



*the* Métis  
Nation<sup>of</sup>  
Ontario

# CARDIOVASCULAR DISEASE IN THE MÉTIS NATION OF ONTARIO

CLINICAL SIGNIFICANCE REPORT  
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## ABSTRACT

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality among Canadians. While the burden of CVD is higher among Aboriginal people when compared to non-Aboriginal people, little is known about CVD prevalence and incidence among the Métis people of Canada. The Métis people comprise approximately 30% of the Aboriginal population in Canada, according to the 2006 census and are defined as offspring of European men and First Nations women. In this report we review data generated from an analysis of administrative data that examines the burden of CVD among Métis people living in Ontario. The age and sex standardized prevalence for acute coronary syndromes, atrial fibrillation, and congestive heart failure were higher in the Métis population (median age: 44; IQR: 32-54), when compared to the general adult population (median age: 45; IQR 34-58) in Ontario. Furthermore, the incidence and mortality rate for atrial fibrillation and the re-hospitalization rate for congestive heart failure were higher in the Métis population compared to the general population of Ontario. While the literature indicates income levels, social support, education level, prevalence of obesity and the higher burden of diabetes among the Métis as possible reasons for higher burden of CVD, the exact causes cannot be determined from this study. Future studies should investigate the determinants of CVD, atrial fibrillation, and use of evidence-based proven therapies for Métis people who have hypertension, coronary artery disease, atrial fibrillation and CHF in Ontario.

## INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality among Canadians [1,2]. While the rate of death from CVD has declined in Canada over the past two decades, there has been a commensurate rise in the prevalence of CVD risk factors within the Canadian population [2,3]. The major risk factors for CVD include abnormal lipids, hypertension, type 2 diabetes, and obesity. As these risk factors are preventable through health behavior changes (i.e. primary prevention), and treatable using combination of health behavior changes and drug therapy (i.e. secondary prevention), interventions that target these factors (through lifestyle modifications, medications, etc.) should reduce the burden of CVD risk factors and CVD in this population. Furthermore, there is strong evidence that supports the use of multiple drug therapies among patients who suffer CVD (i.e. secondary prevention). Optimizing the prescription and adherence to these drugs is also critical to reduce recurrent CVD events including re-hospitalization and death.

Some subpopulations within Canada have an increased prevalence of risk factors and suffer an increased burden of CVD when compared to the general population. For example, previous studies demonstrate that the prevalence of smoking, obesity, and glucose intolerance, in addition CVD is higher among Canada's Aboriginal peoples when compared to Canadians of European descent [4]. However, research regarding the health of Canada's Aboriginal Peoples has typically focused on First Nations (usually those living on Reserves), with little representation of from the Métis people, and thus, little is known regarding burden of disease/risk factors in that population [5]. The Métis people trace their ancestry to the offspring of European men and First Nations women, and represent approximately one-third of the Aboriginal population in Canada. The Métis people have a distinct culture, differing from First Nations people in many aspects, including language and history. The vibrant culture and cultural activities of the present day Métis People in Canada, including Ontario, is documented in the Métis Supplement questionnaire of the 2006 Aboriginal Peoples Survey (6). As a result of their unique culture, the Métis people may differ from non-Métis people in their health behaviours and burden of CVD risk factors, and subsequently their disease CVD burden. Métis people typically do not live on reserve lands (1% on reserve lands; 70% live in urban centres) [7], and are not registered as "Status Indians" in the same way as many First Nations people. [8] Thus, the Métis people may require risk factor modification interventions that are unique to their culture.

In 1994, the Métis Nation of Ontario (MNO) established a registry to identify individuals of Métis descent in Ontario. This registry makes it possible to explore the health of a subset of Métis people living in Ontario. There are believed to be approximately 70 - 80,000 Métis people living in Ontario, approximately 15,000 of whom are

enrolled in the MNO registry. The purpose of this report is three-fold. First, we present and comment on recent data generated from Ontario on the CVD burden among the Métis people of Ontario. Second we will explore the prevalence of known CVD risk factors in order to examine the possible reasons for differing health status between the Métis and the general population in Ontario. Our examination of risk factors will focus on information derived from published reports presenting socioeconomic and health data of the Métis people. Finally, we will suggest areas for future health surveillance, investigation of access to screening, diagnostics, and therapeutic management of Métis with established CVD, and areas for future research,

## METHODS

Data were acquired through a joint effort from the MNO and the Institute for Clinical Evaluative Sciences (ICES). Métis people in Ontario were identified through the MNO registry. The MNO registry issues Métis citizenship to those who self-identify as Métis, and can provide proof of Métis Nation ancestry through genealogical documentation. As of spring 2005, the registry contained information on 14,480 individuals. Data acquired from the MNO registry was then linked to the Registered Persons Database (RPDB) in order to acquire a valid Ontario health card number. By acquiring health card numbers individuals from the MNO registry could be linked with other administrative data sources (i.e. the Discharge Abstracts, Ontario Health Insurance Plan, and National Ambulatory Care Reporting System databases) to provide information regarding cardiovascular health status and related hospital admissions. This would result in cardiovascular health information on 12,550 individuals age 20 and over. The linking of all databases used in this study was facilitated through ICES. Further details regarding data acquisition and database linkages for this study are provided elsewhere [9].

ICD-9 and ICD-10 codes were used to identify the rates of the following four types of CVD: acute coronary syndrome (ACS), congestive heart failure (CHF), cerebrovascular disease (CBVD), and atrial fibrillation (AF). The specific ICD-9/10 codes and definitions used to identify CVD cases are described in more detail elsewhere. The prevalence of ACS, CHF, AF, and CBVD were based on hospital discharge data between fiscal years 2006 and 2008. Prevalent cases were those with a documented claim (at least 1 claim in a fiscal year in the Discharge Abstracts database, or 2 claims in a fiscal year in the National Ambulatory Care Reporting System database). First-time or incident cases were defined if the subject had no prior claim in the above-mentioned databases in the prior 5 years.

Mortality and hospital re-admission rates were examined up to one year following the documented case (index event) for each disease in each individual. All rates were age and sex-standardized using the following indirect method:

**Métis Risk-adjusted Rate = [crude rate(Métis) / predicted rate(Métis)] x crude rate[Ontario]**

The predicted rate for the Métis population was generated using logistic regression models (mortality), or Poisson regression models (re-admissions). Métis population CVD rates were compared to those in the rest of the Ontario population. All other Ontario residents with a valid Ontario health card number were considered to be part of the "Ontario population" (10,014,400 individuals aged 20 and over). A p-value of <0.05 was considered significant.

All statistical tests used in this analysis were performed using SAS version 9.2.

## RESULTS

Compared to the rest of the Ontario adult population, the Métis population examined in this study was slightly younger (median age: 44; IQR: 32-54 vs. median age: 45; IQR 34-58), and had a lower proportion of females (46.4% vs. 51.1%). Demographic information, including region of residence is presented in table 1 (note: this table includes all those registered – only those over 20 years of age were considered in this analysis). The standardized rate for each CVD examined was significantly higher in the Métis population when compared to the general Ontario population. Specifically, the standardized prevalence was significantly higher for ACS (75%), and CHF (28%), whereas the standardized incidence of AF was significantly higher (73%). The only exception was CBVD, where the difference in the standardized rates between populations, although higher (35%) in the Métis population, did not meet the threshold for statistical significance ( $p = 0.067$ ). The crude and standardized number of prevalent and incident cases per 100 persons for each CVD examined is presented in tables 2 and 3.

The mortality rate at one year after index event for ACS, CHF, CBVD did not differ for the Métis population when compared to the general Ontario population. However, mortality among Métis with atrial fibrillation was 3 times higher compared to the general population. Standardized mortality rates for each disease are presented in table 4.

Standardized hospital re-admission rates for each ACS, CBVD, and AF were similar between populations. However, the standardized re-admission rate for CHF in the Métis population was two times higher than that of the general Ontario population. Standardized hospital re-admission rates for each disease are presented in table 5.

## DISCUSSION

This study demonstrates a substantial difference in the CVD burden between the Métis and the general population of adults in Ontario, with the Métis showing a higher burden of ACS, CHF, and AF (after age/sex adjustment), higher rates of readmission to hospital among patients with CHF, and higher mortality 1 year after diagnosis among people hospitalized with AF. This suggests that the CVD risk factor burden including elevated lipids, hypertension, type 2 diabetes mellitus, and obesity may be higher in the Métis people, although this requires confirmation. It also suggests that the treatment and access to specialized programs among Métis patients with atrial fibrillation and CHF may be suboptimal in comparison to the general population in Ontario. Our findings are consistent with other studies of Aboriginal peoples' health in Canada, and with studies regarding the general health of Métis people throughout Canada, whereby Aboriginal people (Métis included) tend to show poorer health when compared to non-Aboriginal peoples'.

## RISK FACTORS

The presence of co-morbidities may have an effect on the overall cardiovascular health of the Métis people. The burden of co-morbidities is significantly higher in the Métis population when compared to the non-Aboriginal population in Canada. An increased rate of diabetes may be especially important, as diabetes is a risk factor for CVD. A previous study utilizing census data demonstrated a higher rate of arthritis, asthma, and diabetes, even after adjustment for age, sex, income, education, access to healthcare professionals and location of residence (rural vs. urban) [10]. Both the prevalence and annual incidence of diabetes in the Métis population we examined were substantially higher when compared to the general Ontario population [11]. Obesity, as defined by a body mass index (BMI)  $\geq 30\text{kg/m}^2$ , is also a risk factor for CVD. The prevalence of obesity in the Métis population is high, with over 1 in 4 Métis adults in Canada reported to be obese, compared to 1 in 6 Canadians of non-Aboriginal descent [9]. Considering other risk factors for CVD, preliminary data from the Aboriginal Peoples Survey reveals that approximately 1 in 3 Métis adults smoke cigarettes on a daily basis, and approximately 1 in 10 Métis adults frequently (i.e. one or more times per week over a one year period) consumed five or more alcoholic beverages on one occasion. Both tobacco use and alcohol intake are associated with CVD.

## SOCIAL DETERMINANTS

The World Health Organization outlines a number of “determinants of health” related to social and physical environments, and a person’s individual characteristics and behaviours [12]. Among them are income, social status, education, social support, and access to health services. Previous work by Anand et al. [13] found an association between social disadvantage (which encompasses many of the WHO determinants of health) and CVD, with lower levels of income, employment, and social (marital) support coinciding with a higher CVD burden. When compared to the general population in Ontario, the Métis people in our sample had a higher proportion of individuals in the lowest two income quintiles (43.4% vs. 40.1%). This is consistent with 2001 and 2006 Canadian census data and the 2006 Aboriginal Peoples Survey showing higher unemployment and lower mean and median annual incomes for Métis people in Canada, when compared to the non-Aboriginal population [10,14,15].

The level of social support seems to differ between Métis and non-Aboriginal people in Canada. Data regarding the social support specific to Métis people in Ontario examined in this study was not available. However, using marital status as a proxy for social support, 1991 census data reveals far fewer Métis are married or common-law when compared to non-Aboriginal Canadians (males: 80% vs. 70%; females: 72% vs. 65%) [16]. Likewise, 2006 census data showed that Métis children are far more likely to live in a single parent family [15].

There also seems to be a disparity in the level of education obtained by the Métis and non-Aboriginal people in Canada. According to census data, more than 40% of Métis people in Canada have not completed high school, compared to approximately 30% in the non-Aboriginal population. Furthermore, only 1.8% of Métis have obtained at least a bachelor’s level degree, compared to 15.8% in the non-Aboriginal population [14]. A similar disparity is seen in more recent census data, where only 9% of Métis between ages 25 and 64 (compared to 23% of non-Aboriginal Canadians) have obtained a university degree [15].

## GENERAL DISCUSSION

The significant and substantially higher rate in mortality and re-hospitalization at one year after AF and CHF (index event), respectively, seen among the Métis may indicate either a relatively higher disease severity, or poorer management of both diseases (or both). Optimal management of AF requires both access and adherence to appropriate medications for heart rate control as well as stroke prevention. The increase in AF related mortality might reflect a higher burden of hypertension and/or alcohol use (both risk factors for AF) among Métis people. Likewise, it may be a result of sub-optimal access to or use of oral anticoagulants. Based on the higher incidence and seemingly poorer management of AF, one might expect a relatively higher rate of stroke in the Métis population. However, the two populations did not differ in the prevalence of CBVD, or the subsequent rate of re-hospitalization or mortality.

The high rate of re-hospitalization due to CHF may reflect poorer access to specialized care for heart failure, including medical specialists, medications for CHF, heart function programs, or cardiac rehabilitation programs. However, access to and utilization of healthcare provider resources appears to be similar for Métis and non-Métis populations in Canada [7]. Evidence of this point may be seen in the fact that the two groups showed a similar rate of mortality at 1-year post ACS (likely due to similar access to reperfusion and/or medical therapy). The higher rate of unemployment and lower income levels among working age Métis may limit the extent of their access to medications (when compared to non-Métis). On the other hand, assuming the rate disparity is indeed a result of relatively poorer disease management, it is possible our observations reflect a need for more “culturally appropriate” disease management strategies. Unfortunately, it may be difficult to operationalize potential strategies, as 38% of Métis in Canada reporting a lack of availability of traditional medicines, healing or wellness practices in their community [7].



## LIMITATIONS

This study employed administrative databases. The incidence and prevalence of each CVD and their related subsequent event(s) had to be inferred from ICD codes based on physician reporting. While such a method is widely employed in population level studies, a margin of error in correctly identifying cases and events is expected; the extent of which is unknown. Furthermore, ACS includes those who suffer an acute myocardial infarction (MI), such as ST-elevation myocardial infarction (STEMI) or non-STEMI. A substantial portion of these individuals will die prior to reaching hospital. Such individuals may account for up to 50% of all CVD mortality.

A further limitation is the potential selection bias. The Métis population examined in this study is self-selected and represents a small minority of the approximately eighty thousand Métis in Ontario. The results of this study may be over- or under-exaggerated in the event that those who choose to participate in the MNO registry systematically differ from those who do not on a qualities related CVD. More problematic, this study was not designed to examine determinants of CVD in the Métis. Thus, reasons for the observed higher CVD burden must be inferred from national level data sources. The extent to which the Métis in Ontario (or rather, those studied here) differ from the general Métis population in Canada is unknown. Finally, any correlation between the current level of risk factors/social determinants and disease state may be misleading. There have been significant improvements in income and education levels obtained by the Métis over the past few decades. Thus, one may not appreciate the extent of the social disadvantage and exposure to risk factors leading to the current disease state in much of the population, given that income levels and living conditions may have changed (improved) dramatically after most of the cardiovascular damage had been done.

## CONCLUSION

The burden of CVD among the Métis in Ontario is significantly higher than that in the general population. The previous literature points to mechanisms related to social disadvantage, including income levels, education, and social support. Furthermore, the relatively higher burden of CVD related co-morbidities/risk factors among the Métis, such as diabetes and obesity, might contribute to the increase incidence and prevalence of CVD. The seemingly poor management of AF and CHF may indicate the need for improved access to medications or novel, possibly more “culturally appropriate” strategies for disease management. Future studies are needed to determine the precise reasons for the higher extent of CVD among the Métis population in Ontario. This may require an assessment of the use of and adherence to secondary prevention programs/therapies for CVD, and an investigation into potential access-to-care barriers resulting from geographic/regional characteristics. Finally, further research into Métis cultural beliefs regarding both the development of risk factors and the use of medications and therapies to prevent or treat CVD may be warranted.

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**Table 1.** Demographic data for the Métis and General Ontario Population.

Characteristic		Métis Nation of Ontario Citizenship Registry	General population
Number of persons		12,814	13,445,390
Median Age (IQR)		43 (31-54)	38 (20-53)
Sex (%)	Female	46.5	50.5
	Male	53.5	49.5
Income Quintile* (%)			
	1 (lowest)	22.8	20.3
	2	20.6	19.8
	3	20.4	19.5
	4	18.0	19.7
	5 (highest)	16.9	19.6
	<i>Missing</i>	1.6	1.1
Local Health Integration Network (LHIN) (%)			
	Erie St. Clair	3.3	5.1
	South West	3.7	7.1
	Waterloo Wellington	2.3	5.4
	Hamilton Niagara		
Haldimand Brant		6.3	10.5
	Central West	1.2	6.1
	Mississauga Halton	1.8	8.5
	Toronto Central	2.4	9.3
	Central	2.2	12.7
	Central East	4.8	11.7
	South East	3.4	3.7
	Champlain	5.2	9.5
	North Simcoe Muskoka	17.1	3.3
	North East	28.4	4.4
	North West	16.7	1.9
	<i>Missing</i>	1.1	0.8



**Table 2.** Prevalent cases of cardiovascular disease per 100, April 1 2006 to March 31 2009. Standardized rates are age and sex adjusted.

	<b>Métis</b>	<b>Ontario Population</b>	<b>p-value</b>
<b>Number of individuals</b>	<b>12,550</b>	<b>10,014,4002</b>	
<b>Acute Coronary Syndromes</b>			
Crude Rate	1.44	1.11	
Standardized Rate (95% CI)	1.94 (1.73-2.15)	1.11 (1.1-1.12)	<0.01
<b>Congestive Heart Failure</b>			
Crude Rate	1.07	1.4	
Standardized Rate (95% CI)	1.79 (1.53-2.05)	1.4 (1.39-1.41)	<0.01
<b>Cerebrovascular Disease</b>			
Crude Rate	0.32	0.37	
Standardized Rate (95% CI)	0.5 (0.36-0.63)	0.37 (0.37-0.38)	0.07

**Table 3.** Incident cases of cardiovascular disease per 100, April 1 2006 to March 31 2009. Standardized rates are age and sex adjusted.

	<b>Métis</b>	<b>Ontario Population</b>	<b>p-value</b>
<b>Number of individuals</b>	<b>12,550</b>	<b>10,014,4002</b>	
<b>Atrial Fibrillation</b>			
Crude Rate	0.13	0.11	
Standardized Rate (95% CI)	0.19 (0.12-0.26)	0.11 (0.1-0.11)	0.01

**Table 4.** Mortality at one year following the index event, per 100 persons, April 1, 2003 to March 31, 2009. Standardized rates are age and sex adjusted.

	<b>Métis</b>	<b>Ontario Population</b>	<b>p-value</b>
<b>Number of individuals</b>	<b>12,550</b>	<b>10,014,4002</b>	
<b>Acute Coronary Syndromes</b>			
Crude Rate	11.1	17.6	
Standardized Rate (95% CI)	16.9 (6.72-27.1)	17.6 (17.3-17.9)	0.90
<b>Congestive Heart Failure</b>			
Crude Rate	16.6	25.7	
Standardized Rate (95% CI)	21.8 (14.9-28.8)	25.7 (25.5-25.9)	0.27
<b>Cerebrovascular Disease</b>			
Crude Rate	20	26.96	
Standardized Rate (95% CI)	26.95 (26.3-27.6)	28.5 (6.95-50.1)	0.89
<b>Atrial Fibrillation</b>			
Crude Rate	25	9.44	
Standardized Rate (95% CI)	30.95 (15.2-46.7)	9.44 (8.88-9.99)	0.01

**Table 5.** Hospital re-admissions within one year of the index event per 100 persons, April 1, 2006 to March 31, 2008 (two year period). Standardized rates are age and sex adjusted.

	<b>Métis</b>	<b>Ontario Population</b>	<b>p-value</b>
<b>Number of individuals</b>	<b>12,550</b>	<b>10,014,4002</b>	
<b>Acute Coronary Syndromes</b>			
Crude Rate	0.06	0.13	
Standardized Rate (95% CI)	0.07 (0.06-0.07)	0.13 (0.13-0.13)	0.14
<b>Congestive Heart Failure</b>			
Crude Rate	0.29	0.15	
Standardized Rate (95% CI)	0.32 (0.31-0.32)	0.15 (0.15-0.15)	0.02
<b>Cerebrovascular Disease</b>			
Crude Rate	0.08	0.05	
Standardized Rate (95% CI)	0.8 (0.08-0.08)	0.05 (0.05-0.05)	0.49
<b>Atrial Fibrillation</b>			
Crude Rate	0.13	0.16	
Standardized Rate (95% CI)	0.12 (0.11-0.14)	0.16 (0.16-0.16)	0.70