

# Use of the health care system by Ontario First Nations people with diabetes: a population-based study

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## Abstract

**Background:** First Nations people in Ontario have an increased prevalence of diabetes compared to other people in the province. This study examined use of health care services by First Nations people with diabetes and other people with diabetes in Ontario.

**Methods:** Using linked health administrative databases, we identified all people in Ontario with diabetes as of Apr. 1, 2014. We identified First Nations people using the Indian Register. We looked at outcomes from Apr. 1, 2014, to Mar. 31, 2015. We determined the proportion of people with a regular family physician and their continuity of care with that physician. We also examined visits with specialists for diabetes care, hospital admissions for ambulatory-care-sensitive conditions, and emergency department visits for hypo- or hyperglycemia.

**Results:** There were 1 380 529 people diagnosed with diabetes in Ontario as of Apr. 1, 2014, of whom 22 952 (1.7%) were First Nations people. First Nations people were less likely to have a regular family physician (85.3% v. 97.7%) and had lower continuity of care with that physician (mean score for continuity of care 74.6 v. 77.7) than other people in Ontario. They were also less likely to see specialists. First Nations people were more likely to be admitted to hospital for ambulatory-care-sensitive conditions (2.4% v. 1.2%) and to have an emergency department visit for hypo- or hyperglycemia (1.5% v. 0.8%). Disparities were particularly marked for those living in First Nations communities.

**Interpretation:** First Nations people with diabetes in Ontario had poorer access to and use of primary care than other people with diabetes in the province. These findings may help explain continued disparities in the rates of complications related to diabetes.

Health care systems with strong primary care deliver better outcomes at lower costs and with fewer disparities,<sup>1,2</sup> particularly among people with chronic diseases such as diabetes.<sup>3</sup> First Nations people in Ontario have an increased prevalence of diabetes compared to other people in the province<sup>4</sup> and experience complications from diabetes at elevated rates.<sup>5</sup>

First Nations people face unique geographic and sociopolitical barriers to diabetes care. Colonialism is a major contributor to socioeconomic and environmental marginalization, geographic and transportation barriers, and the fragmentation of responsibility for health care services.<sup>6–8</sup> Racism, discrimination, unconscious bias and structural violence in the health care system also create barriers that keep Indigenous people from accessing health care services.<sup>9–12</sup> The aim of this study was to determine whether family physician, specialist and hospital use by First Nations people with diabetes in Ontario differs from that of other people with diabetes in the province.

## Methods

### Design, data sources and study population

We conducted a retrospective population-based cohort study in Ontario. The general approach to cohort creation and the characteristics of the study cohort are described in detail elsewhere.<sup>13</sup> Data evaluated in this study were sourced from comprehensive linked health administrative data sets related to Ontario's single-payer publicly funded health care system housed at ICES. The data sets used are described in Appendix 1 of our previous publication.<sup>13</sup>

**Competing interests:** None declared.

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In brief, for this study, we identified all people with diagnosed nongestational diabetes in Ontario as of Apr. 1, 2014. We identified those who were First Nations using the Indian Register, which includes information for all people registered as Status First Nations people under the *Indian Act*. All other Ontario residents were classified as “other people in Ontario.” First Nations people were also categorized as living in or outside of First Nations communities (“Indian reserves”) by means of postal codes and other geographic information.<sup>13</sup> Baseline characteristics ascertained for each patient included age, sex, location of residence (defined with the Rurality Index for Ontario score for each person’s home address, classified into urban, semiurban, rural and remote)<sup>14</sup> and comorbidity (defined with the Johns Hopkins Adjusted Clinical Group System Aggregated Diagnosis Groups).<sup>15</sup>

### Outcome measures

We ascertained use of health care services from physician service claims for fee-for-service reimbursement, and from hospital discharge abstracts and emergency department encounter abstracts compiled by the Canadian Institute for Health Information. We determined 6 outcomes that spanned primary, specialist and hospital care for diabetes. First, we determined the proportion of people with diabetes who had a regular family physician by examining their registrations to a family physician under a primary care enrolment model, where patients are rostered with a specific family physician or team. We considered people who were not formally rostered to have a regular family physician if they had received any core primary care services such as periodic health examinations or vaccinations over the preceding 2 years.<sup>16</sup> Second, we determined a score for continuity of family physician care among people who had a regular family physician and who had had at least 3 family physician visits over the preceding 2 years by calculating the proportion of their total family physician visits that were with their regular family physician.

We next examined secondary care by evaluating use of specialists for diabetes care. We ascertained any ambulatory visits with an endocrinologist (third outcome) and any ambulatory visits with a general internist (fourth outcome) between Apr. 1, 2014, and Mar. 31, 2015.

The fifth outcome was hospital admission for an ambulatory-care-sensitive condition between Apr. 1, 2014, and Mar. 31, 2015. Ambulatory-care-sensitive conditions are chronic medical conditions (asthma, chronic obstructive pulmonary disease, congestive heart failure or diabetes) for which adequate and timely primary care ought to reduce the requirement for hospital admission for these conditions.<sup>17,18</sup>

The sixth outcome was an emergency department visit for hypo- or hyperglycemia between Apr. 1, 2014, and Mar. 31, 2015. These conditions are acute complications of diabetes, as they indicate profound metabolic abnormalities that a patient cannot self-manage and instead requires medical assistance. We restricted these visits to unplanned emergency department visits triaged with a score of “urgent” or higher, to exclude emergency department visits that were substitutes

for primary care visits (e.g., prescription renewals or scheduled follow-up with a family physician working an emergency department shift). Both hospital admissions for ambulatory-care-sensitive conditions and emergency department visits for hypo- or hyperglycemia are potentially preventable events, and so both can be considered markers for poor access to primary care. The *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* diagnosis codes used for both are presented in Appendix 1, Supplemental Table S1 (available at [www.cmajopen.ca/content/8/2/E313/suppl/DC1](http://www.cmajopen.ca/content/8/2/E313/suppl/DC1)).

### Statistical analysis

For continuity of care, we determined the mean score among eligible people; all other outcomes were dichotomous and we determined the proportion of people with the outcome. All analyses were adjusted for age and sex, and 95% confidence intervals (CIs) were calculated. We compared First Nations people living in First Nations communities and those living outside of First Nations communities with other people in Ontario. Because living in rural or remote areas can influence use of health care services, all analyses were further stratified by location of residence. Analyses were conducted with SAS Enterprise Guide version 7.1 (SAS Institute).

### Ethics approval

The study received research ethics review from Queen’s University and Laurentian University. The project was also approved by the Chiefs of Ontario Data Governance Committee.

### Results

There were 1 380 529 people diagnosed with diabetes in Ontario as of Apr. 1, 2014, of whom 22 952 (1.7%) were First Nations people. Table 1 shows the baseline characteristics of these populations. On average, First Nations people with diabetes were younger than other people with diabetes in Ontario, with 7516 (32.7%) less than age 50 years, compared to 242 423 other people (17.9%), and a higher proportion were female (53.6% v. 48.0%). First Nations people were also more likely to reside in rural and remote areas.

Table 2 shows each outcome across the populations. First Nations people, particularly those who lived in First Nations communities (77.6%, 95% CI 75.5%–79.8%), were less likely to have a regular family physician than were other people in Ontario (97.7%, 95% CI 97.5%–97.9%). Continuity of care was also lower for First Nations people.

First Nations people were markedly less likely to receive specialist care from an endocrinologist (3.9%, 95% CI 3.6%–4.2% v. 9.5%, 95% CI 9.5%–9.6%), and those living in First Nations communities were also less likely to receive care from a general internist (9.5%, 95% CI 9.0%–10.0% v. 11.0%, 95% CI 10.9%–11.0%).

First Nations people were twice as likely as other people to be admitted to hospital for ambulatory-care-sensitive conditions (2.4%, 95% CI 2.2%–2.7% v. 1.2%, 95% CI 1.2%–1.2%), and

**Table 1: Demographic characteristics of First Nations people with diabetes and other people with diabetes in Ontario, 2014/15**

Characteristic	No. (%) of people			
	First Nations people			
	Overall <i>n</i> = 22 952	Living in First Nations communities <i>n</i> = 8869	Living outside of First Nations communities <i>n</i> = 14 083	Other people in Ontario <i>n</i> = 1 357 577
<b>Sex</b>				
Male	10 644 (46.4)	4234 (47.7)	6410 (45.5)	705 528 (52.0)
Female	12 308 (53.6)	4635 (52.3)	7673 (54.5)	652 049 (48.0)
<b>Age, yr</b>				
≤ 19	290 (1.3)	111 (1.3)	179 (1.3)	11 409 (0.8)
20–34	1605 (7.0)	613 (6.9)	992 (7.0)	42 235 (3.1)
35–49	5621 (24.5)	2202 (24.8)	3419 (24.3)	188 779 (13.9)
50–64	9218 (40.2)	3532 (39.8)	5686 (40.4)	469 665 (34.6)
65–74	4106 (17.9)	1597 (18.0)	2509 (17.8)	335 360 (24.7)
≥ 75	2112 (9.2)	814 (9.2)	1298 (9.2)	310 129 (22.8)
<b>Rurality*</b>				
Urban	6644 (28.9)	392 (4.4)	6252 (44.4)	986 217 (72.6)
Semiurban	4600 (20.0)	1119 (12.6)	3481 (24.7)	261 741 (19.3)
Rural	5393 (23.5)	2400 (27.1)	2993 (21.3)	105 371 (7.8)
Remote/missing	6315 (27.5)	4958 (55.9)	1357 (9.6)	4248 (0.3)
<b>Comorbidity†</b>				
Low	4984 (21.7)	2464 (27.8)	2520 (17.9)	247 756 (18.2)
Medium	8868 (38.6)	3481 (39.2)	5387 (38.3)	577 934 (42.6)
High	9100 (39.6)	2924 (33.0)	6176 (43.9)	531 887 (39.2)

\*Defined with the Rurality Index for Ontario.<sup>14</sup>

†Defined with the Johns Hopkins Adjusted Clinical Group System Aggregated Diagnosis Groups.<sup>15</sup>

they were also more likely to have emergency department visits for hypo- or hyperglycemia (1.5%, 95% CI 1.3%–1.7% v. 0.8%, 95% CI 0.8%–0.9%).

Many of the differences between populations persisted when outcomes were stratified by location (Appendix 1, Supplemental Table S2). For example, among other people in Ontario, even those who lived in remote areas were still more likely to have a regular family physician than First Nations people living in any location. However, use of endocrinologists differed by location of residence: remote-dwelling First Nations people had similar use of endocrinologists as remote-dwelling other people, but First Nations people had lower use in all other locations.

### Interpretation

First Nations people with diabetes in Ontario had poorer access to primary and specialist care than other people with diabetes in the province. These disparities were particularly striking for those who were living in First Nations communities. First Nations people also had more potentially prevent-

able hospital admissions and emergency department visits, which can be markers of poor primary care access.

First Nations people with diabetes in Ontario were less likely to have a family physician than were other people with diabetes in the province. As primary care plays an important role in overall health, the fact that nearly one-quarter of First Nations people with diabetes living in First Nations communities did not have a family physician is concerning. It is important to highlight that family physician care delivered at community health centres and Aboriginal Health Access Centres (where physicians do not submit fee-for-service claims) was not captured within the data sources used in this study. However, less than 4% of Ontario’s First Nations people with diabetes received physician care at a Community Health Centre in 2014, and the majority of them continued to receive core primary care services from outside family physicians whose data were captured (Jennifer Rayner, Alliance Ontario: personal communication, 2020). First Nations people living in First Nations communities may also receive care through federally funded nursing stations and health centres, which may offer some of the primary care services that would otherwise

**Table 2: Age- and sex-adjusted use of health care use services of the 2 groups, 2014/15**

Outcome	% of people (95% CI)*			
	First Nations people			
	Overall	Living in First Nations communities	Living outside First Nations communities	Other people in Ontario
Had regular family physician	85.3 (83.9–86.7)	77.6 (75.5–79.8)	90.1 (88.3–92.0)	97.7 (97.5–97.9)
Score for continuity of care with regular family physician, mean (95% CI)	74.6 (74.1–74.5)	78.1 (77.3–78.9)	72.8 (72.2–73.4)	77.7 (77.6–77.7)
Receiving care from endocrinologist	3.9 (3.6–4.2)	2.2 (1.9–2.6)	5.0 (4.6–5.5)	9.5 (9.5–9.6)
Receiving care from general internist	9.5 (9.0–10.0)	7.6 (6.9–8.3)	10.7 (10.1–11.4)	11.0 (10.9–11.0)
Admitted to hospital for ambulatory-care-sensitive condition	2.4 (2.2–2.7)	2.5 (2.1–2.9)	2.4 (2.1–2.7)	1.2 (1.2–1.2)
Emergency department visit for hypo- or hyperglycemia	1.5 (1.3–1.7)	1.1 (0.9–1.3)	1.8 (1.5–2.0)	0.8 (0.8–0.9)

Note: CI = confidence interval.  
\*Except where noted otherwise.

be available from a family physician. Even among people who have a regular family physician, continuity of care was somewhat lower for First Nations people living outside of First Nations communities. Having a regular family physician and having continuity of care are both associated with better diabetes care,<sup>19–21</sup> which suggests that First Nations people may be at risk for poor quality of care.

First Nations people were also less likely to receive specialist diabetes care, especially if they lived in First Nations communities. Specialist physicians, particularly endocrinologists, are concentrated in larger urban centres, which may explain why use of specialist physicians decreased as rurality increased. However, except in the most remote locations of residence, First Nations people had substantially lower use of endocrinologists than comparable other people in Ontario, which suggests that there may also be systemic barriers to accessing specialist care for First Nations people. This gap in access to specialty care has been previously reported for diabetes<sup>22</sup> and other chronic conditions.<sup>23–25</sup>

Hospital admissions for ambulatory-care-sensitive conditions are a measure of overall health care performance, since timely, high-quality and accessible primary care can prevent many of these admissions.<sup>17,18</sup> First Nations people had higher rates of hospital admission for these conditions than other people in Ontario, regardless of location of residence. The increased burden of admission for ambulatory-care-sensitive conditions has been previously documented in First Nations people in Ontario and other Canadian provinces<sup>22,26,27</sup> and in Métis people.<sup>28</sup> Lavoie and colleagues<sup>27</sup> found that First Nations communities in Manitoba with better access to community-level primary health care had lower rates of hospital admission for ambulatory-care-sensitive conditions, whereas communities with limited in-community access to primary health care services had higher admission rates.

First Nations people also had higher rates of emergency department visits for hypo- or hyperglycemia. Although the vast majority of hypo- and hyperglycemic events can be managed by patients themselves on their own, these findings suggest that First Nations people are at particularly increased risk for severe metabolic abnormalities that they were unable to self-manage. Furthermore, a disproportionate number of First Nations people live in communities that are far from hospitals, so they would attend nursing stations or other health care facilities as the only available source of acute care. Thus, these data may actually underestimate the true burden of acute metabolic complications among First Nations people in Ontario.

Our findings corroborate previous research in Ontario.<sup>29</sup> A recent qualitative study of health care experiences of Indigenous people with type 2 diabetes showed that visits to care providers outside of their First Nation communities were considered a major challenge, not only because of geographic isolation, but also because the shortage of physicians in First Nations communities substantially jeopardized continuity of care.<sup>9</sup>

Some of the differences between First Nations people and other people in Ontario may result from geographic issues. For example, many First Nations communities are in isolated and remote locations, where access to health care services, particularly specialized services, is problematic. However, it is important to highlight the continuing impact of colonization as a key barrier to health care access.<sup>9,30,31</sup> Given power imbalances in the patient-provider relationship, service providers ought to be sensitive to these circumstances,<sup>32</sup> as miscommunication is a major barrier to care.<sup>33,34</sup> Inequities in access to health care can be lessened by implementing models of care that embrace Indigenous knowledge systems and that acknowledge the social and historical context of the health of First Nations people.<sup>9,32,35,36</sup>

## Limitations

This study has important strengths, including that it was a participatory research collaboration between academic researchers and First Nations community members, who were involved through the inception and design of the study and interpretation of the data. However, there are also limitations in the data to note. First, we were unable to capture family physician services delivered at community health centres and Aboriginal Health Access Centres, or through federally funded facilities; hence, we may have overestimated gaps in family physician care between First Nations people and other people in Ontario. However, very few First Nations people received primary care services exclusively within community health centres, so the impact of these missing data is likely negligible. In addition, hospital admissions for ambulatory-care-sensitive conditions and emergency department visits for hypo- or hyperglycemia both reflect inadequate primary care regardless of where it is delivered, and the results for these outcomes mirrored the results for family physician use. Also, any specialist care delivered outside of Ontario was not captured. This may particularly affect First Nations people living in northwestern Ontario, who may travel to Winnipeg for specialist care.

We included all people with nongestational diabetes in this study, and most people in the population with diabetes have type 2. Use of health care services by people with type 1 diabetes may be different from that of the diabetic population as a whole, but type 1 diabetes is particularly rare among First Nations people.<sup>37</sup>

As the study relied on secondary data not collected prospectively for research purposes, diagnoses may have been miscoded, which would have led to misclassification of outcomes. In addition, we could not examine the impact of socioeconomic status on health care use, because neighbourhood-level household income proxies are inaccurate among First Nations people.<sup>13</sup> Finally, First Nations people who are not registered with the Indian Register, including members of First Nations not recognized by the federal government, were not included in the First Nations population of this study.

## Conclusion

Compared to other people with diabetes in the province, First Nations people with diabetes in Ontario were less likely to have a regular family physician, had lower continuity of care and were less likely to see a diabetes specialist. They also had higher rates of hospital admission for ambulatory-care-sensitive conditions and higher rates of emergency department visits for hypo- or hyperglycemia, both of which are indicators of poor access to or quality of primary care. It is essential to improve health care access for First Nations people in order to reduce their burden of diabetes complications.

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**Contributors:** Baiju Shah and Michael Green conceived the study. Shahriar Khan analyzed the data. Baiju Shah drafted the manuscript. All of the authors were involved in designing the study and interpreting the data, revised the manuscript critically for important intellectual content, approved the final version to be published and agreed to be accountable for all aspects of the work.

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**Data sharing:** The data set from this study is held securely in coded form at ICES. Although data-sharing agreements prohibit ICES from making

the data set publicly available, access may be granted to those who meet prespecified criteria for confidential access. The full data set creation plan and underlying analytic code are available from the authors on request, with the understanding that the programs may rely on coding templates or macros that are unique to ICES Data from this study are not available for sharing.

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**Supplemental information:** For reviewer comments and the original submission of this manuscript, please see [www.cmajopen.ca/content/8/2/E313/suppl/DC1](http://www.cmajopen.ca/content/8/2/E313/suppl/DC1).