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3 Reducing the burden of diabetes in First Nations people in Ontario: methods for a longitudinal  
4 population-based cohort study  
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**Abstract**

Background: First Nations people experience high rates of diabetes and related complications. To improve care, First Nations leaders need access to population-level health data. We provide an overview of the collaborative methods we used to describe the landscape of diabetes in First Nations people in Ontario using linked, health services datasets. In addition, we present demographic data on First Nations people in Ontario compared to the rest of Ontario.

Methods: Through a partnership with First Nations and academic researchers, we conducted in-depth analyses of diabetes-specific health outcomes and service utilization among First Nations people. Key was the ability to link provincial, population-based health data stored at ICES with the Indian Register (IR), which identifies all Status First Nations people. Our collaborative process was guided by the First Nations principles of ownership, control, access and possession (OCAP®).

Results: Using postal codes, we classified more than 99.9% of First Nations people in Ontario as living in or outside of a First Nations community. First Nations people were younger compared to the rest of Ontario. They were also more likely to live in semi-urban or rural areas.

Interpretation: This project is a first-of-its-kind study of diabetes in First Nations people in Ontario. The age and sex distribution of First Nations populations is different from the rest of Ontario; as such, adjusted rates are important to use for comparison. While significant urban-rural differences also exist, stratified results are more relevant to present due to differences in availability of health services throughout the province.

## Introduction

Diabetes is now considered one of the largest global health emergencies (1). In 2016, 3.4 million Canadians were estimated to be living with the disease; by 2025, it is estimated that the prevalence of diabetes will increase by 44% (2). People with diabetes are three times more likely to be hospitalized with cardiovascular disease, 12 times more likely to be hospitalized with end-stage renal disease, and over 20 times more likely to be hospitalized for a non-traumatic lower limb amputation than the general population (3). Among Indigenous people, the burden of diabetes is disproportionate (4, 5); the lifetime risk of diabetes was recently estimated to be 8 in 10 for First Nations adults over 18 years of age, compared to 5 in 10 for non-First Nations people (6). Prevalence rates are three to five times higher among First Nations people than other Canadians (7). Diabetes develops at younger ages, progresses more rapidly, and has higher complication rates among First Nations people than the general population (6, 8, 9).

Indigenous populations in Canada continue to experience health inequities related to the ongoing impacts of colonization (5, 10, 11). Significant disparities in health status and outcomes have been reported for decades across a range of conditions, including mortality, acute infectious diseases, injuries, mental health and suicide, and chronic diseases, including diabetes (5, 12, 13). To understand the impact of chronic disease in their communities and advocate for services within a complex and fragmented health system (14, 15), First Nations leaders need access to population-level data.

A first, limited look at the impact of diabetes using First Nations-specific data in Ontario in 2003 relied on identifying First Nations communities through postal codes; this analysis captured only 7% of First Nations people in Ontario (16). Recent initiatives at ICES, where Ontario's public health services datasets are stored, linked, and used for research, have enabled the identification of status First Nations people in Ontario, within guidelines established to ensure that First Nations principles of ownership, control, access and possession (OCAP® (17)) are respected (18, 19). As a result, we were able to reliably link rich ICES datasets on disease incidence, demographics, and geography with a robust dataset of registered First Nations people in Canada, allowing us to collaboratively perform the first ever in-depth analyses of First Nations-specific health outcomes and service utilization among individuals with diabetes in the province. These analyses were part of a larger, mixed-methods study to describe the landscape of diabetes in First Nations communities across Ontario.

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3 This manuscript will discuss the methodology used for these analyses, which will be presented  
4 across a series of manuscripts *{{reference other CMAJ papers}}*. In addition, we will present  
5 demographic data on the population of First Nations people in Ontario and compare it to that of  
6 the rest of Ontario.  
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## 10 11 **Methods**

### 12 Partnership and collaboration

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14 This study is a result of a partnership between the Chiefs of Ontario (COO), ICES, and  
15 researchers from across Ontario, coordinated by investigators at Queen's University, Laurentian  
16 University and the University of Minnesota Medical School (Duluth). The collaborative process  
17 used for this project has been described elsewhere (20). Briefly, through this partnership,  
18 academic, community and clinical team members actively participated in the conception, design,  
19 analysis and interpretation of the results as co-investigators through ongoing participation in  
20 study team meetings at all stages of the project. In addition, a Patient Advisory Group, made up  
21 of seven First Nations people with personal connection to diabetes as either a patient or family  
22 member, provided additional insight and reflections at regular intervals throughout the project.  
23 Members of the Patient Advisory Group were invited from different communities to acknowledge  
24 the diversity of First Nations people in Ontario.  
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### 33 Data governance

34 A data governance agreement between COO and ICES was established prior to the beginning  
35 of this project to ensure First Nations governance of the Indian Register (IR) data held at ICES,  
36 in accordance with OCAP® principles (17). This data sharing agreement established a First  
37 Nations-led review process. This project served as a pilot for, and was the first project approved  
38 by, the First Nations Data Governance Committee, which has members appointed by the  
39 Ontario Chiefs' Committee on Health (18). The project was also reviewed and approved by the  
40 Health Coordination Unit, which includes members from First Nations organizations from across  
41 Ontario and Grand Council Treaty 3. We provided regular updates and presented findings back  
42 to the Patient Advisory Group, the Health Coordination Unit and the annual First Nations Health  
43 Forum in Ontario prior to releasing the results elsewhere.  
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52 This project was reviewed and approved by the Research Ethics Boards of Queen's University  
53 and Laurentian University.  
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### Data sources

This project used the Ontario population-level health administrative data housed at ICES (21). We linked a number of datasets to gather information on demographics, diagnoses, and health care utilization (listed in Appendix 1). Key to these analyses is the ability to link provincial, population-based health information at the individual level with the Indian Register (IR). The IR is maintained by Crown-Indigenous Relations and Northern Affairs Canada and lists all people who are registered as members of a First Nation that is recognized under the Indian Act (i.e., all “Status Indians” or “Registered Indians”) (22). These datasets were linked using unique encoded identifiers and analyzed at ICES.

### Study cohort

To estimate the incidence and prevalence of diabetes, annual cohorts of the Ontario population were created for each year between April 1, 1995 to April 1, 2014. All individuals from the Registered Persons Database (RPDB) who were Ontario residents eligible for a health card, were alive for the entire year of the cohort (April 1 to March 31 of the following year), had contact with the healthcare system within the past 7 years, and were aged 105 years or younger were included in the population cohorts. All people who were alive at the end of each fiscal year, irrespective of diabetes status, were included to ensure that all new cases of diabetes were captured. The presence of diabetes was established through the Ontario Diabetes Database (ODD). This dataset has been validated against primary care health records and has demonstrated to be accurate for determining incidence and prevalence of diabetes with a sensitivity of 86% and a specificity of 97% (23).

To estimate diabetes-specific outcomes, including micro- and macrovascular complications and health services utilization, annual cohorts of the population with diabetes were created for each year between April 1, 1995 to April 1, 2014. All individuals from the RPDB who were Ontario residents eligible for a health card, were alive on the index date, were diagnosed with diabetes prior to the index date according to the ODD, had contact with the healthcare system within the past 7 years, and were aged 105 years or younger were included in these diabetes cohorts.

In each cohort, the IR was used to identify all Status First Nations people in Ontario; all other Ontario residents were considered to be the population of “other people in Ontario”. A combination of residence codes and postal codes were used to identify whether a First Nations person lived in a First Nations community (i.e., “Indian Reserves”, according to the Indian Act

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3 (22) each year. Residence codes are unique to each municipality or First Nations community  
4 and are recorded in the National Ambulatory Care Reporting System (NACRS) and the  
5 Discharge Abstract Database (CIHI-DAD) databases when individuals are admitted to  
6 emergency departments or hospitals. If an individual had no emergency department visits or  
7 hospitalizations and therefore did not have a recorded residence code, their postal code from  
8 the RPDB, which includes the address associated with a person's health card, was used to map  
9 their home address to a census subdivision (CSD). Some CSDs are clearly and exclusively  
10 within a First Nations community or outside of a First Nations community. First Nations  
11 individuals who lived in the few CSDs that included both First Nations communities and other  
12 communities were considered to be living in a First Nations community. Through this process,  
13 the residence for First Nations people was classified as being in a First Nations community,  
14 outside of a First Nations community, out-of-province (based on a postal code from outside  
15 Ontario), or unknown (there was no available residence code or postal code for the individual)  
16 each year. As the geographic information available in the 1990s has limited reliability, the  
17 classification of living in or outside of a First Nations community was determined from 2001  
18 onwards.  
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### 30 Covariates

31 Multimorbidity was described using the Johns Hopkins ACG<sup>®</sup> System (version 7) Aggregated  
32 Diagnosis Groups (ADGs) (24), and was classified as low (0-4 ADGs), medium (5-9) and high  
33 (10+) degree of comorbidity. Urban-rural location was assigned using the Rurality Index of  
34 Ontario (RIO) (25). The RIO is a broad measurement of rurality, based on the dissemination  
35 area of a person's postal code. A RIO score of 0 to 9 indicates a major urban centre, a score of  
36 10-39 specifies a non-major urban centre (referred to as semi-urban) and a score of 40 and  
37 above is considered rural/remote.  
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### 44 Analytic approach

45 Annual prevalence rates of diabetes were calculated using each annual population cohort as the  
46 denominator for that year. The numerator was calculated as those in the denominator who  
47 were diagnosed with diabetes on or before the end of the year according to the ODD. Incidence  
48 rates of diabetes were calculated in a similar fashion using all newly diagnosed cases in a  
49 particular year as the numerator and all individuals "exposed to risk" who had no previous  
50 diagnosis of diabetes as the denominator.  
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3 To estimate diabetes-specific outcomes, each outcome measure was calculated on an annual  
4 basis using each annual diabetes cohort as the denominator for that year. The numerator was  
5 those in the denominator who experienced the outcome during the one year of follow-up. For  
6 rare events, outcomes measures were calculated on a 2-year or 5-year basis. Definitions for  
7 these specific outcomes are described in detail in each relevant manuscript *{{reference other*  
8 *CMAJ papers}}*.

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14 Both crude and age-sex standardized prevalence and incidence rates among First Nations  
15 people were estimated and compared with other people in Ontario. Age- and sex-standardized  
16 rates were calculated, using a direct standardization based on the 2001 Ontario census  
17 population, along with gamma-distributed 95% confidence intervals, to adjust for the differences  
18 in population distribution between populations and over time. Among First Nations people,  
19 estimates were also stratified by living in or outside of First Nations communities for First  
20 Nations people. Analyses were also stratified by rurality and co-morbidity.

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24 Analyses were conducted using SAS Enterprise Guide version 7.1 (Cary, NC).

### 25 26 27 28 29 30 **Cohort Description**

31 Registered First Nations people account for 1.2% of the overall population in Ontario. Over time,  
32 the proportion of First Nations people living in First Nations communities has slightly decreased,  
33 from 36.4% in 1995 to 35.0% in 2014. We were able to determine the location of residence  
34 (living in or outside a First Nations community) for more than 99.9% of First Nations individuals  
35 listed in the Indian Register.

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41 The age and sex distribution of First Nations people is different from other people in Ontario:  
42 First Nations people are younger and have a slightly higher proportion of males compared to the  
43 population of other people in Ontario (Figure 1). There is a higher proportion of males living in  
44 First Nations communities and tend to be younger than those living outside of First Nations  
45 communities (Figure 2).

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51 More than half of First Nations people live in semi-urban or rural/remote areas, significantly  
52 higher than the rest of the Ontario population (Table 1). Fifty percent of First Nations people live  
53 in Northern areas of the province compared to 5.5% of the rest of the Ontario population. Those  
54 living outside of First Nations communities have a higher burden of comorbidity (19.1% have

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3 high comorbidity) compared to those living in First Nations communities (13.1% with high  
4 comorbidity).  
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### 8 **Interpretation**

9 The age and sex distribution of the population of First Nations people differs from that of other  
10 Ontarians; First Nations people tend to be younger than other people in Ontario. Most First  
11 Nations people live in the Northern regions of the province and significantly more First Nations  
12 people live in semi-urban or rural areas compared to other people in Ontario. Others have  
13 demonstrated that individuals living in rural areas have poorer health, including higher rates of  
14 disability and infant mortality, and shorter life expectancy than those living in urban areas (26-  
15 28). A recent study showed that preventable and treatable mortality rates were significantly  
16 higher in more remote areas (29).  
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24 This study shows that those living in First Nations communities tend to have a lower burden of  
25 comorbid disease than those who live outside of First Nations communities; this may be due to  
26 the fact that those living in First Nations communities tend to be younger. However, First  
27 Nations people may be moving outside of First Nations communities as they age or experience  
28 illness or disease to be closer to health care services, which may be more difficult to access  
29 from First Nations communities. First Nations people living with diabetes have noted that a  
30 major barrier to receiving care is the lack of health care providers on their communities,  
31 resulting the need to travel to receive appropriate care (9).  
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38 It is important to note that most administrative data-based studies conducted at ICES make use  
39 of income quintiles for a defined geographic area as a proxy for individual level socio-economic  
40 status (SES). In the general population this works well in most areas but is known to be less  
41 accurate in large rural regions (30). Prior work at ICES on cancer in First Nations people (31)  
42 and preliminary analyses using this data set (data not shown) suggest that this proxy method is  
43 not sufficiently accurate for use in the status First Nations population so we are unable to  
44 include SES in these analyses.  
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### 50 **Limitations**

51 A number of limitations exist with the use of administrative health data. Population denominators  
52 based on the Registered Persons Database (RPDB) do not include individuals who have had a  
53 lapse in their health care coverage, which may lead to rates of diabetes being overestimated in  
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3 some regions or communities. Postal codes in the RPDB are captured from the information  
4 associated with a person's health card. This information is updated when a health card is  
5 renewed (usually every five years) or when an individual interacts with the health care system.  
6 As such, the RPDB may not have up-to-date postal codes for all individuals living in the  
7 province, and this may influence the rates generated in a given region or community. For  
8 individuals with high mobility, there is a high likelihood that we are misclassifying their place of  
9 residence. This is especially relevant for First Nations people as Indigenous populations in  
10 Canada experience higher levels of geographic mobility than other Canadians and may  
11 frequently move both within urban areas or between rural and urban areas (32-34). Any  
12 inaccuracies in postal codes recorded for First Nations people may also result in incorrectly  
13 ascribing people to living in or outside of First Nations community. Lastly, the RPDB contains a  
14 small number of individuals who are deceased or no longer living in Ontario; as such, the RPDB  
15 will underestimate mortality.  
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25 When interpreting the results from all the studies in this series, it is important to consider that  
26 our analyses only include Status First Nations people (i.e., those registered under the Indian Act  
27 (22)). First Nations individuals who are not registered with the federal government, or are  
28 members of a First Nation that is not recognized by the Government of Canada would not be  
29 included in these analyses. In addition, in our analyses that ascertained use of ambulatory care  
30 services, we were not able to capture care delivered by Community Health Centres (CHCs),  
31 Aboriginal Health Access Centres (AHACs), and federally funded nursing stations and health  
32 centres. While we would still capture any other primary care visits (i.e. primary care providers  
33 other than AHACs and CHCs) and access to other services (e.g., laboratory tests, ED visits,  
34 hospitalizations, etc.), this will result in an underestimate of primary care received by patients  
35 using these facilities and will mean that outcome measures that rely on primary care physician  
36 billing claims will also be underestimated. It is estimated that AHACs and Aboriginal CHCs  
37 provide care to 25% of Indigenous populations in Ontario (35); unfortunately, we are unable to  
38 estimate the percent of First Nations people that receive care from these services. First Nations  
39 people living in First Nations communities who are seen exclusively by nurses working at  
40 federally-supported nursing stations and health centres will have no physician visit billing claims  
41 and appear to have no primary care, when in fact they may be accessing regular primary care at  
42 these sites. This will be more relevant in the Sioux Lookout and Moose Factory zones, where  
43 these facilities are more common. In general, visits with specialist physicians or to emergency  
44 departments, as well as hospitalizations, are not subject to these same limitations, and outcome  
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3 measures relying on these data will not be underestimated. However, individuals living in  
4 northwestern Ontario may receive specialist care and hospital-based care in Manitoba and, to a  
5 lesser extent, individuals living in southeastern Ontario may receive such care in Quebec. Our  
6 data only include claims from Ontario physicians and facilities, so out-of-province care would be  
7 missed. As many First Nations people live in northwestern Ontario, this limitation may be  
8 important for some diabetes outcome measures.  
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13 While the algorithm used by the ODD to identify individuals with diabetes has a sensitivity of  
14 86% and a specificity of 97% (23), it does not perfectly identify all patients with diabetes and  
15 thus may include false negatives or false positives. In addition, the Ontario Diabetes Database  
16 (ODD) does not distinguish between type 1 and type 2 diabetes, so we cannot compare  
17 prevalence, incidence or complication rates between diabetes types. Although the vast majority  
18 of people with diabetes have type 2, type 1 makes up a greater proportion of the diabetes  
19 burden among younger individuals. This is particularly relevant in First Nations populations who  
20 are younger than other people in Canada (36). In addition, the ODD only captures individuals  
21 who have been diagnosed with diabetes, not those who may have the disease but have not had  
22 it diagnosed or have not sought health care services for it. A recent study found over 90% of  
23 Ontarians aged 40 years and older were screened for diabetes over a five year period,  
24 suggesting that the percentage of all cases that remain undiagnosed is likely small (37).  
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34 Lastly, administrative health data does not capture information on other important risk factors of  
35 diabetes. To complement the administrative data analyses, we have included an analysis of the  
36 First Nations Regional Health Survey, which captures a number of individual risk factors and  
37 sociodemographic characteristics *{{reference Rosella et al, CMAJ}}*.  
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## 42 **Conclusions and future directions**

43 This project is a first-of-its-kind study of the landscape of diabetes among First Nations people  
44 in Ontario. As the age and sex distribution of First Nations populations is significantly different  
45 from the rest of Ontario, it is important to account for these underlying differences. As such,  
46 age- and sex-adjusted rates are important to use for comparison and will be presented in our  
47 series of manuscripts *{{reference other CMAJ papers}}*. While significant urban-rural differences  
48 also exist, we present stratified results to describe these differences given the underlying  
49 differences in the availability of health services throughout the province.  
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3 First Nations' perspectives were integrated into the research process, findings and  
4 interpretations of the data. The Patient Advisory Group relayed the need to ground the findings  
5 of this work in the context of the history of First Nations people in Ontario and their experiences  
6 with colonization to better understand the environment that has been created where diabetes  
7 can take hold at a population level. This context is important to consider as we look at how  
8 diabetes affects First Nations people differently from other people in Ontario.  
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14 The overall aim of this project was to describe diabetes in First Nations populations to inform  
15 policy and practice. Using administrative health data sources to understand diabetes and its  
16 consequences at a population level will help First Nations organizations and communities to  
17 prevent and manage diabetes as well as cope with the long-term complications of the disease.  
18 We also analyzed the First Nations Regional Health Survey to better understand diabetes risk  
19 *{{reference Rosella et al, CMAJ}}*. In parallel, we worked with five First Nations communities  
20 across Ontario to interview people living with diabetes and health care providers *{{reference*  
21 *Jacklin et al, CMAJ}}*. Together, these perspectives paint a picture of diabetes in First Nations  
22 communities, patient encounters with the health care system and the trajectories of care  
23 experienced by First Nations people with diabetes.  
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38 *Atlas citation}}*. We also wish to acknowledge the First Nations individuals from Big Grassy  
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46 and statements expressed in this paper are solely those of the authors and do not reflect those  
47 of the funding or data sources; no endorsement is intended or should be inferred.  
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### Figure headings

44 Figure 1 – Population pyramids of First Nations people and other people in Ontario, 2014

47 Figure 2 – Population pyramids of First Nations people living in and outside of First Nations communities, 2014

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Table 1: Demographic characteristics of First Nations people, including those living in and outside of First Nations communities, and other people in Ontario, 2014

Characteristic	First Nations people			Other people in Ontario (N=13,248,443)
	Overall* (N=158,241)	Living in First Nations communities (N=55,311)	Living outside of First Nations communities (N=102,889)	
Age (years)				
Mean ± SD	34.11 ± 19.84	33.07 ± 20.52	34.68 ± 19.45	40.79 ± 22.54
Median (IQR)	32 (18-50)	30 (16-49)	32 (19-50)	41 (22-58)
Age group				
0-19	44,856 (28.3)	17,965 (32.5)	26,884 (26.1)	2,829,983 (21.4)
20-34	40,855 (25.8)	13,019 (23.5)	27,815 (27.0)	2,635,661 (19.9)
35-49	32,926 (20.8)	10,660 (19.3)	22,258 (21.6)	2,745,274 (20.7)
50-64	27,606 (17.4)	9,324 (16.9)	18,279 (17.8)	2,863,509 (21.6)
65-74	8,060 (5.1)	2,885 (5.2)	5,174 (5.0)	1,213,258 (9.2)
75+	3,938 (2.5)	1,458 (2.6)	2,479 (2.4)	960,758 (7.3)
Sex				
Female	78,877 (49.8)	26,557 (48.0)	52,299 (50.8)	6,759,006 (51.0)
Male	79,364 (50.2)	28,754 (52.0)	50,590 (49.2)	6,489,437 (49.0)
Rurality				
Urban	52,343 (45.6)	2,990 (13.5)	49,338 (53.3)	9,693,463 (73.5)
Semi-urban	30,268 (26.4)	5,527 (24.9)	24,732 (26.7)	2,545,162 (19.3)
Rural	32,134 (28.0)	13,639 (61.6)	18,486 (20.0)	941,948 (7.1)
Comorbidity				
Low	71,452 (45.2)	30,635 (55.4)	40,782 (39.6)	5,116,120 (38.6)

Characteristic	First Nations people			Other people in Ontario (N=13,248,443)
	Overall* (N=158,241)	Living in First Nations communities (N=55,311)	Living outside of First Nations communities (N=102,889)	
Medium	57,760 (36.5)	17,421 (31.5)	40,334 (39.2)	5,605,860 (42.3)
High	29,029 (18.3)	7,255 (13.1)	21,773 (21.2)	2,526,463 (19.1)

\* This includes all First Nations people included in the Indian Register, regardless of whether we could determine whether they lived within a First Nation community

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Figure 1 – Population pyramids of First Nations people and other people in Ontario, 2014

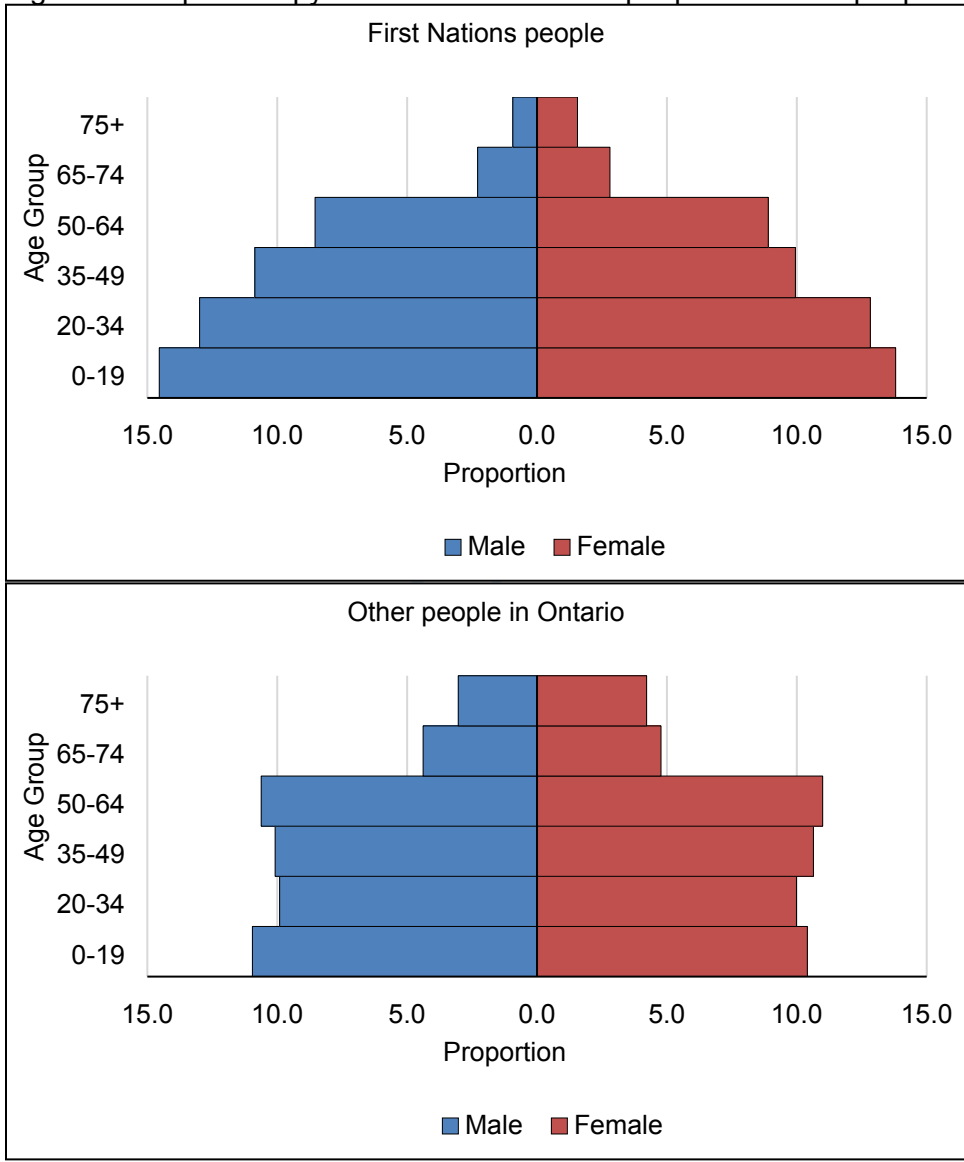
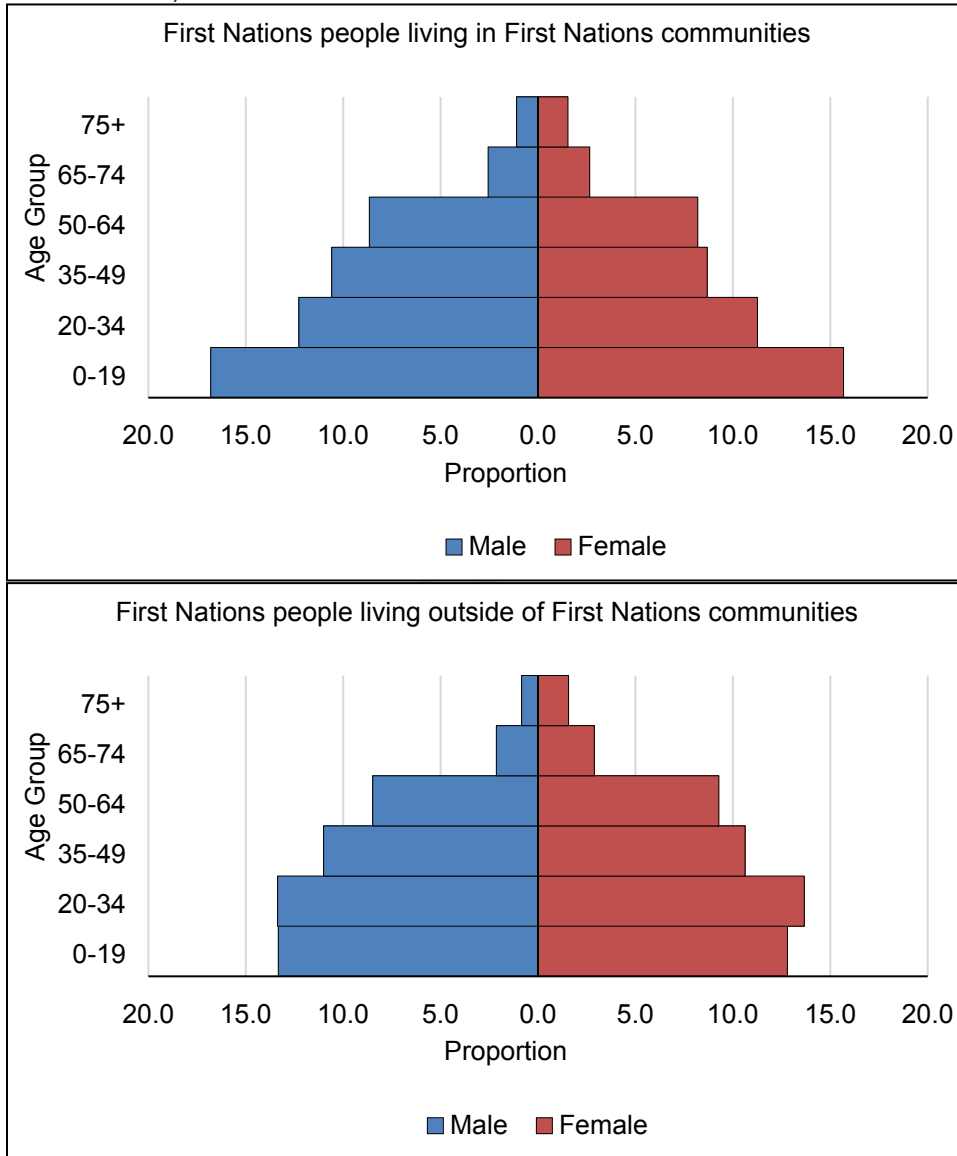




Figure 2 – Population pyramids of First Nations people living in and outside of First Nations communities, 2014



## Appendix 1 - Data sets accessed at ICES

Data set	Description
Canadian Organ Replacement Register (CORR)	This data set records and analyzes the level of activity and outcome of vital organ transplantation and renal dialysis activities.
Client Agency Program Enrolment (CAPE)	The CAPE data set identifies patients enrolled in different primary care models over time. A separate file provided by the Ministry of Health and Long-Term Care (MOHLTC) identifies the physicians that were part of a Family Health Team.
Corporate Provider Database (CPDB)	This data set includes physician birth date, gender, school of graduation, year of graduation, reported specialties and postal code of practice.
Discharge Abstract Database (CIHI-DAD)	This data set is compiled by the Canadian Institute for Health Information; it captures administrative, clinical and demographic information on hospital discharges, including deaths.
ICES Physician Database (IPDB)	The IPDB contains information about physicians practicing in Ontario. It is created and maintained by ICES, using data from several sources including: the Ontario Physician Human Resource Data Centre (OPHRDC), the OHIP Corporate Provider Database (CPDB), and the OHIP database of physician billings. The IPDB includes: demographic information about each physician (i.e., age, sex), practice location, physician specialty, services provided, where each physician was trained and year of graduation.
Indian Registry System (IRS)	The Indian Register is the official record identifying persons registered as Status Indians under the <i>Indian Act</i> . According to section 5 of the <i>Indian Act</i> (22), Crown-Indigenous Relations and Northern Affairs Canada is responsible for maintaining the Register. The dataset contains band numbers, which allow for the assignment of individuals to the First Nations community where they have membership, demographic and administrative information on all Registered/Status First Nations people in Canada. The IR was linked to the data at ICES by resolution and under a Data Governance Agreement with the Chiefs of Ontario and used to identify First Nations people in Ontario.
National Ambulatory Care Reporting System (NACRS)	This data set is maintained by the Canadian Institute for Health Information. It contains data for all hospital- and community-based ambulatory care, such as day surgery and emergency department visits including chief complaint (reason for visit). NACRS data are available from 2002 onwards.
Ontario Diabetes Database (ODD)	This data set is a validated registry of all people in Ontario diagnosed with diabetes (23). It was created at ICES using hospital discharge abstracts (from the Discharge Abstract Database [DAD] and Same Day Surgery [SDS]), Ontario Health Insurance Plan (OHIP) claims and Registered Persons Database (RPDB).
Ontario Drug Benefit (ODB)	The ODB Program database identifies the drug, dose and date for outpatient drug dispensations through publicly-funded drug programs in Ontario. Eligible recipients are all Ontario residents aged $\geq 65$ years and selected younger populations.

Ontario Health Insurance Plan (OHIP)	These data record all claims for reimbursement by Ontario physicians for inpatient and ambulatory visits, consultations and procedures. The data also include claims from optometrists for publicly-funded reimbursement and from laboratories for all diagnostic tests performed.
Ontario Laboratory Information System (OLIS)	OLIS provides lab results of patients from all Public Health Ontario laboratories and a number of hospitals and community laboratories.
Ontario Mental Health Reporting System (OMHRS)	This database contains admissions to mental health-designated hospital beds and includes the most responsible diagnosis for admission.
Ontario Mother-Baby linked dataset (MOMBABY)	This dataset is derived within ICES to link the inpatient admission records of delivering mothers and their newborns. Ideally, each record corresponds to a mother-child pair. However, in cases when a mother record was identified but the corresponding child-record was not found, or vice versa, a MOMBABY record is still created with all the available information.
Ontario Population Estimates and Projections (POP)	Generated by Statistics Canada and made available by the Ontario Ministry of Health and Long-Term Care through IntelliHealth Ontario, this data set provides Ontario population estimates and projections by sex, age, and geographic areas.
Primary Care Population dataset (PCPOP)	PCPOP is an ICES derived population level dataset that includes all people from Ontario who are deemed eligible at the index date in question. An eligible person would be an Ontario resident who is alive at the index, have had some contacts with healthcare system within 7-9 years of index and must have OHIP eligibility. PCPOP data is available from 2000 onward and each quarterly dataset includes basic demographic variable, information on primary care rostering identifying a patient's attachment status (rostered, virtually rostered or not rostered /not in PEM) along with a number of variables such as ED visits, hospitalization, access to specialty care, continuity of care and models of care.
Registered Persons Database (RPDB)	This data set provides demographic information about all individuals who have received an Ontario health card number, including their date of birth, sex, and home address.
Same Day Surgery (SDS)	This database includes ambulatory care visits for inpatient surgery or to the emergency department.