members and organizations, social media posts on Facebook, word of mouth, and passive advertising in various community locations.

Data collection

Quantitative and qualitative data were collected between 1st April and 30th November 2021 via a semi-structured questionnaire administered by local RAs. Interviews were done in English or the local Indigenous language. The questionnaire included questions about the impact of COVID-19 on health, mental health, daily activities, traditions and culture, and access to healthcare, COVID-19 symptoms, and the availability, utilization, and side-effects of COVID-19 vaccines.

Close ended questions regarding non-pharmaceutical COVID-19 preventive measures included, “Are you able to do certain things to prevent COVID-19, such as handwashing, physical distancing, and wearing a mask?” and “How often have you done the following since March 2020: a) Avoided crowded places/gatherings, b) Avoided common greetings (such as a handshake or a hug), c) Limited contact with people at higher risk (e.g. an elderly relative), d) Self-isolated because you thought you were infected with COVID-19, e) Self-quarantined because you may have been exposed to COVID-19, but did not show symptoms, f) Gone out on to the land to avoid COVID-19”. There were four open-ended questions: “If yes, how do you feel about being asked to do these things (hand washing, physical distancing,

and wearing a mask)?"; "If no, are there reasons you are not able to do these things (hand washing, physical distancing, and wearing a mask)?"; "What other ways do you try to prevent COVID-19?"; and "Do you have any suggestions for COVID-19 prevention in your community?"

Before the start of each interview, participants gave either verbal or written consent. Depending on travel and COVID-19 restrictions at the time of data collection, interviews were conducted either by phone or face-to-face, each lasting approximately 45 min. Interviews were audio-recorded with participant permission; qualitative responses were transcribed verbatim and verified by checking the transcribed data against the audio files. All responses were recorded on an electronic case report form utilizing REDCap (version 8.1.1). Each participant received a $50 gift card honorarium.

Ethical Considerations

Ethical approval was granted by the University of Alberta's Research Ethics Board, and a research license was obtained from the Aurora Research Institute in Inuvik, Northwest Territories. Formal research agreements and memorandums of understanding (MOUs) were obtained before data collection. A Community Advisory Board (CAB), composed of Elders, community members, local healthcare professionals, policymakers, and key government officials, provided guidance for all aspects of the project.

Table 1 Sociodemographic characteristics of participating community members in ten Northwest Territories communities, Canada ($n = 287$)

Characteristics	*n* (%)
Gender identity[a]	
Men	95 (33.10)
Women	192 (66.55)
Age in years (mean ± SD)	41.63 (± 13.53)
Age group (years)[b]	
18–29	58 (20.49)
30–49	150 (53.00)
50–65	59 (20.85)
> 65	16 (5.65)
Ethnicity	
First Nations	208 (72.47)
Inuit	62 (21.60)
Métis	13 (4.53)
Other/ not specified	4 (1.39)
Educational status	
Post-secondary[c]	88 (30.66)
High school diploma or higher	135 (47.04)
Junior high school	43 (14.98)
Elementary school	11 (3.83)
Other (none/unsure/declined)	10 (3.49)

SD standard deviation

[a]Missing = 1; [b]Missing = 4

[c]Post-secondary includes vocational and cultural training, and university education

Data Analysis

Data analyses were performed utilizing SAS statistical software, (SAS Version 9.4, SAS Institute Inc, Cary, NC). The frequencies of prevention measures were expressed as proportions (%). Bivariate analysis utilizing the Fisher's Exact test determined if there were statistically significant associations between the date of a COVID-19 outbreak (August 2021) in NWT and adherence to preventive measures, and between community size and adherence to preventive measures. Statistical significance was set at $p = < 0.05$.

After familiarization with the qualitative data, quotes were coded utilizing an inductive approach. The initial codes were collated into connective themes and reviewed by research team members before being organized utilizing NVivo Pro version 12 (QSR International Pty Ltd, 2018). The process helped to ensure coding was consistent and unbiased.

Results

Quantitative

Of the 287 (33.1% men, 66.6% women) community members (mean age = 41.6 years; SD ± 13.5), 73.5% were 18–49 years old and 5.7% were > 65 years old. The most common self-identified ancestry was First Nations (72.5%), followed by Inuit (21.6%) and Métis (4.5%). The majority of participants had completed a high school education or above (77.7%) (Table 1).

COVID-19 preventive measures were practiced by 98.6% of participants. The most common measures participants reported often or always practicing were the avoidance of crowded places and gatherings (67.2%), the avoidance usual greetings (63.3%) and the limiting of contact with individuals at higher risk (71.4%). Participants most frequently reported rarely or never practicing self-isolation (67.5%), self-quarantine following exposure (76.5%), and going out on the land (58.8%) (Table 2). Three preventive measures were significantly associated with the date of an outbreak (August 2021): self-quarantine ($p = 0.0023$), self-isolation ($p = 0.0023$), and going onto the land ($p = 0.0001$). No significant associations were seen with community size (data not shown).

Table 2 COVID-19 preventive measures among Indigenous participating community members in ten Northwest Territories communities, Canada

Variable	*n* (%)
Able to do things to prevent C19 since March 2020[a]	*n* = 284
Yes	280 (98.59)
No	3 (1.06)
Avoided crowded places/gatherings	*n* = 119
Often/always	80 (67.23)
Occasionally	21 (17.65)
Rarely/never	18 (15.13)
Avoided common greetings (e.g., hugs, handshakes)	*n* = 120
Often/always	76 (63.33)
Occasionally	22 (18.33)
Rarely/never	22 (18.33)
Limited contact with people at higher risk	*n* = 119
Often/always	85 (71.43)
Occasionally	13 (10.92)
Rarely/never	21 (17.65)
Self-isolated: due to possible C-19 infection	*n* = 117
Often/always	23 (19.66)
Occasionally	15 (12.82)
Rarely/never	79 (67.52)
Self-quarantined: due to C-19 exposure	*n* = 115
Often/always	15 (13.04)
Occasionally	12 (10.43)
Rarely/never	88 (76.52)
Gone out on land to avoid C19	*n* = 119
Often/always	26 (21.85)
Occasionally	23 (19.33)
Rarely/never	70 (58.82)

[a]Unsure/refused = 1

Qualitative

Two themes were identified regarding preventive measures: living with preventive measures and public health recommendations.

Theme 1: Experience Living with Preventive Measures

The theme denotes participants' overall experiences with and use of COVID-19 preventive measures. Participants discussed how hygiene and handwashing measures were easy to perform, having been taught at and practiced from a young age.

> *"My mother taught me to wash my hands at a very young age so I've been doing that since then so it doesn't affect me much"*

Participants also reported that having healthcare professionals in the family and occupational training positively influenced preventive measure utilization:

> *"...watching my wife, in the healthcare field so I have a lot of respect for those in the healthcare field and health services so whenever there's any guidelines or anything, I respect and follow those guidelines. I have no issues at all"*

Feelings of moral obligation towards and concern for the safety of community members were reported by participants as reasons for compliance:

> *"I'm willing to do it, it's not only for my safety it's for others"*

Participants further explained that initially challenging preventive measures began to feel normal with time:

> "*I'm used to it now, but it was hard at first*"

> "*I am, its normal practice nowadays"*

Subtheme: Masking

Some participants viewed masking as important and as a way to show respect to others, a perspective that strengthened as COVID-19 cases increased in the communities:

> *"At first I didn't like it but then people started getting sick and it got me thinking that I have to wear a mask"*

Many participants reported that wearing masks resulted in discomfort, which was exacerbated in warmer weather conditions. Breathing difficulties were also exacerbated for some participants due to underlying medical conditions, such as asthma and allergies:

> *"At first it was really hard because of my allergy, my asthma*"

> *"...the mask is kind of annoying because it's getting warmer outside"*

Some participants reported that face shields produced a reflective glare that caused headaches:

> *"...using the shield, if I'm in too much lighting or it's too windy the reflection of it tends to give me headaches"*

One participant also stated that wearing masks for extended periods was unhealthy:

"...it's not healthy to wear a mask all day that's what I was told"

Subtheme: Social Interaction

Participants described different methods for reducing social interaction, from 'social bubbles' to self-isolation, with some participants reporting that self-isolation was difficult to adapt to:

"I stick to my bubble. I don't associate with anyone who is not in my bubble"

"I guess I try to isolate myself as much as I can, which I know is not good. I'm just paranoid"

"...even when we were out of self isolation I felt like I was in isolation, so that was kind of weird because I felt like I was in a self isolation mode for a while even when I wasn't"

Participants also reported that travel restrictions limited access to family and resulted in sadness, especially when access to sick relatives was prohibited:

"I just really miss my mom and my kids really miss their grandmother and that's sad. My grandfather passed away in November and I was not able to be with my grandmother…. Because of the pandemic, I did not get to see him".

Subtheme: Personal Measures

Personal measures are preventive measures that are based in personal convictions or beliefs. Participants described practicing several holistic personal measures including the utilization of meditation, breathing techniques, nutrient and vitamin supplementation, and traditional medicines.

"Meditation, breathing, working on increasing my immune system via various nutrients and vitamins"

"We make traditional medicine and get in contact with those people who reach out to us"

"I tried to use, what do you call those, woodchips you smell the aroma of the spruce ball or gum"

Participants reported that personal measures including connecting with nature, doing outdoor physical activities, and going onto the land also positively impacted mental health. Apart from being a personal measure, going onto the land was also pursued as an enjoyable part of traditional living.

"Taking vitamins and doing physical outside outdoors so my mind will be clear, being outdoors a lot and I come in the evening, but I do stuff like piling wood or racking my yard or decluttering my warehouse, that keeps me from, to have clear minds"

"Gone out on the land, yeah, but it wasn't to avoid"

Subtheme: Perceptions towards Preventive Measures

Participants initially perceived restrictive preventive measures as difficult; however, participants reported that increased community safety and the hope of a more rapid end to the pandemic increased compliance.

"All of those things, even though they were small things, were really empowering because the coronavirus and all of the implications of it worldwide were so big that the little things we could do as individuals really have gotten an importance that I have appreciated"

"I'm used to it now, but it was hard at first"

"I don't mind if it's to keep everybody safe I'll follow it"

"If it makes it go away quicker, I'm ok with it. I don't mind it"

Theme 2: Public Health Recommendations

The theme denotes participants' experiences with and perceptions of restrictions implemented by the government, local health authorities, municipalities, and Indigenous government. Participants explained that public health guidance provided by healthcare professionals protected the well-being of individuals and the community; participants also reported that a measure being enforced by the law increased compliance:

"I want to eradicate this, and the only way is to follow what the doctors are ordering us to do"

"well, again, stressful but you want to be able to protect yourself and your family so you do what you are told to do and it's enforced, so you have to follow the rules, if you don't then you get charged and no one wants to get charged"

Mandatory preventive measures reported by participants included social distancing, handwashing, workspace sanitization, and customer screening.

"It's a routine now we have to enforce it at work and be a role model to other staff, so six feet apart, washing hands, wearing masks"

"...we developed procedures in my office, gets sterilized before an interview, and maybe do a background check on the people…did you do any of this in the last 14 days"

"Disinfecting surfaces, high traffic surfaces, such as door handles and counters and stuff that are high traffic areas"

One participant explained that mandatory face masks were a barrier to effectively working as a teacher:

"I had no choice…We had a lot of changes in our teaching, we had to make sure kids were in their own bubbles, there's a lot of social-distancing, we had to ensure kids did not high-five…For me as a language teacher there were barriers cause when you're teaching the language, students have to look at your mouth, how are you saying it, how is your mouth moving but with the mask, they can't see nothing"

Participants reported minimising social contact in various ways, including staying home, avoiding gatherings, social distancing, utilizing alternative greetings, limiting visitors at home, working remotely, keeping a social bubble with trusted friends, shopping online, and utilizing social media and phones:

"...staying home or staying away from people like 6 feet apart"

"...instead of shaking hands, I bump the knuckles - it is a strange way to say hello but that's today's way of saying hello"

"...stay away from everybody, work at home"

"I stick to my bubble. I don't associate with anyone who is not in my bubble"

"...virtual meetings, virtual zoom meetings, that's pretty much it"

"I use food ordering services; I order clothes and stuff online…avoiding physical shopping"

"...limit the contact, use social media and the phone"

Some participants reported that minimal social contact resulted in loneliness:

"...you can't meet with your people you take care of, that's part of that loneliness that comes in"

Participants also explained that restrictions on travel and visiting elderly individuals were difficult to adhere to and resulted in challenging situations.

"No unnecessary trips outside of the community. When I do I usually do bulk shopping not only for myself but my family members and if anybody else needed supplies"

"I guess it's reduced travel outside the territory, or in the areas where there were cases"

"Avoiding visiting my mother who is 93 years old. I have no choice but to follow the rules"

Subtheme: Concerns about Others

Some participants expressed concern for the actions of individuals that were perceived as non-compliant and voiced the hope that all community members would be receptive to local restrictions as part of a collaborative effort:

"I get frustrated and annoyed when people have a problem with things that should be normal"

"You see some people saying it's my right not to wear a mask and it's like if it's your right not to wear a mask, go home"

"...inform other people that we are practicing these safe manners and hopefully they will do the same"

"I hate to say that but you see it everyday, they don't

isolate themselves, they go out partying, go out drinking, and whatnot, not much I can say other than you got to wake up you guys"

Subtheme: Suggestions for Improvement

Many participants reported satisfaction with the existing COVID-19 preventive measures and with the community implementation and response.

"...no, I think everyone in my community are taking the right requirements"

Some participants discussed suggestions for improvement, such as banning public gatherings and travel outside the community or territory and continuing to disseminate public health guidelines in communities and schools.

"Stop public gatherings"

"*..just stay in the community or go on the land, we don't have to go to another province or territory we have everything right here*"

"...a lot of people that don't listen, probably someone walking around and telling them"

One participant expressed that community members should increase compliance with measures as new COVID-19 variants spread:

"...now they're talking about COVID delta, I think that when it gets to the Northwest Territories, people should take restrictions seriously"

Discussion

COVID-19 has become one of several circulating respiratory viruses that threaten human health [19]. The preventive measures recommended for COVID-19 will also reduce the transmission of other respiratory viruses [19]. In the project, a high level of compliance with preventive measures was reported. Acceptance of measures also increased with time, becoming a new normal for some participants. The most commonly practiced measures were the avoidance of gatherings, the avoidance of usual greetings, and the limiting of contact with high-risk individuals. Masking was considered challenging and the least practiced measures were self-isolation and self-quarantining.

Physical distancing and self-isolation measures may have been difficult to practice due to household overcrowding and limited supplies of clean water for handwashing [20]. Overcrowded households are common in NWT communities. Further, while the COVID-19 outbreak in August 2021 within NWT led to a significant increase in reports of self-isolation and self-quarantining, 20% of participants in the project also reported having rarely or never avoided gatherings; improvement regarding both self-isolation and distancing is possible.

Participants reported that masking was challenging, often associated with breathing difficulties and discomforts that have been documented elsewhere [21]. However, a Cochrane review concluded that masking is the most effective physical preventive intervention [22] against COVID-19 transmission. The importance of masking was generally understood by participants and acceptance of masking increased as the number of confirmed COVID-19 cases increased. This follows evidence that such behaviour changes are influenced by an individual's knowledge of COVID-19 and ability to perceive risks associated with the virus [23].

Importantly, Indigenous worldviews of wellness in Canada embrace kinship, community connections, communication, social support [16], and a deep sense of community [24]. In the project, participants expressed moral obligation towards and concern for the well-being of family and community members, concern which increased compliance with measures. Participants also demonstrated a community-driven collaborative effort regarding preventive measures and recognized that success regarding COVID-19 prevention resulted from both individual effort and collaborative approaches. For example, community members supported each other by online shopping for those who may not have reliable internet access and for those in isolation.

Participants also expressed the importance of maintaining traditional ways of living, including access to traditional foods and nature, when implementing preventive measure. The ability to access and practice Indigenous knowledge and traditional ways of life, which includes connection to the land, physical activities, and traditional medicines, has been shown to improve spiritual and emotional health [25]. The remoteness of the communities in NWT allowed for connection to the land and outdoor physical activity with minimal COVID-19 risk. Community members explained that physical activity resulted in a 'clear mind', demonstrating the protective effects of physical activity on mental health [26]. In some indigenous communities, lockdowns have had other positive impacts, including the rejuvenation of local languages and teachings [27]. Participants in the project also practiced personal preventive measures that involved traditional medicines, meditation, and breathing techniques, which are Indigenous healing traditions

and ways of nourishing the body [28]. Encouraging such approaches may help to further maintain the wellbeing of community members.

Some preventive measures, including social distancing and isolation, resulted in disconnection from community support systems, such as the support of Elders. Elders, are viewed as knowledge keepers who pass talents or knowledge onto future generations, helping a community to stay focused [29]. Travel restrictions also reduced access to elderly or sick relatives and resulted in sadness and loneliness. Critically, the formation of social bubbles did provide some support to community members; the strategy has effectively allowed for social connection beyond the home while limiting the risk of transmitting COVID-19 [30].

The project relied on self-reporting, which may have resulted in the under or over-reporting of preventive behaviors by participants. As well, the cross-sectional design and convenience sampling methods utilized in the project provided data for a specific time during the pandemic when case numbers were low; this may impact the external validity and generalisability of results. This limitation may have been overcome by the inclusion of small and homogenous communities.

Conclusions Adherence to COVID-19 preventive measures among Indigenous community members in NWT was high. In particular, the safety and wellbeing of community members was viewed as important and impacted preventive measure utilization. Continuing to raise of awareness of self-imposed measures will provide essential time for capacity building in healthcare systems. The results of the project can be utilized to inform the development of culturally-sensitive and specific public health practices and knowledge translation regarding preventive measures.

Author Contributions FK, AW, CG, DD, KK, AC, SP, SIF, and SS conceived and designed the study. FK and SS supervised data collection. AO and RH performed the data analyses. RH produced the first article draft. All authors reviewed and revised the manuscript and read and approved the final version.

Funding The COVID-19 Impact Project (FRN 172676, FRN 177783) was funded by the Canadian Institutes of Health Research (CIHR). The CITF Project (2122-HQ-000062) was funded by Public Health Agency of Canada.

Data Availability All data supporting the findings of this study are available within the paper.

Declarations

Competing Interests The authors have no competing interests to declare that are relevant to the content of this article.

Ethics Approval and Consent The Research Ethics Board at the University of Alberta issued the research ethics certificate. Following the Scientists Act of Northwest Territories, researchers obtained a research license from the Aurora Research Institute. Verbal or written informed consent was obtained from all participants.

References

1. Azamfirei R. The 2019 novel coronavirus: a crown jewel of pandemics? Journal of Critical Care Medicine (Targu Mures) 2020;6:3–4.
2. Krittanawong, C., Maitra, N., Kumar, A., Hahn, J., Wang, Z., Carrasco, D., et al. (2022). COVID-19 and preventive strategy. *American Journal of Cardiovascular Diseases*, *12*, 153–169.
3. World Health Organization Infection prevention and control during health care when coronavirus disease (COVID-19) is suspected or confirmed: WHO interim guidance March 2020. Available: https://www-who-int.login.ezproxy.library.ualberta.ca/publications/i/item/WHO-2019-nCoV-IPC-2020.4.
4. Wong, V. W., Cowling, B. J., & Aiello, A. E. (2014). Hand hygiene and risk of influenza virus infections in the community: A systematic review and meta-analysis. *Epidemiology and Infection*, *142*, 922–932.
5. Anderson, R. M., Heesterbeek, H., Klinkenberg, D., & Hollingsworth, T. D. (2020). How will country-based mitigation measures influence the course of the COVID-19 epidemic? *Lancet*, *395*, 931–934.
6. Talic, S., Shah, S., Wild, H., Gasevic, D., Maharaj, A., Ademi, Z., et al. (2021). Effectiveness of public health measures in reducing the incidence of covid-19, SARS-CoV-2 transmission, and covid-19 mortality: Systematic review and meta-analysis. *British Medical Journal*, *375*, e068302.
7. Teslya, A., Pham, T. M., Godijk, N. G., Kretzschmar, M. E., Bootsma, M. C. J., & Rozhnova, G. (2020). Impact of self-imposed prevention measures and short-term government-imposed social distancing on mitigating and delaying a COVID-19 epidemic: A modelling study. *Plos Medicine*, *17*, e1003166.
8. Statistics Canada Tables 98-10-001-01 Population and dwelling counts: Canada, provinces and territories. Available: https://doi.org/10.25318/9810000101-eng.
9. Government of the Northwest Territories. Northwest Territories health status report. Yellowknife, NT: Department of Health and Social Services (2011). Available: https://www.hss.gov.nt.ca/en/services/nwt-health-status-profile.
10. Tang, B., Scarabel, F., Bragazzi, N. L., McCarthy, Z., Glazer, M., Xiao, Y. (2020). De-escalation by reversing the escalation with a stronger Synergistic Package of contact tracing, Quarantine, isolation and Personal Protection: Feasibility of preventing a COVID-19 Rebound in Ontario, Canada, as a case study. *Biology (Basel)*. ;9.
11. Canadian Institute for Health Information. Canadian COVID-19 Intervention Timeline (2022). Available: https://www.cihi.ca/en/canadian-covid-19-intervention-timeline.
12. Bayha, M., & Spring, A. (2020). Response to COVID in Dél̨ı̨nę, NT: Reconnecting with our community, our culture and our past after the pandemic. *Agriculture and Human Values*, *37*, 597–598.
13. Brown, H. J., McPherson, G., Peterson, R., Newman, V., & Cranmer, B. (2012). Our land, our language: Connecting dispossession and health equity in an indigenous context. *The Canadian Journal of Nursing Research*, *44*, 44–63.
14. Watts, V. (2013). Indigenous place-thought and agency amongst humans and non humans (First Woman and Sky Woman go on a European world tour!). *Decolonization: Indigeneity Education & Society* ;2.

15. Clayton, D. (2016). Maps and memes: Redrawing Culture, Place and Identity in Indigenous communities. *BC Studies*. :164-.
16. Fijal, D., & Beagan, B. L. (2019). Indigenous perspectives on health: Integration with a Canadian model of practice. *Canadian Journal of Occupational Therapy*, *86*, 220–231.
17. Springer, M. V., & Skolarus, L. E. (2019). Community-based Participatory Research. *Stroke*, *50*, e48–e50.
18. Canadian Data Set of COVID-19 Interventions Available: https://www.cihi.ca/en/canadian-data-set-of-covid-19-interventions. Accessed.
19. Emanuel, E. J., Osterholm, M., & Gounder, C. R. (2022). A national strategy for the new normal of life with COVID. *Journal of the American Medical Association*, *327*, 211–212.
20. Charania, N. A., & Tsuji, L. J. (2013). Assessing the effectiveness and feasibility of implementing mitigation measures for an influenza pandemic in remote and isolated First Nations communities: A qualitative community-based participatory research approach. *Rural and Remote Health*, *13*, 2566.
21. Matusiak, Ł., Szepietowska, M., Krajewski, P., Białynicki-Birula, R., & Szepietowski, J. C. (2020). Inconveniences due to the use of face masks during the COVID-19 pandemic: A survey study of 876 young people. *Dermatologic Therapy*, *33*, e13567.
22. Jefferson, T., Del Mar, C. B., Dooley, L., Ferroni, E., Al-Ansary, L. A., Bawazeer, G. A., et al. (2011). Physical interventions to interrupt or reduce the spread of respiratory viruses. *Cochrane Database Systematic Review*, *2011*, Cd006207.
23. Beca-Martínez, M. T., Romay-Barja, M., Falcón-Romero, M., Rodríguez-Blázquez, C., Benito-Llanes, A., & Forjaz, M. J. (2022). Compliance with the main preventive measures of COVID-19 in Spain: The role of knowledge, attitudes, practices, and risk perception. *Transboundary and Emerging Diseases*, *69*, e871–e82.
24. MacDonald, J. P., Willox, A. C., Ford, J. D., Shiwak, I., Wood, M., Government, R. I. C., et al. (2015). Protective factors for mental health and well-being in a changing climate: Perspectives from Inuit youth in Nunatsiavut, Labrador. *Social Science and Medicine*, *141*, 133–141.
25. Sasakamoose, J., Scerbe, A., Wenaus, I., & Scandrett, A. (2016). First Nation and Métis youth perspectives of health: An indigenous qualitative inquiry. *Qualitative Inquiry*, *22*, 636–650.
26. Firth, J., Solmi, M., Wootton, R. E., Vancampfort, D., Schuch, F. B., Hoare, E., et al. (2020). A meta-review of lifestyle psychiatry: The role of exercise, smoking, diet and sleep in the prevention and treatment of mental disorders. *World Psychiatry*, *19*, 360–380.
27. What we heard: Indigenous Peoples and COVID-19 - Canada.ca. Public Health Agency of Canada's companion report (2021). Available: https://www.canada.ca/en/public-health/corporate/publications/chief-public-health-officer-reports-state-public-health-canada/from-risk-resilience-equity-approach-covid-19/indigenous-peoples-covid-19-report.html. Accessed.
28. Robbins, J. A., & Dewar, J. (2011). Traditional indigenous approaches to healing and the modern welfare of traditional knowledge, spirituality and lands: A critical reflection on practices and policies taken from the Canadian indigenous example. *The International Indigenous Policy Journal* ;2.
29. Smylie, J. (2014). *Strong women, strong nations: Aboriginal maternal health in British Columbia*http://www.nccah-ccnsa.ca/Publications/Lists/Publications/Attachments/129/2014_07_09_FS_2421_MaternalHealth_EN_Web.pdf
30. Leng, T., White, C., Hilton, J., Kucharski, A., Pellis, L., Stage, H., et al. (2020). The effectiveness of social bubbles as part of a Covid-19 lockdown exit strategy, a modelling study. *Wellcome Open Research*, *5*, 213.