Author Contribution Statement

Medical Emergencies in Northern Ontario Remote First Nations: Using Air Ambulance Transport Data to Understand Epidemiology

CMAJ Open

October 2019

Author	Contributed to conception and design	Contributed to acquisition of data	Contributed to analysis and interpretation	Drafted the article	Revised article critically	Gave final approval of version to be published	Agreed to act as guarantor of the work
VanderBurgh D	X	X	X	X	X	X	X
Savage DW	X	X	X	X	X	X	X
Dubois S	X	X	X	X	X	X	X
Binguis N	X				X	X	X
Maxwell S	X				X	X	X
Bocking N	X				X	X	X
Farrell T	X				X	X	X
Tien H	X	X			X	X	X
Ritchie S	X				X	X	X
Orkin A	X	X	X	X	X	X	X

Medical Emergencies in Northern Ontario Remote First Nations: Using Air Ambulance Transport Data to Understand Epidemiology

VanderBurgh D (a), Savage DW (b), Dubois S (c), Binguis N (d), Maxwell S (e), Bocking N (f), Farrell T (g), Tien H (h), Ritchie S (i), Orkin A (j)

a. Northern Ontario School of Medicine, Thunder Bay ON
b. Northern Ontario School of Medicine, Thunder Bay ON
c. Northern Ontario School of Medicine, Thunder Bay ON
d. Nishnawbe Aski Nation, Thunder Bay ON
e. Windigo First Nations Council, Sioux Lookout ON
f. Sioux Lookout First Nations Health Authority, Sioux Lookout ON
g. Sioux Lookout First Nations Health Authority, Sioux Lookout ON
h. University of Toronto, Ornge, Toronto, ON
i. Laurentian University, Sudbury, ON
j. University of Toronto, St. Joseph's Health Centre, Toronto, ON

Abstract

Background. For approximately 25,000 Ontarians living in remote communities, accessing a doctor in an emergency department requires flying in a plane or helicopter. This study describes the demographic and epidemiological characteristics of patients transported from remote First Nation communities in Northern Ontario to access emergency, hospital-based medical care. **Methods**. Using primary data from Ornge, medical patient transportation was examined for 26 remote Ontario Nishnawbe Aski Nation (NAN) communities from 2012-2016. Using univariate descriptive statistics, this study describes these transports. **Results.** Over the five-year study period, a total of 10,538 patients were transported by Ornge from the twenty-six included communities, a mean of 2107.6 patients per year. Transport Incidence ranged from 9.2 to 9.5 per 100 on-reserve population per year. Females over 65 had the highest transport incidence (25.9 per 100). Females between ages 5-9 had the lowest mean incidence (2.1 per 100). Gastrointestinal issues accounted for about 13%, neurologic, respiratory and trauma complaints each approximately 11% of transfers, cardiac issues accounted for approximately 10%. Patients with obstetrics issues accounted for 7.6%, and toxicologic emergencies accounted for 7.5% of transfers per year. **Interpretation**. In remote, First Nations communities in Ontario, where no Emergency Department exists, patients must fly to access hospital-based physician care. This study provides the epidemiological foundation to improve emergency care and emergency transport from remote First Nation communities in Ontario.

Background

Approximately 98% of the population of Ontario, Canada lives within a 30 minute drive of an Emergency Department (ED) [1]. However, for about 25,000 Ontarians living in remote communities, accessing a doctor in an emergency department requires flying in a plane or helicopter [1]. Patients in these remote communities, primarily north of Sioux Lookout, access medical care through a local nursing station, with intermittent in-community physician coverage. Patients with high-acuity conditions are transported

from remote First Nations communities to hospital by Ornge, the provincial medical air ambulance service provider [2,3]. Even under ideal conditions, these transfers take several hours. Air medical transports can be used as a measure of health emergencies in these remote settings. The characteristics of patients requiring air medical transport in this region has not been thoroughly described, with only a handful of published papers describing medical emergencies in these remote communities over the last 35 years [2,4-7].

There are more than 600 First Nations communities in Canada, 49 of which are part of Nishnawbe Aski Nation (NAN) in Ontario [8,9]. Of these, 26 are remote. First Nations populations living in remote communities are known to face challenging social determinants of health: isolated geography, housing, unemployment, and the cultural impact of colonialism and residential schools [10]. Access to potable water is an ongoing issue in many communities, with 188 boil water advisories in the region between 2007 and 2016 [4]. These populations face trauma at rates 2.5 to 8 times greater than the Canadian average [5,11-13]. People living in these communities face elevated rates of chronic disease which manifest as critical health emergencies including mental health, infectious disease, diabetic, and cardiovascular emergencies [14-17].

Through this study, we aim to describe who is transported from remote Nishnawbe Aski Nation (NAN) communities in Northern Ontario to access emergency, hospital-based medical care, why they are transported, and if there are specific risk factors which lead to a higher rate of emergency medical transfer.

Methods

The objectives and methods of this study were developed in consultation and collaboration with Nishnawbe Aski Nation (NAN), Sioux Lookout First Nations Health Authority (SLFNHA) and Weeneebayko Area Health Authority (WAHA).

For the purpose of this study, we define remote communities as having no permanent, four-season road access. These remote communities only have access to an Emergency Department by air or by winter road; people are unable to get in a vehicle and drive to access physician services.

Using primary data from Ornge, we examined all medical patient transportation in Ontario by the provincial air ambulance provider from remote NAN communities from January 1 2012 to December 31, 2016. A patient transport was eligible for inclusion in this study if the transfer occurred from a community that:

1. Is part of NAN; and
2. Is remote; and
3. Has a landing strip or helicopter pad; and
4. Has a nursing station or a health centre; and
5. Does not have access to full-time, in-community physician services.

Figure 1. Included Remote Nishnawbe Aski Nation Communities.

Ornge patient transportation from remote Ontario communities not associated with NAN were excluded. Medical transportation on scheduled flights with commercial carriers were excluded.

We examined the Ornge transportation data through univariate descriptive statistics. We computed mean annual emergency transport incidence per 100 people on-reserve. We computed total, and incidence of, transports by year, sex and age group. We also compared transport incidence stratified by community population.

We analyzed reason for transport as stated in the Ornge record. Ornge paramedics assign patients a primary reason for transportation, and we grouped these into clinical subheadings according to their clinical domain. Transfers due to primary mental health concerns were not clearly defined in this data set; patients who were transferred by Ornge due to a mental health crisis were captured under another chief complaint.

For population data, we used on-reserve population from Government of Canada, Indigenous and Northern Affairs Canada (INAC) over the same five-year period [18].

We grouped communities into three on-reserve population groupings to assess if community size was associated with the rate of emergency transfer. The three population groupings are: a) 1-499, b) 500-1000, and c) >1000. These groupings resulted in approximately an equal number of communities per group.

Results

Between 2012-2016, the total on-reserve population of the 26 included communities increased from 21,488 to 23,257 (Appendix Table 1). During the same period, total emergency medical transports by Ornge from the communities increased from 2051 to 2145, a mean of 2107.6 patients per year. (Appendix Table 2). While population rose 8.23% over the study period, total emergency medical transports rose 4.58%, corresponding with a decreasing incidence of emergency transfer from 9.5 to 9.2 per 100 on-reserve population. Each year, approximately 43% of people receiving emergency transports were male, and 57% were female.

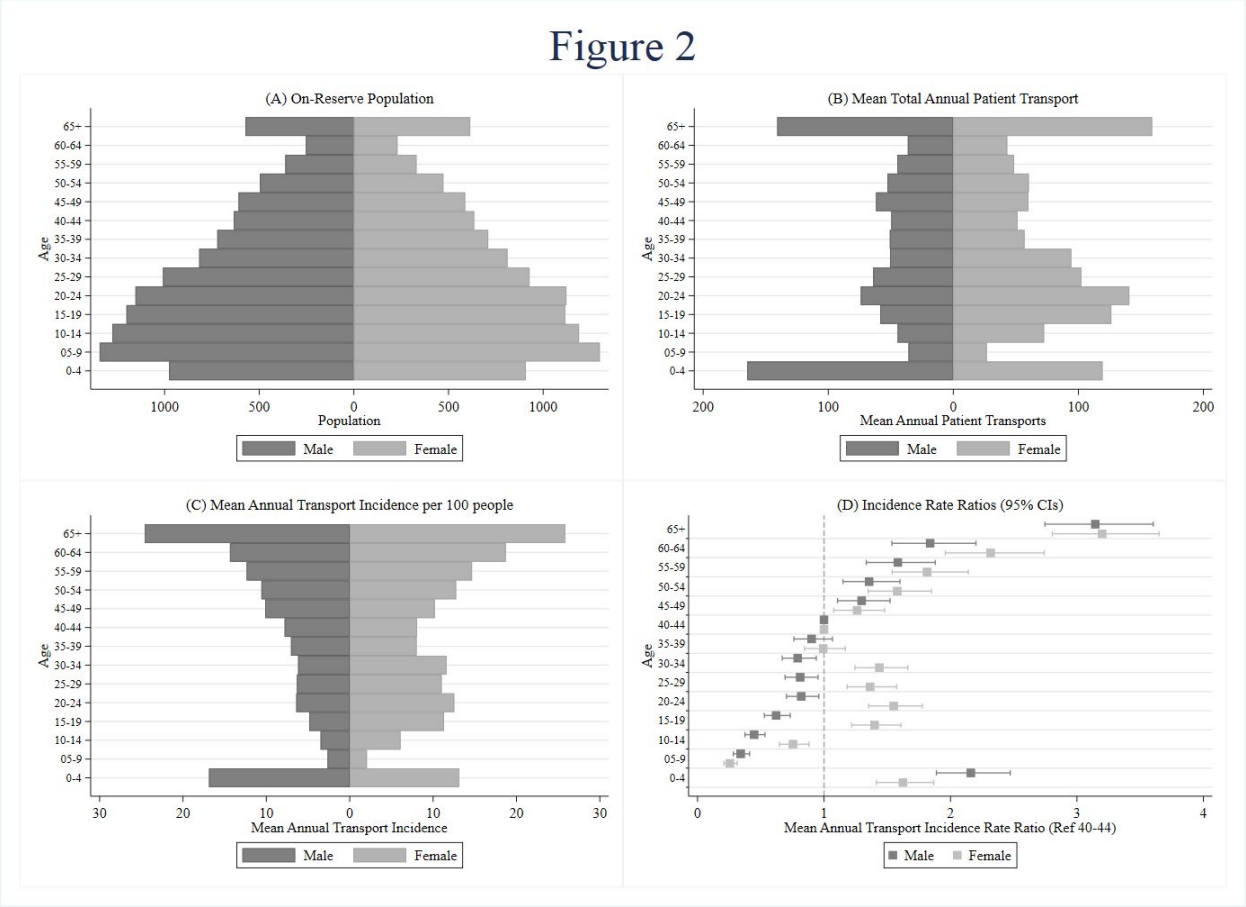
Within all males transported, the 0-4 and 65+ age ranges had the highest mean number of transports over the 5 year period of 164.8 and 140.8 respectively (Figure 2, panel b and Appendix Table 2). For females, similar peaks of mean total number of transports over the 5 year period were observed (0-4: 119.4 per year; 65+: 159.0 per year), however mean number of transports were also high for females at ages 16-19 (126.4 per year) and 20-24 (140.8 per year).

Over the five year period, there were a total of 776 transports of children under the age of 1, or a mean of 155.2 per year. Of those, 133 were under 28 days, a mean of 26.6 per year. In the 65+ age group, 804 people were transported who were 75 or older, a mean of 160.8 transports per year. Of those, 162 transfers were for patients older than 85, a mean of 32.4 per year (Appendix Table 6).

Females over the age of 65 had the highest incidence over the five-year period with a mean annual rate of 25.9 transports per 100 on-reserve population (Figure 2, panel c). Conversely, females between ages 5-9 had the lowest rate of emergency transport with a mean annual incidence of 2.1 per 100 on-reserve population.

Compared to the chosen reference age group of 40-44, the age group over 65 had the highest incidence rate ratio (Figure 2, panel d).

Figure 2. Demographic pyramids by sex and age for a) reserve populations, b) mean total annual patient transport, and c) mean annual transport incidence per 100 on-reserve population, Remote Communities of the Nishnawbe Aski Nation, 2012-2016.



Community size varies widely in remote communities in the region, with some communities consisting of fewer than five hundred people, while other communities have a population of more than 2500. Over the study period, as population grew, several communities moved to the a larger population bracket.

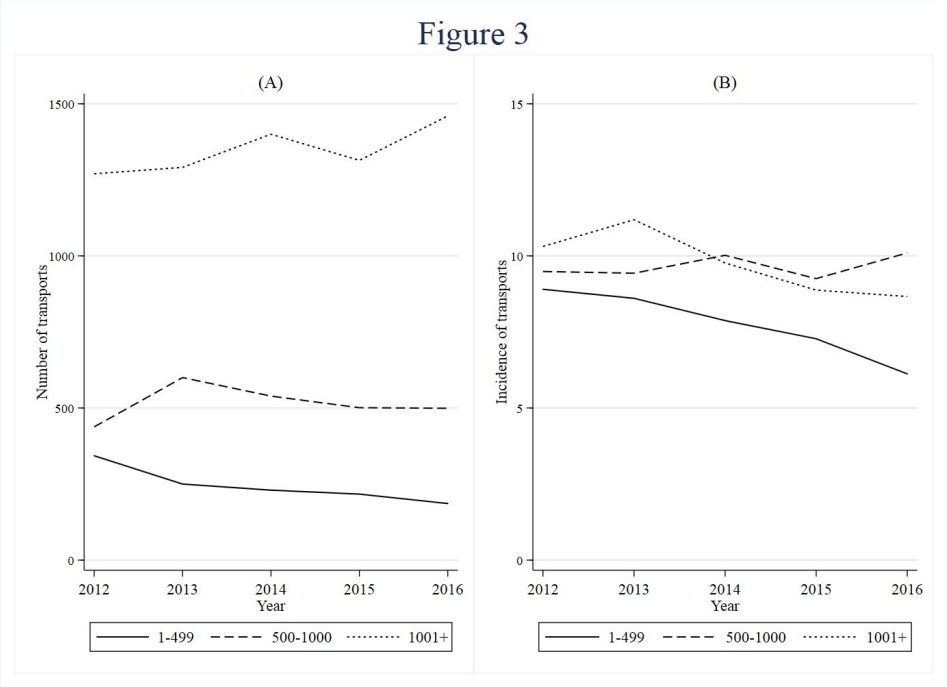
Table 1. Number of transports and incidence per 100 people by community size and year

Community Size	2012	2013	2014	2015	2016	Mean
Number of Transfers						
1-499	*343(16.7%)	250(11.7%)	230(10.6%)	217(10.7%)	186(8.7%)	245.2
500-1000	438(21.4%)	600(28%)	539(24.9%)	501(24.7%)	499(23.3%)	515.4
1001+	1270(61.9%)	1291(60.3%)	1400(64.5%)	1314(64.7%)	1460(68.1%)	1347
Incidence						
1-499	8.9	8.6	7.9	7.3	6.1	
500-1000	9.5	9.4	10.0	9.3	10.1	
1001+	10.3	11.2	9.8	8.9	8.7	

*Number of transports(Percentage in a given year)

Across each of the five study years, we observed that the highest number of transfers came from the larger communities, with 60.3% to 68.1% of all transfers initiated in communities over a thousand people (Table 1). While the total number of transfers was higher in the large communities, the incidence was more stable across community population sizes (Figure 3). Over the five year period, the lowest incidence of transfer was 6.1 per 100 on-reserve population per year, from communities less than 500 people in 2016. The highest incidence of transfer was 11.2 per 100 on-reserve population per year, from communities larger than 1000 in 2013. While there was year-to-year variability between incidence of transfer for medium and large communities, the incidence of emergency medical transfer from communities less than 500 people was consistently lower than other population strata.

Figure 3. A comparison of a) number of patient transports by community size and year, and b) incidence of transports per 100 on-reserve population by community size and year.



The most common reasons for medical transport were consistent from year-to-year (Table 2). Cardiac issues accounted for approximately 10% of the total emergency transfers from remote reserves in Ontario. Gastrointestinal issues accounted for about 13%. Patients with obstetrics issues were evacuated on average 161 times per year, or 7.6% of all emergency Ornge transfers. Toxicologic emergencies accounted for 7.5% of transfers per year and accidental and non-accidental trauma lead to approximately 240 transfers per year, or about 11% of all transports. Approximately 27% of transfers were due to chief complaints that individually yield fewer than 5% of all transports per year.

Table 2. Transport totals for presenting complaints from 2012 to 2016

	2012	2013	2014	2015	2016	Mean
Cardiac	176(8.6%)	202(9.4%)	215(9.9%)	189(9.3%)	230(10.7%)	202(9.6%)
Gastrointestinal	247(12%)	261(12.2%)	310(14.3%)	297(14.6%)	283(13.2%)	280(13.3%)
Neurological	237(11.6%)	235(11%)	214(9.9%)	215(10.6%)	267(12.4%)	234(11.1%)
Obstetrics	204(9.9%)	169(7.9%)	159(7.3%)	144(7.1%)	129(6%)	161(7.6%)
Respiratory	183(8.9%)	243(11.3%)	262(12.1%)	179(8.8%)	255(11.9%)	224(10.6%)
Toxicology	142(6.9%)	142(6.6%)	146(6.7%)	159(7.8%)	202(9.4%)	158(7.5%)
Trauma	252(12.3%)	244(11.4%)	239(11%)	229(11.3%)	223(10.4%)	237(11.3%)
†Other	524(25.5%)	597(27.9%)	597(27.5%)	608(29.9%)	545(25.4%)	574(27.2%)
Blank	86(4.2%)	48(2.2%)	27(1.2%)	12(0.6%)	11(0.5%)	37(1.7%)

*Number of transports(Percentage in a given year)
†Airway, Circ/Vasc, EENT, End, Environment, GU, Oncology, Opthamology, Organ Recipient, Sepsis, VSA

The majority of patients transported by Ornge from a remote Northern Ontario First Nation community for a medical emergency went to Sioux Lookout Meno Ya Win Health Centre. The mean annual transfers to Sioux Lookout was 1146 people or 56% of all transfers each year (Appendix Table 5). Patients were flown by Ornge to access an Emergency Department in Moose Factory 16.2% of the time, Thunder Bay 13.3%, Winnipeg 6.5%, and about 8% to another accepting hospital.

Interpretation

This study provides a new understanding of the burden of emergency medical problems in the region, and the volume of emergency air transports to access physician services.

Rate of transfer

Meno Ya Win Hospital in Sioux Lookout sees an annual emergency department visit rate of up to 62 per 100 population. This compares to a provincial rate of 44 emergency department visits per 100 population [2,19]. In 2014, approximately 1,028,000 patients in Ontario were transported by land ambulance, a rate of 7.5 per 100 population [20]. Data from this study suggests that First Nations people living on remote reserve in Northern Ontario are accessing physician services through Ornge at a rate of approximately 9 per 100 on-reserve population. While one might see the Ornge usage as comparable to provincial land ambulance numbers, these services are not comparable. In remote First

Nations communities in Northern Ontario, there is no 911 dispatch and no local ambulance or paramedical services. Patients must first find their own transportation to the local nursing station. There is no option for them to self-present in an ED without boarding an aircraft. Patients who are transferred by Ornge have been assessed by a nurse, who then discussed the case with a physician; they are deemed sick or injured enough to require emergent transfer to a hospital and in-person assessment by a physician. These data therefore underscore severe disparities in health services and a high burden of emergency health conditions in remote First Nations.

Rate of transfer by demographic

There are three age peaks of total transfers: less than 4, over 65, and females aged 15-34, with the incidence of transfer beginning to increase after the age of 50. Preschool children from First Nations communities in the Sioux Lookout catchment present to an ED about half as often as the provincial average, but when they do present, they are about twice as likely to be admitted compared to their non-indigenous counterparts [4]. This trend suggests that poor access to care leads to preschool First Nations children being more acutely unwell when they do access emergency physician services.

The increased incidence of transfer in young adult women may be due to obstetrical concerns - there are approximately 160 obstetrics-related transfers per year. In 2016, Sioux Lookout area First Nations had a birth rate of 19.5 per 1,000 population, compared to the provincial rate of 10.4 per 1,000 [4].

Population size of community

Remote First Nations communities in Ontario with an on-reserve population size of less than 500 people had a lower incidence of transfer for emergency medical care. The reason for this trend was unclear, and most likely multi-factorial. Paradoxically, larger communities often have more in-community physician coverage, but also higher rates of transfer, suggesting that local access to physician services may not independently reduce emergency patient transfers. Further analysis is needed to determine if the presence of a local physician reduces emergency transfers in remote communities.

Reason for transfer

When compared to national and regional patterns of ED visits, these data reveal a different pattern. Canada-wide, the top three reasons for an ED visit are abdominal-pelvic pain, chest-throat pain, and respiratory problems [19]. In the Sioux Lookout Meno Ya Win Health Centre ED, the top four reasons for ED visits are follow-up examination, respiratory problem, mental health and addiction, and abdominal-pelvic complaints [2]. In comparison, the top three chief complaints of patients transported from remote reserves in northern Ontario for medical emergencies are gastrointestinal, trauma and neurological.

Understanding why people are transferred off remote Ontario reserves to access emergency care may also help health systems planning. For example, on average 202 people per year are flown from remote First Nation communities in Ontario for cardiac reasons. Could point-of-care testing in nursing stations reduce transfers for chest pain? For each category of transport, similar questions can be raised, leading to further areas of inquiry or innovation.

Limitations

A limitation of this study is its inability to quantify the burden of emergency mental health transports in the region. While all of these patients are included in this data set, they are not captured in a Mental Health field, but categorized under another chief complaint. Between 2012 and 2016, the rate of Sioux Lookout area First Nation youth mental health related ED visits increased by 123%, and admissions increased 191% over the same time period [4]. In 2017, the area experienced a youth suicide rate of at least 2.7 per 1000, far higher than the provincial average [4].

While we have used the best population data available through Indigenous and Northern Affairs Canada (INAC), there are major limitations with this data. This study has chosen to use on-reserve population data in an attempt to best include those living in remote communities. These numbers are reliant on band-reporting which may lag behind true changes to community population as people move to and from a remote community. Further, with a quickly growing population, the on-reserve numbers may be inaccurate due to delays in including births into the data set.

Future Directions and Conclusion

This study provides the epidemiological foundation to enhance emergency care services in remote Indigenous communities in Ontario. While the findings in this study are descriptive, they are foundational. There is limited publicly available data on the epidemiology of disease in remote First Nations in Ontario. Improved data and linkages with administrative health data would allow further inquiry into mental health and a deeper understanding of other conditions of interest. This understanding will improve our ability to plan services to address medical emergencies in these remote communities, communities that experience a disproportionate burden of disease and inequitable access to hospital-based emergency care.

Acknowledgements
Julia Russell, Mahvareh Ahghari, Sol Mamakwa, Jackson Beardy, Cai-lei Matsumoto, Jeff Gunner, John McIntosh.

Financial Support.
This research was funded in part by a grant from the Northern Ontario Academic Medical Association (NOAMA).

References

1. Institute for Clinical Evaluative Sciences [Internet]. Geographic Access to Primary Care and Hospital Services for Rural and Northern Communities. 2011 [cited 2019 Feb 26]. Available from http://www.ices.on.ca/flip-publication/geographic-access-to-primary-care-and-hospital-services-for-rural-northern/index.html.

2. Matsumoto C, O'Driscoll T, Madden S et al. Characterizing high-frequency emergency department users in a rural northwestern Ontario hospital: a 5-year analysis of volume, frequency and acuity of visits. Can J Rural Med. 2018; 23(4): 99.
3. Office of the Auditor General of Canada [Internet]. Access to Health Services for Remote First Nations Communities; April 28, 2015 [cited 2019 Feb 25] . Available from http://www.oag-bvg.gc.ca/internet/English/parl_oag_201504_04_e_40350.html.
4. Sioux Lookout First Nations Health Authority [Internet]. Our Children and Youth Health Report 2018 [cited 2019 Mar 11]. Available from: https://slfnha.com/application/files/6215/4022/0883/CHSR_FINAL_-_Web_Version.pdf.
5. Oliver LN, Fines P, Bougie E et al. Intentional injury hospitalizations in geographical areas with a high percentage of Aboriginal-identity residents, 2004/2005 to 2009/2010. Chronic Dis Inj Can. 2014; 34:82–93.
6. Nolan B, Ackery A, Mamakwa S et al. Care of the Injured Patients at Nursing Stations and during Air Medical Transport. Air Medical Journal. 2018; 37: 161–164.
7. Young K. Mortality Pattern of Isolated Indians in Northwestern Ontario: A 10-Year Review. Public Health Reports. 1983; 98(5): 467-475.
8. Assembly of First Nations [Internet]. [cited 2019 Aug 13] Available from https://www.afn.ca/Home/.
9. Nishnawbe Aski Nation [Internet]. Alphabetical Listing of First Nations in NAN. [cited 2019 Aug 13] Available from http://www.nan.on.ca/article/alphabetical-listing-of-first-nations-in-nan-398.asp.
10. Richmond CA, Ross NA. The determinants of First Nation and Inuit health: a critical population health approach. Health Place. 2009; 15:403-11.
11. Whitehead S, Henning B, Johnston J et al. 1996. Developing an Injury Morbidity and Mortality Profile in the Sioux Lookout Zone: 1992-1995. Project supported by the Canadian Hospitals Injury Reporting and Prevention Program.
12. Fantus D, Shah BR, Qiu F et al. Injury in first nations communities in Ontario. Can J Public Health. 2009; 100:258–262.
13. Karmali S, Laupland K, Harrop AR et al. Epidemiology of severe trauma among status Aboriginal Canadians: a population-based study. CMAJ. 2005; 172:1007–1011.
14. Matsumoto CL, O'Driscoll T, Lawrence J et al. A 5 year retrospective study of emergency department use in Northwest Ontario: a measure of mental health and addictions needs. CJEM 2017; 19:381-5.
15. Eton, V et al. Epidemiology of invasive pneumococcal and Haemophilus influenzae diseases in Northwestern Ontario, Canada, 2010–2015. International Journal of Infectious Diseases.. 2017; 65: 27–33.
16. Maple-Brown et al. Cardiovascular disease risk profile and microvascular complications of diabetes: comparison of Indigenous cohorts with diabetes in Australia and Canada. Cardiovascular Diabetology 2012; 11:30.
17. Shah BR, Hux JE, Zinman B. Increasing rates of ischemic heart disease in the native population of Ontario, Canada. Arch Intern Med. 2000;160:1862-66.
18. Government of Canada. Indigenous and Northern Affairs Canada. Personal Correspondence 2018 June 26. [cited 26 Feb 2019].

19. Canadian Institute for Health Information [Internet]. NACRS emergency department visits and length of stay, 2016–2017 [cited 2019 Feb 26]. Ottawa. Available from https://www.cihi.ca/en/nacrs-emergency-department-visits-and-length-of-stay-2016-2017.
20. Office of the Auditor General of Ontario [Internet]. Land Ambulances Services Follow-up to VFM Section 3.04, 2013 Annual Report [cited 2019 May 7]. Available from http://www.auditor.on.ca/en/content/annualreports/arreports/en15/4.04en15.pdf.

Appendix

Appendix Table 1. Population demographics of Indigenous air access only communities in Northern Ontario by year, sex, and age group

	2012	2013	2014	2015	2016	Mean
Total	21488	21957	22414	22829	23257	22389
Male						
0-4	*1023(9.3%)	1015(9.1%)	995(8.7%)	931(8%)	918(7.7%)	976.4
5-9	1276(11.6%))	1302(11.6%)	1345(11.8%)	1394(12%)	1399(11.8%)	1343.2
10-14	1227(11.2%)	1246(11.1%)	1274(11.1%)	1299(11.2%)	1335(11.3%)	1276.2
15-19	1207(11%)	1203(10.7%)	1200(10.5%)	1199(10.3%)	1198(10.1%)	1201.4
20-24	1124(10.2%)	1145(10.2%)	1157(10.1%)	1156(9.9%)	1187(10%)	1153.8
25-29	916(8.3%)	972(8.7%)	997(8.7%)	1052(9%)	1106(9.3%)	1008.6
30-34	766(7%)	778(6.9%)	823(7.2%)	848(7.3%)	871(7.3%)	817.2
35-39	717(6.5%)	723(6.4%)	718(6.3%)	718(6.2%)	731(6.2%)	721.4
40-44	601(5.5%)	612(5.5%)	636(5.6%)	660(5.7%)	666(5.6%)	635
45-49	603(5.5%)	617(5.5%)	621(5.4%)	615(5.3%)	592(5%)	609.6
50-54	437(4%)	469(4.2%)	493(4.3%)	526(4.5%)	557(4.7%)	496.4
55-59	318(2.9%)	342(3.1%)	355(3.1%)	391(3.4%)	405(3.4%)	362.2
60-64	233(2.1%)	237(2.1%)	249(2.2%)	261(2.2%)	287(2.4%)	253.4
65+	536(4.9%)	552(4.9%)	571(5%)	592(5.1%)	614(5.2%)	573
Total	10984(100%)	11213(100%)	11434(100%)	11642(100%)	11866(100%)	11427.8
Female						
0-4	944(9%)	926(8.6%)	921(8.4%)	895(8%)	859(7.5%)	909.0
5-9	1240(11.8%))	1272(11.8%)	1309(11.9%)	1325(11.8%)	1351(11.9%)	1299.4
10-14	1138(10.8%)	1178(11%)	1205(11%)	1208(10.8%)	1220(10.7%)	1189.8
15-19	1120(10.7%)	1099(10.2%)	1093(10%)	1123(10%)	1150(10.1%)	1117.0
20-24	1075(10.2%)	1125(10.5%)	1134(10.3%)	1151(10.3%)	1129(9.9%)	1122.8
25-29	861(8.2%)	879(8.2%)	916(8.3%)	954(8.5%)	1032(9.1%)	928.4
30-34	801(7.6%)	795(7.4%)	814(7.4%)	826(7.4%)	823(7.2%)	811.8
35-39	655(6.2%)	695(6.5%)	704(6.4%)	729(6.5%)	765(6.7%)	709.6
40-44	638(6.1%)	628(5.8%)	636(5.8%)	631(5.6%)	646(5.7%)	635.8
45-49	558(5.3%)	582(5.4%)	589(5.4%)	609(5.4%)	602(5.3%)	588.0
50-54	412(3.9%)	445(4.1%)	481(4.4%)	504(4.5%)	523(4.6%)	473.0
55-59	269(2.6%)	305(2.8%)	336(3.1%)	362(3.2%)	384(3.4%)	331.2
60-64	218(2.1%)	218(2%)	232(2.1%)	234(2.1%)	251(2.2%)	230.6
65+	575(5.5%)	597(5.6%)	610(5.6%)	636(5.7%)	656(5.8%)	614.8
Total	10504(100%)	10744(100%)	10980(100%)	11187(100%)	11391(100%)	10961.2

*Number of people on reserve (Percentage in a given year)

Appendix Table 2. Demographics of medical transports by year, sex, and age group

	2012	2013	2014	2015	2016	Mean
Total	2051	2141	2169	2032	2145	
Male						
0-4	*176(19.8%)	140(14.8%)	190(20%)	136(15.1%)	182(18.9%)	164.8
5-9	38(4.3%)	36(3.8%)	32(3.4%)	43(4.8%)	30(3.1%)	35.8
10-14	47(5.3%)	39(4.1%)	43(4.5%)	36(4%)	58(6%)	44.6
15-19	85(9.6%)	51(5.4%)	52(5.5%)	46(5.1%)	58(6%)	58.4
20-24	73(8.2%)	87(9.2%)	67(7.1%)	77(8.5%)	66(6.9%)	74.0
25-29	64(7.2%)	74(7.8%)	67(7.1%)	53(5.9%)	62(6.4%)	64.0
30-34	54(6.1%)	52(5.5%)	51(5.4%)	46(5.1%)	50(5.2%)	50.6
35-39	47(5.3%)	63(6.7%)	38(4%)	55(6.1%)	51(5.3%)	50.8
40-44	56(6.3%)	57(6%)	52(5.5%)	39(4.3%)	44(4.6%)	49.6
45-49	45(5.1%)	59(6.2%)	76(8%)	72(8%)	57(5.9%)	61.8
50-54	37(4.2%)	44(4.7%)	50(5.3%)	66(7.3%)	66(6.9%)	52.6
55-59	29(3.3%)	38(4%)	40(4.2%)	56(6.2%)	61(6.3%)	44.8
60-64	32(3.6%)	36(3.8%)	42(4.4%)	26(2.9%)	46(4.8%)	36.4
65+	104(11.7%)	169(17.9%)	147(15.5%)	152(16.8%)	132(13.7%)	140.8
Unknown	2(0.2%)	1(0.1%)	2(0.2%)	0(0%)	0(0%)	1.0
Total	889	946	949	903	963	
Female						
0-4	101(8.8%)	136(11.5%)	127(10.5%)	104(9.3%)	129(11%)	119.4
5-9	26(2.3%)	34(2.9%)	32(2.6%)	21(1.9%)	21(1.8%)	26.8
10-14	54(4.7%)	43(3.6%)	69(5.7%)	90(8%)	107(9.1%)	72.6
15-19	168(14.7%)	118(10%)	93(7.7%)	110(9.8%)	143(12.2%)	126.4
20-24	131(11.5%)	155(13.1%)	154(12.7%)	136(12.2%)	128(10.9%)	140.8
25-29	111(9.7%)	104(8.8%)	92(7.6%)	104(9.3%)	101(8.6%)	102.4
30-34	96(8.4%)	108(9.1%)	96(7.9%)	74(6.6%)	98(8.4%)	94.4
35-39	48(4.2%)	59(5%)	60(5%)	58(5.2%)	60(5.1%)	57
40-44	48(4.2%)	55(4.6%)	57(4.7%)	52(4.6%)	45(3.8%)	51.4
45-49	56(4.9%)	56(4.7%)	59(4.9%)	66(5.9%)	63(5.4%)	60
50-54	58(5.1%)	56(4.7%)	80(6.6%)	59(5.3%)	49(4.2%)	60.4
55-59	45(3.9%)	55(4.6%)	53(4.4%)	41(3.7%)	49(4.2%)	48.6
60-64	61(5.3%)	45(3.8%)	52(4.3%)	26(2.3%)	32(2.7%)	43.2
65+	136(11.9%)	154(13%)	182(15.1%)	176(15.7%)	147(12.5%)	159
Unknown	5(0.4%)	6(0.5%)	2(0.2%)	2(0.2%)	0(0%)	3
Total	1144	1184	1208	1119	1172	
Unknown Sex	18	11	12	10	10	

*Number of transports(Percentage in a given year)

Appendix Table 3. Incidence of medical transport by year, sex, and age group

	2012	2013	2014	2015	2016	Mean
Male						
0-4	17.2	13.8	19.1	14.6	19.8	16.9
05-09	3.0	2.8	2.4	3.1	2.1	2.7
10-14	3.8	3.1	3.4	2.8	4.3	3.5
15-19	7.0	4.2	4.3	3.8	4.8	4.9
20-24	6.5	7.6	5.8	6.7	5.6	6.4
25-29	7.0	7.6	6.7	5.0	5.6	6.4
30-34	7.0	6.7	6.2	5.4	5.7	6.2
35-39	6.6	8.7	5.3	7.7	7.0	7.0
40-44	9.3	9.3	8.2	5.9	6.6	7.9
45-49	7.5	9.6	12.2	11.7	9.6	10.1
50-54	8.5	9.4	10.1	12.5	11.8	10.5
55-59	9.1	11.1	11.3	14.3	15.1	12.2
60-64	13.7	15.2	16.9	10.0	16.0	14.4
65+	19.4	30.6	25.7	25.7	21.5	24.6
Female						
0-4	10.7	14.7	13.8	11.6	15.0	13.2
05-09	2.1	2.7	2.4	1.6	1.6	2.1
10-14	4.7	3.7	5.7	7.5	8.8	6.1
15-19	15.0	10.7	8.5	9.8	12.4	11.3
20-24	12.2	13.8	13.6	11.8	11.3	12.5
25-29	12.9	11.8	10.0	10.9	9.8	11.1
30-34	12.0	13.6	11.8	9.0	11.9	11.6
35-39	7.3	8.5	8.5	8.0	7.8	8.0
40-44	7.5	8.8	9.0	8.2	7.0	8.1
45-49	10.0	9.6	10.0	10.8	10.5	10.2
50-54	14.1	12.6	16.6	11.7	9.4	12.9
55-59	16.7	18.0	15.8	11.3	12.8	14.9
60-64	28.0	20.6	22.4	11.1	12.7	19.0
65+	23.7	25.8	29.8	27.7	22.4	25.9

Appendix Table 4. Number of transports and incidence per 100 on-reserve population by communities with EMS and no EMS services by year

	2012	2013	2014	2015	2016	Total
Number of Transfers						
No EMS	*1641(80%)	1713(80%)	1727(79.6%)	1578(77.7%)	1711(79.8%)	8370(79.4%)
EMS	410(20%)	428(20%)	442(20.4%)	454(22.3%)	434(20.2%)	2168(20.6%)
Incidence						
No EMS	8.4	8.5	8.7	8.8	8.3	
EMS	8.4	8.6	8.5	7.6	8.1	

*Number of transports(Percentage in a given year)

Appendix Table 5. Transports by accepting facility with greater than 50 transports

Community	2012	2013	2014	2015	2016	Mean
Kingston - Kingston General Hospital	38(1.9%)	57(2.7%)	33(1.5%)	33(1.6%)	50(2.3%)	42.2
Moose Factory - Weeneebayko General Hospital	359(17.5%)	281(13.1%)	344(15.9%)	355(17.5%)	321(15%)	332
Out of Province - Manitoba	81(3.9%)	41(1.9%)	57(2.6%)	55(2.7%)	56(2.6%)	58
Sioux Lookout - Meno Ya Win Health Centre	1117(54.5%)	1291(60.3%)	1176(54.2%)	1024(50.4%)	1120(52.2%)	1145.6
Thunder Bay - Thunder Bay Regional Health Sciences Centre	271(13.2%)	239(11.2%)	272(12.5%)	288(14.2%)	291(13.6%)	272.2
Timmins - Timmins and District Hospital	35(1.7%)	78(3.6%)	67(3.1%)	66(3.2%)	68(3.2%)	62.8
Winnipeg - Children's Hospital	54(2.6%)	43(2%)	91(4.2%)	87(4.3%)	117(5.5%)	78.4
Winnipeg - Health Sciences Centre	38(1.9%)	26(1.2%)	49(2.3%)	58(2.9%)	44(2.1%)	43
Winnipeg - St. Boniface Hospital	9(0.4%)	5(0.2%)	12(0.6%)	18(0.9%)	17(0.8%)	12.2
Total	2002	2061	2101	1984	2084	

*Number of transports(Percentage in a given year)

Appendix Table 6. Number of transports over the study period for selected groups of patients

	Total transports over study period
Transfer of children 28 days to 1 year	643
Transfer of children under the age of 28 days	133
Transfer of adults 75-84	642
Transfer of adults 85+	162