the Métis Nation of Ontario

DIABETES
IN THE MÉTIS NATION OF ONTARIO

LAY REPORT
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DIABETES IN THE MÉTIS NATION OF ONTARIO

Canada's Aboriginal Peoples are less healthy than the general population and also have higher rates of diabetes than non-Aboriginal Canadians.

Diabetes is a chronic disease that prevents the body from turning sugar from food into energy. The unused glucose (sugar) builds up in the bloodstream. Controlling the symptoms of diabetes is extremely important as uncontrolled diabetes can lead to several very serious health problems, including heart disease, stroke, kidney failure and blindness.

In recent years, researchers and health officials have gathered a great deal of information on diabetes in Canada's Aboriginal populations (see Bibliography). However, the research was not geared specifically towards the Métis population. Little is known about diabetes in the Métis population.

The Métis Nation of Ontario (MNO) is the only representative body for the Métis people in Ontario. The MNO was aware that diabetes was an issue with the Métis people in Ontario through contact with the Métis citizens and clients in the health programs. This led to a desire to conduct research to find out what the actual rate of diabetes in order to identify the extent of the problem. The MNO was also interested in gathering more information on what level of health care services the Métis people received in the treatment of their diabetes. As a consequence, the MNO launched a research study with funding from the Public Health Agency of Canada.

The Métis Nation of Ontario has a Citizenship Registry with a total of 14,480 citizens who have met citizenship criteria. The MNO worked with the Institute for Clinical Evaluative Sciences (ICES) to link the records of the Registry with provincial healthcare records. This was done because health data in Ontario do not include information on people's ethnic background, so another way of identifying Métis people was needed. All information that might identify individuals was kept strictly confidential. ICES is an independent organization funded through the Ministry of Health that studies the health of people in Ontario and contributes to policy and sustainable change in the health care system. ICES linked the Registry with provincial records to gather the information that was required.

This report explains the methods on how the information was gathered, shows what was learned about the disease among the Métis and how that compares to diabetes in the general population of Ontario. This study also looked at what type of treatment Métis people received to see if there were notable differences in the care Métis people received in comparison to the general population in Ontario.

THE EXTENT OF THE PROBLEM

It is not known exactly how many Métis people have diabetes. There are many different estimates. The 2006 Census indicates that there are 389,785 Métis people in Canada. The Aboriginal Peoples Survey, a post-censul survey of the national enumeration, indicates that the number of Métis who reported that they had diabetes increased from 5.5% in 1991 to 7% in 2006.

These results are similar to the estimated 6.1% reported by University of Manitoba researchers in 2000. But a study of Métis people's health needs done by Health Canada in 2005 and a Saskatchewan survey from 2009, each put the number at around 15% of the Métis population. As you can see, the numbers vary, however, all reports show that diabetes is a serious health issue in the Métis population.

RESEARCH METHODS

HOW THE INFORMATION WAS GATHERED

This study is based on the citizenship registry of the Métis Nation of Ontario (updated to August 2009), which represents about 18% of Ontario's total Métis population. The registry file was linked to the database of everyone who is eligible for a health card in Ontario. In total, 14,021 of the 14,480 individuals in the citizenship registry were found in Ontario health records, and 94% of them had a valid Ontario address. These records were used in the research. In this report, the group that was studied is referred to as "the Métis population" or "the Métis". All other Métis who are not part of the Citizenship Registry of the MNO were counted as part of the general population.

Individual privacy was protected by substituting coded numbers for real health-card numbers, so that records would remain anonymous. The Ontario Diabetes Database was also used to further narrow down the group, so that it included only people who have diabetes, both in the Métis Nation of Ontario, and in the general population. The information in this database does not distinguish between different types of diabetes. However as it is known that almost all people with diabetes have type 2 diabetes, it was assumed that these results apply mainly to type 2 diabetes.

Once the study group was established, the sample was linked with government healthcare records to search for diabetes-related entries. The records used are were follows:

- The Ontario Health Insurance Plan (OHIP), which records payments to Ontario physicians for consultations, visits and procedures.
- The Discharge Abstract Database (DAD), which has detailed information on each hospital stay in Ontario, including diagnoses and procedures performed during the stay.
- The National Ambulatory Care Reporting System (NACRS), which records diagnoses for all visits to Ontario emergency departments.
- The Ontario Drug Benefit Program, which keeps records of all the drug prescriptions filled for people who are eligible to have their drug costs paid by the province, which includes all senior citizens.

HOW WIDESPREAD IS DIABETES AMONG MÉTIS?

The proportion of the population living with diabetes or being told for the first time they have the disease is higher for the Métis population than the general population. As of April 1, 2007, 9.82 of every 100 Métis male in our sample had diabetes, compared to 6.75 non-Métis men in the general male population. Among women, the gap was a little narrower, with 7.88 of every 100 Métis women diagnosed with diabetes, compared to 6.15 in the general female population. During the study period, a higher proportion of the Métis population also received a new diagnosis of diabetes (technically the "incidence" of the disease) each year. Between April 1, 2006 and March 31, 2007, 0.88 of every 100 Métis women were diagnosed with the disease, compared to 0.62 of the general female population. The figure is 1.04 of every 100 for Métis men compared to 0.70 for other men.

In order to compare the Métis population in our study with the general population, the numbers gathered had to be standardized or adjusted. Standardizing or adjusting the numbers ensures that fair comparisons are made. This was necessary because the average age and the distribution of men and women of the Métis population is different than the Ontario population overall. For example, diabetes is more common in older people and in men in general, but because the Métis population in our study group has a different age and more men than Ontario overall, just counting cases could give us a false impression. By adjusting the numbers, a more accurate comparison between the Métis population in our study group and the overall Ontario population can be made. When statistics have not been adjusted, they are technically referred to as "crude" numbers.

ACCESS AND PROCESS OF CARE

People with diabetes tend to stay healthier longer when they are regularly followed and monitored by their doctors and other health professionals. Information can be gathered on who is receiving adequate care by keeping track of certain tests that all diabetics should have regularly. These tests include monitoring blood sugar levels, measuring blood pressure and checking eyes for blood clots and other signs of damage. An alternative source of information that shows what level and quality of care is received is if patients are receiving the medications recommended to control the negative effects of diabetes.

It was also important to see for the level of care received by Métis people compared to the general population. The different types of care listed below for all Ontario residents who had been diagnosed with diabetes by April 1, 2007 and were still alive and residents of Ontario on March 31, 2008 were examined. This data about the citizens of the Métis Nation of Ontario was compared to the general population. The signs of good care explored included:

- Number of office visits each patient had with a primary care physician (from zero through 5 or more)
- If a patient had at least one office visit with a physician specializing in diabetes care (an endocrinologist or general internist)
- Whether each patient had at least one visit for eye care with an ophthalmologist or optometrist (screening for diabetic eye disease is recommended for most people with diabetes every one to two years)

This study also included looking at whether older people in our study group – that is those 65 years of age or older received at least one prescription for any of these medications for diabetes:

- Glucose-lowering drugs
- Statins (which lower cholesterol)
- Drugs to lower blood pressure
- ACE inhibitors/angiotensin receptor blockers (which lower blood pressure and control other complications of diabetes as well)
- Glucose test strips, (which let patients monitor their own blood-sugar levels)

The results of these comparisons were mixed. The Métis people in our study group were less likely to see a diabetes specialist, more likely to take insulin and less likely to try to control their diabetes by diet alone. Less than half of the Métis people in our study group as well as the general population with diabetes were getting the recommended eye care. More details are provided in the tables on pages 12 to 13.

HOW WELL IS CARE WORKING?

As part of this study, the researchers were interested in finding out about the outcomes of care that people with diabetes are receiving. One way to do this is to check hospital stays or admissions with causes that are linked to complications of diabetes (heart conditions, dialysis, blood clots in the eyes and amputation of the feet). Researchers could not be 100% sure that all of the conditions are due to a poor level of diabetes care and were aware that these conditions could be caused by other factors. The time period studied was April 1, 2007 through to March 31, 2008. Hospital stays or admissions with the following eight conditions were reviewed and are as follows:

- Hypo- or hyperglycemia: This means that blood-sugar levels are too low (hypo) or too high (hyper). Hypoglycemia can cause confusion, clumsiness, or fainting and even lead to seizures, coma, and death. Hyperglycemia causes frequent urination, thirst and unhealthy weight loss. Hospital stays or emergency department visits where blood-sugar imbalance was the cause were explored.
- Eye complications: These were found by checking hospital admission and billing records for 'laser photocoagulation' or 'vitrectomy,' which are ways of treating eye damage caused by diabetes.

- Dialysis: The strain of diabetes causes kidneys to stop working; people with severe diabetes often need dialysis to stay alive.
- Heart attacks: Diabetes is linked to many kinds of heart problems, including heart attacks, so hospital stays with these causes were checked.
- Congestive heart failure: Fluid build-up due to improper pumping of the heart is another common complication of diabetes, so hospital stays because of them were checked.
- Clogged arteries: Diabetes increases the risk of having plaque build up in arteries, so people with diabetes who had by-pass surgery, or a procedure to scrape out plaque and open up blood flow.
- Stroke: Disrupted blood flow in the brain is a common risk for people with diabetes, so hospital stays after stroke was checked.
- Foot amputations: Poor circulation of the blood can mean diabetics must have their feet amputated. Records of amputations not cause by cancer or accidents were checked.

Results showed that Métis people with diabetes had higher rates of heart attack (1.36 per 100 people) than the general population with diabetes (0.73 per 100 people). The rates of other complications were not significantly different. More details are provided in the tables on pages 14 to 16. The "standardized rates" on these tables show the rates of these diabetes complications adjusted for age, sex, socioeconomic status and place of residence.

The study planned to compare pregnancy and delivery among people with diabetes as well, yet none of the women in the Métis population had a baby in the year looked at.

FINDINGS

WHO WAS INCLUDED IN THIS STUDY

Table 1 : Demographic characteristics of the Métis Nation of Ontario citizenship registry versus the Ontario Métis population identified in the 2006 Census.

Characteristic		Métis Nation of Ontario Citizenship Registry	Ontario Métis people identified in the 2006 Census
Number of persons		13,173	73,605
Age (median)		43	33
Sex	Female	46%	50%
	Male	54%	50%
Census division	Southern Ontario	52%	61%
	Northern Ontario *	48%	39%

* Northern Ontario includes Algoma District, Cochrane District, the City of Greater Sudbury, Kenora District, Manitoulin District, Muskoka District, Nipissing District, Parry Sound District, Rainy River District, Sudbury District, Thunder Bay District and Timiskaming District.

The Métis Nation of Ontario citizenship registry represents about 18% of the total number of people who identified themselves as Métis in the 2006 Census. People in the citizenship registry are older, more likely to be male, and more likely to live in Northern Ontario than the province's overall Métis population.

Table 2 : Characteristics of registered citizens of the Métis Nation of Ontario compared to the general Ontario population.

Characteristic		Métis Nation of Ontario Citizenship Registry	General population
Number of persons		13,173	14,391,351
Age (median)		43	38
Sex (%)	Female	46	50
	Male	54	50
Socioeconomic status (%)	Poorest	22	21
	2	20	20
	3	21	20
	4	19	20
	Richest	18	20
Local Health Integrated Network (LHIN) (%)			0.0
	Erie St. Clair	2.5	5.0
	South West	3.7	7.0
	Waterloo Wellington	2.4	5.4
	Hamilton Niagara Haldimand Brant	5.4	10.4
	Central West	1.4	6.3
	Mississauga Halton	1.7	8.7
	Toronto Central	2.4	9.7
	Central	2.2	13.2
	Central East	5.1	11.7
	South East	2.8	3.7
	Champlain	5.7	9.6
	North Simcoe Muskoka	17.7	3.2
	North East	30.9	4.3
	North West	16.0	1.9
	Central East	4.8	11.7
	South East	2.7	3.9
	Champlain	5.3	9.4
	North Simcoe Muskoka	17.3	3.4
	North East	29.3	4.5
	North West	15.5	1.8

People in the Métis nation of Ontario citizenship registry are older, more likely to be male, more likely to be poor, and more likely to live in northern Ontario than the province's general population.

WHO HAS DIABETES?

Table 3 : Number of people with diabetes out of every 100 people, as of April 1, 2007.

Prevalence	Métis	General population
Crude rate	8.92	6.45
Standardized rate *	8.13	6.45

The rate of diabetes is nearly 40% higher in the Métis population than in the general Ontario population. This significant difference is still evident even after adjusting the rate to allow for the age/sex characteristics of the Métis population decreases the differences, but this does not disappear.

Table 4 : Overall rates of diabetes in Ontario at April 1, 2007 (prevalence rates).

Prevalence	Métis	General population
Males		
0 to 34 years	1.10	0.67
35 to 49 years	5.91	4.38
50 to 64 years	17.30	13.84
65 to 74 years	30.29	25.01
75+ years	37.43	25.98
Overall	9.82	6.75
Females		
0 to 34 years	1.93	0.81
35 to 49 years	5.19	4.09
50 to 64 years	11.88	10.84
65 to 74 years	27.07	19.64
75+ years	28.19	21.41
Overall	7.88	6.15

The number of cases of diabetes in the Métis population is higher overall for both sexes and across all age groups (incidence rates).

Table 5 : New diagnoses of diabetes for every 100 people, between April 1, 2006 and March 31, 2007.

Incidence	Métis	General population
Crude rate	0.96	0.66
Standardized rate *	0.82	0.66
Cervix	-	0.10 (0.09, 0.10)

* Standardized for age and sex

The rate of people who are diagnosed with diabetes is 45% higher among the Métis than in the general population. Adjusting for age and sex reduces the difference, but it's still higher for the Métis population.

Table 6 : Details of new diagnoses of diabetes per 100 people, between April 1, 2006 and March 31, 2007.

Incidence	Métis	General population
Males		
0 to 34 years	0.14	0.09
35 to 49 years	0.90	0.68
50 to 64 years	2.20	1.75
65 to 74 years	2.76	2.57
75+ years	2.56	2.08
Overall	**1.04**	**0.70**
Females		
0 to 34 years	0.34	0.11
35 to 49 years	0.52	0.54
50 to 64 years	1.99	1.35
65 to 74 years	2.51	2.03
75+ years	0	1.78
Overall	**0.88**	**0.62**

Being diagnosed with diabetes is significantly more common in the Métis population overall. This is true for both sexes and in most age groups.

ACCESS TO AND PROCESS OF CARE

Table 7 : Visits to primary care doctors by people with diabetes, between April 1, 2007 and March 31, 2008.

Number of primary care visits	Métis	General population	Are these rates different between groups?
None	7.9	11.0	Yes
1	8.9	6.6	
2 to 4	33.1	27.6	
5 or more	50.1	54.8	

The Métis were less likely to have frequent primary care doctor visits, but were also less likely to have no primary care doctor visits.

Table 8 : Visits to diabetes specialists per 100 people, between April 1, 2007 and March 31, 2008.

Specialist care visits	Métis	General population	Are these rates different between groups?
Crude rate	15.0	18.3	Yes

The Métis were 18% less likely to get care from a diabetes specialist.

Table 9 : Eye check ups per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Eye care visits	Métis	General population	Are these rates different between groups?
Crude rate	49.5	48.4	No

Eye care is not good enough for either the Métis or the general population. Fewer than half of either group had their eyes examined by an ophthalmologist or optometrist during the 2 year study period.

Table 10 : Seniors' use of drugs and diet to control blood sugar between April 1, 2007 and March 31, 2008.

Glucose-lowering regimen	Métis	General population	Are these rates different between groups?
Insulin	16.9	12.7	
Oral glucose-lowering agents	49.1	49.1	Yes
Diet control only	34.0	38.2	

Métis seniors were less likely to get medication for high blood pressure, but differences in the use of statins and ACE inhibitors/angiotensin receptor blockers by Métis seniors and others were not significant.

Table 11 : Number of every 100 seniors prescribed drugs, between April 1, 2007 and March 31, 2008.

Medications	Métis	General population	Are these rates different between groups?
Statins	66.8	62.6	No
Blood pressure medications	78.4	81.2	Yes
ACE inhibitors/ ARBs	73.1	69.3	No

Métis seniors were less likely to receive medication for high blood pressure but differences in the use of statins and ACE inhibitors/angiotensin receptor blockers by Métis seniors and others were not significant.

Table 12 : Self-monitoring of blood sugar per 100 seniors, between April 1, 2007 and March 31, 2008.

Self-monitoring of blood glucose	Métis	General population	Are these rates different between groups?
Crude rate	64.4	54.3	Yes

Métis seniors were 19% more likely to test their own blood sugar levels than other seniors.

RESULTS OF DIABETES CARE

Table 13 : Care for blood-sugar imbalances per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Hypo- or hyper-glycemia	Métis	General population	Are these rates different between groups?
Crude rate	1.40	1.22	No
Standardized rate *	1.35	1.22	No

* Standardized for age, sex, socioeconomic status and place of residence

There was no statistically significant difference in visits to emergency or hospital stays for high or low blood sugar problems between the Métis and the general population.

Table 14 : Eye complications per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Eye complications	Métis	General population	Are these rates different between groups?
Crude rate	0.96	1.39	No
Standardized rate *	1.02	1.39	No

* Standardized for age, sex, socioeconomic status and place of residence

Although these values look different, there is no statistically significant difference in eye complications between the Métis and others.

Table 15 : Kidney dialysis per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Kidney dialysis	Métis	General population	Are these rates different between groups?
Crude rate	0.87	0.57	No
Standardized rate *	0.90	0.57	No

* Standardized for age, sex, socioeconomic status and place of residence

Although these values were different, they were not considered significantly different in dialysis between the Métis and the general population.

Table 16 : Heart attacks per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Heart attack	Métis	General population	Are these rates different between groups?
Crude rate	1.75	0.73	Yes
Standardized rate *	1.36	0.73	Yes

* Standardized for age, sex, socioeconomic status and place of residence

The Métis population with diabetes were 86% more likely to go to hospital for a heart attack than the general population. The Métis population with diabetes were 86% more likely to go to hospital for a heart attack than the general population.

Table 17 : Congestive heart failure per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Congestive heart failure	Métis	General population	Are these rates different between groups?
Crude rate	1.40	1.14	No
Standardized rate *	1.35	1.14	No

* Standardized for age, sex, socioeconomic status and place of residence

There was no significant difference in the rate of hospital stays for congestive heart failure between the Métis population and others with diabetes.

Table 18 : Procedures to reopen blood vessels per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Procedures to reopen blood vessels	Métis	General population	Are these rates different between groups?
Crude rate	1.75	0.81	Yes
Standardized rate *	1.30	0.81	No

* Standardized for age, sex, socioeconomic status and place of residence

The crude rate of procedures to reopen blood vessels was higher in the Métis population. However, adjusting for age, sex, socioeconomic status and region, the difference was not statistically significant.

Table 19 : Stroke per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Stroke	Métis	General population	Are these rates different between groups?
Crude rate	0.26	0.34	No
Standardized rate *	0.34	0.34	No

* Standardized for age, sex, socioeconomic status and place of residence

There was no statistically significant difference in strokes between the Métis with diabetes and others with the disease.

Table 20 : Foot amputations per 100 people with diabetes, between April 1, 2007 and March 31, 2008.

Foot amputations	Métis	General population	Are these rates different between groups?
Crude rate	0.17	0.16	No
Standardized rate *	0.10	0.16	No

* Standardized for age, sex, socioeconomic status and place of residence

There was no statistically significant difference in foot amputations between the Métis and others.

LIMITS OF THE STUDY

Gathering information on diabetes among the Métis population in Ontario is important but there are some significant limits to the information gathered so far. Researchers use health administration records to understand long-term diseases like diabetes because it is an efficient way to get a picture of the impact of the disease – including insights into how many people have it, how bad their side effects are and whether enough is being done to control those side effects.

Unfortunately administrative records are not perfect sources of data. Diagnostic data from doctors' billing records were used to find out who has a disease, however billings are not routinely checked for accuracy. Hospital records are more reliable, but these records are not always accurate either.

The Ontario Diabetes Database was essential for our work, and it has been tested for accuracy. The database captures 86% of cases of diagnosed diabetes and wrongly labels people as diabetic less than 0.2% of the time. However, the accuracy of this database was not checked specifically for the Métis population. If Métis people use healthcare differently, the diabetes database might be less accurate for them. In addition, it is assumed by diabetes healthcare professionals that as many as 30% of all cases of diabetes are not diagnosed, so there may be many more people with the disease than the databases show.

Another issue with administrative records is they do not fully provide a complete picture of the care people receive. Administrative records do not provide enough detail on whether people with diabetes are advised to make changes in the way they live (exercising, eating properly and quitting smoking) and whether they are getting help to do so. Administrative records do not always show care received by other healthcare providers who are paid salaries. As mentioned above, when doctors billings are studied, they will only reflect services provided by a physician that are billed for through the Ontario Health Insurance Plan (OHIP) and do not specify other services provided by other healthcare providers. The records also do not record drugs used by people under 65 or details of laboratory tests.

It's also important to note the Métis Nation of Ontario Citizenship Registry does not include the entire Métis population in the province. It's possible that Métis people in Ontario who are not part of the Métis Nation of Ontario citizenship registry may have different characteristics from those in our study group. There may be differences in their age, behaviour or use of healthcare therefore the findings in this study cannot be assumed to apply to the entire Métis population in Ontario.

CONCLUSIONS

The Métis in our study group are more likely to have diabetes than the general population, and more of them are newly diagnosed with the disease each year. Because diabetes is linked to several serious health problems, including heart failure and heart attacks, stroke, kidney failure, blindness and amputation, the threat diabetes represents for the Métis people must not be ignored.

This increased rate of diabetes may be partially explained because the Métis population was slightly poorer than the general Ontario population, and diabetes is known to be more common amongst the poor.

There were differences in the care the Métis population in our study received for treatment of their diabetes compared to members of the general public with diabetes, but no consistent patterns of unequal care. The Métis were less likely to have frequent visits with primary care physicians and less likely to see endocrinologists or general internists, doctors who specialize in treating the disease. This may be because the Métis population was concentrated in northern Ontario and other rural areas where there is less access to healthcare services by physicians and specialists. In some areas, specialist services may be accessed in a nearby province, and therefore those visits would not be included in this study.

On the other hand, while the Métis were more likely to use drugs to lower blood-sugar levels and more likely to monitor their own blood-sugar levels. The use of statins and ACE inhibitors or angiotensin receptor blockers (medicines to reduce the risk of heart disease) was similar in both groups, but the Métis were less likely to use drugs to lower blood pressure.

There were no significant differences between the Métis and the general population in the rates of such as stroke, kidney failure, amputations and circulation problems. The exception was a significantly higher rate of heart attacks (86% higher), which in turn led to a higher rate of procedures to re-open the arteries around the heart.

The research showed diabetes clearly poses an increased health risk for the Métis population in our study. It is reassuring that there were no large differences in the type of care received by the Métis in our study, and that the results of that care are similar. However the results indicate that the Métis community would benefit from more awareness of the risks that diabetes presents, and from more information and support to make the changes in behaviour, lifestyle, ongoing monitoring of symptoms and use of medicines that can reduce the risk of complications.

Health policy decision-makers such as the Ministry of Health and Long-Term Care and the Local Health Integration Networks should work together with the Métis community to increase understanding of and care for diabetes. Organizations that represent Métis people — such as the Métis Nation of Ontario and the Métis National Council — are natural sources of leadership to promote the health of their citizens.

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Disclaimer:

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BIBLIOGRAPHY

- Allard Y E. Métis concepts of health: Placing health within a social-cultural context. Social, economic and environmental (ecological) determinants of Métis health. Ottawa: Métis National Council, National Collaborating Centre for Aboriginal Health 2007.
- Bruce S. The impact of diabetes mellitus among the Métis of western Canada. Ethnicity & Health 2000; 5 (1): 47-57.
- Bruce SG, Kliewer EV, Young TK, Mayer T, Wajda A. Diabetes among the Métis of Canada: Defining the population, estimating the disease. Can J Diabetes 2003; 27(4): 442-48.
- Health Canada. Analysis of the Métis Nation's Population Health Needs, 2005.
- Métis National Council, Ottawa. Preliminary Assessment of Diabetes Programs for Métis People, 2006: 1-56.
- Métis Nation of Ontario. Literature Scan and Review: Métis Health and Healthcare, 2010.
- Statistics Canada. 2006 Census. Aboriginal peoples of Canada: a demographic profile. Ottawa: Statistics Canada, 2008.
- Statistics Canada. Aboriginal Peoples Survey, 2006. An Overview of the Health of the Métis Population. Catalogue no. 89-637-x.
- Young TK, Reading J, Elias B, O'Neil JD. Type 2 diabetes mellitus in Canada's First Nations: Status of an epidemic in progress. CMAJ 2000; 163(5): 561-66.
- Young, TK. Review of research on Aboriginal populations in Canada: Relevance to their health needs. BMJ 2003; 327(7412): 419-22.