



# Higher COVID-19 Rates in Manitoba's First Nations Compared to Non-First Nations Linked to Limited Infrastructure on Reserves



Ajarat Adegun and Shirley Thompson  
Natural Resources Institute, University of Manitoba

## ABSTRACT

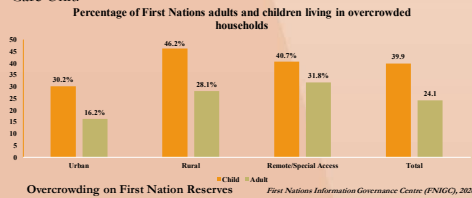
The relationship of COVID-19 rates to community infrastructure is explored through a literature review, mapping, and an ecological-level statistical analysis in this paper. The analysis was undertaken with data from Manitoba, Canada, for 23 of 63 First Nations and 67 non-First Nations communities. COVID-19 community-level per capita rates were estimated by dividing total cases, including active cases, obtained from the COVID-19 Manitoba Open Data portal of the Public Health Information Monitoring System, PHIMS—for the community areas of Regional Health districts by the community 2021 Manitoba population report numbers. The geographical areas for COVID-19 data were identical to the census subdivision levels available from Statistics Canada, used for housing and other infrastructure data. COVID-19 per capita rates in Manitoba communities have a positive significant strong relationship with community rates for (a) overcrowded housing ( $r = 0.532, p < 0.05$ ), (b) unsuitability of housing ( $r = 0.623, p < 0.05$ ), (c) houses needing major repairs ( $r = 0.561, p < 0.05$ ), (d) no access roads ( $t = 2.281, p < 0.05$ ), and (e) lack of hospitals ( $t = 2.024, p < 0.047$ ). The highest rates for COVID-19 and the worst infrastructure are located in First Nations, particularly in special access communities. This preliminary research signals a need to improve infrastructure in First Nations reserves to realize health equity. Further research on built environment conditions in all Manitoba communities with age- and sex-adjusted analysis of COVID-19 data is needed to comprehend the role of infrastructure more fully

## STUDY BACKGROUND

- Health equity is the equal ability for all people to attain their full health potential uncompromised by socially determined aspects or social position (World Health Organization [WHO], 2021).
- Social determinants of health are non-medical factors such as education, clean water, housing, income, employment status, and social services (Abrams, 2020; Butler-Jones & Wong, 2020; Green et al., 2021).
- Socially disadvantaged populations, such as the poor, Indigenous people, and people of colour, are more vulnerable to infectious diseases than advantaged populations (Hassen, 2021; Aguilar-Palacio et al., 2021).
- One in 10 (9.6%) First Nations' adults lacked access to healthcare needed in the previous 12 months (FNIGC, 2020).
- 38% of First Nations' adults in remote/special access communities live in homes needing major repairs (FNIGC, 2020).
- 46% of First Nations' adults in remote/special access communities reported mould in their homes in the previous 12 months—almost 4X higher than the general population at 13% (Statistics Canada, 2019).
- Over one-quarter (28%) of First Nations adults do not have access to drinking water all year-round (FNIGC, 2020).

### During the second and third waves of the pandemic:

The First Nations' total cases were 3X higher than non-First Nations, with 2X higher death rates and 4x higher rates of patients in intensive Care Unit.



Map1: Map of communities in Manitoba and locations of the five regional health authorities

## OBJECTIVES

The research explores whether inequities at the community level for COVID-19 rates are related to their infrastructure (analyzes the role of various infrastructures in Manitoba communities on COVID-19 rates considering health equity).

Variable	Non-First Nations in Manitoba	First Nations in Manitoba
Housing	7% lived in not suitable housing (Statistics Canada, 2016)	37% lived in not suitable housing (Statistics Canada, 2016).
	9% lived in houses needing major repairs (Statistics Canada, 2016).	44% lived in houses needing major repairs (Statistics Canada, 2016).
	Manitobans living off-reserves can apply for mortgage (Lindeman, 2019).	People on First Nation reserves do not have access to mortgage (Lindeman, 2019).
Hospital access	Rural communities in Manitoba generally have access to hospital (within the community or about 1 hr drive from the community) (Government of Manitoba, 2021b).	Only one First Nations community in Manitoba has a hospital (Government of Manitoba, 2021b). Health services on First Nations reserves are limited to non-complex and non-critical care (Kyoon-Achan et al., 2019).
Access roads to service centres	Most non-First Nations communities have paved road access to service centres (Government of Canada, 2019).	27% of First Nations communities are considered special access, without all weather roads (Government of Canada, 2019).

## Research hypothesis

Null hypothesis:  $H_0$ : COVID-19 rate per capita in Manitoba community is not significantly related to infrastructure (i.e., housing, all-weather road, hospital).

## METHODS

### Ecological analysis

- Geo-epidemiological analysis using ArcGIS Pro software 2.8.0
- Inferential statistical analysis using SPSS version 26.0

## LIMITATIONS

- The publicly available Government of Manitoba COVID-19 data used for the analysis has a limited breakdown of data at the community level.
- The analysis was done at the Regional Health Authority level, not individual level.
- Age and sex standardization of data was impossible due to the available data.
- 2016 Statistics Canada census sociodemographic variables used against 2020-2021 COVID-19 data

## RESULTS

Table 1: Correlation of COVID-19 rates with housing variables (not suitable housing, major repairs in housing needed and average household size)

Correlations			
Housing not suitable (%) relationship with COVID-19 rates		Rate (cases per 100,000)	Housing not suitable (%)
COVID-19 Rates (cases per 100,000)	Pearson Correlation	1	0.623**
	Sig. (2-tailed)		.000
	N	80	80
Major repairs in housing needed (%) relationship with COVID-19 rates		Rate (cases per 100,000)	Major repairs in housing needed (%)
COVID-19 Rates (cases per 100,000)	Pearson Correlation	1	0.561**
	Sig. (2-tailed)		.000
	N	80	80
Average household size relationship with COVID-19 rates		Rate (cases per 100,000)	Average household size
COVID-19 Rates (cases per 100,000)	Pearson Correlation	1	0.532**
	Sig. (2-tailed)		.000
	N	80	80

\*\* Correlation is significant at the 0.001 level (2-tailed)

Table 2: Results of the Independent Group t-test of the COVID-19 rates for communities with and without all-year-round road access to a service centre and hospitals

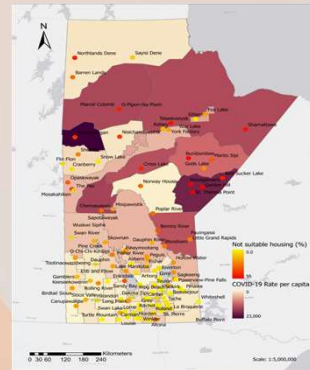
Rate (cases per 100,000)	Groups	N	$\bar{x}$	Ss	T-test		
					Df	T	P
	Communities without all year-round road access	12	9223.372	9223.372	11.135	2.281	0.043
	Communities with all year-round road access	66	2288.842	2188.388			

\*p < .05

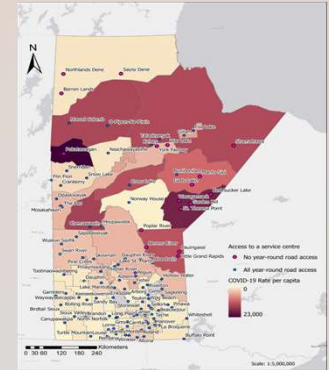
Table 3: Results of the Independent Group t-test of COVID-19 rates comparing communities with and without hospitals

Rate (cases per 100,000)	Groups	N	$\bar{x}$	Ss	T-test		
					Df	T	P
	Communities without hospitals	61	3875.627	6292.130	75.406	2.024	0.047
	Communities with hospitals	19	2104.592	1490.340			

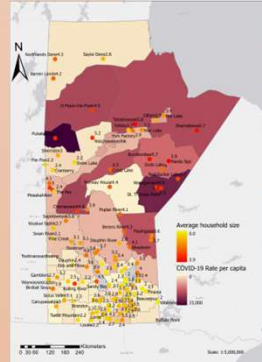
\*p < .05



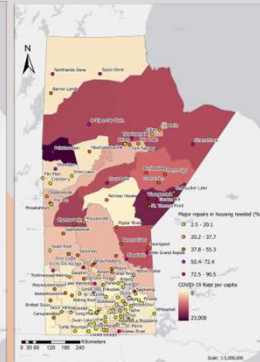
Map 2: Not suitable Housing Rates juxtaposed with COVID-19 rates for Manitoba communities



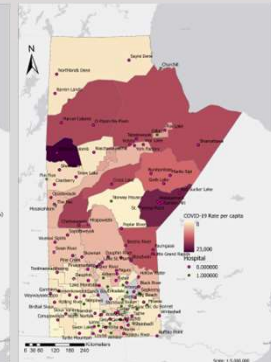
Map 3: Road access to a service centre juxtaposed with COVID-19 rates for Manitoba communities



Map 4: Average Household size juxtaposed with COVID-19 rates for Manitoba communities



Map 5: Rates of Major Repairs in Housing Needed juxtaposed with COVID-19 rates in Manitoba communities



Map 6: COVID-19 rates juxtaposed with the availability of hospitals in Manitoba communities

## CONCLUSION

- COVID-19 per capita rates have a strong, statistically significant relationship with limited infrastructure in First Nations, particularly related to poor housing.
- Poor infrastructure and crowded housing increase the risk of exposure to infectious diseases
- This research found a significant relationship between poor health, as indicated by COVID-19 rates, geographic location and the built environment.
- Worse health outcomes in First Nations communities for COVID-19 are clearly linked to the infrastructural inequalities and regional underdevelopment on First Nations reserves.
- There is a need for improved infrastructure in First Nations' reserves to ensure health equity across Manitoba.

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