



*the* Métis  
Nation *of*  
Ontario

# RESPIRATORY DISEASE IN THE MÉTIS NATION OF ONTARIO

**TECHNICAL REPORT**  
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## BACKGROUND AND RATIONALE

Over 3.5 million Canadians live with respiratory diseases including asthma, chronic obstructive pulmonary disease (COPD), lung cancer, tuberculosis and cystic fibrosis<sup>1</sup>. Most are chronic conditions that have significant disease and economic burden and they are expected to increase in the population over time, placing increased burden on the health care system. Additionally, lung cancer in 2010 had the second highest incidence rate among all cancer types in both men and women and the highest mortality rate overall<sup>2</sup>. Two important risk factors for respiratory disease – tobacco smoke and indoor and outdoor air quality – are modifiable and preventable. A better understanding of the prevalence of these diseases and their risk factors may lead to increased opportunities for primary and secondary prevention<sup>3</sup>.

Métis people comprise approximately 30% of the Aboriginal population in Canada, according to the 2006 census. Métis people trace their ancestry to the offspring of European men and First Nations women and are a distinct Aboriginal people set apart from First Nations and Inuit by language, culture, and history. At present, there are few specific population-based health and healthcare data and peer-reviewed studies on the health of the Métis<sup>4,5</sup>.

The health and healthcare of the Métis are a primary interest of the Métis Nation of Ontario (MNO), the sole representative body for the Métis in Ontario. The main purpose of the MNO is to support and promote the development of self-government institutions for the Métis Nation in Ontario and to represent and advocate for their interests. In order to examine population-based data on chronic diseases, including respiratory diseases and their consequences in the Métis population in Ontario, the MNO launched a research initiative with funding from the Public Health Agency of Canada.

Because Ontario health administrative data do not include identifiers for individuals' ethnic or cultural background, an alternative way of identifying the Métis population was needed. In order to access health administrative data from the province of Ontario for the Métis, a research agreement was developed between the MNO and the Institute for Clinical Evaluative Sciences (ICES). This research agreement permitted linkage of the MNO citizenship registry with Ontario healthcare administrative data in a secure environment. This report describes the data linkage, the analytic methods undertaken, and the results of the analysis related to chronic respiratory disease (CRD) among Métis who are MNO Citizens, for the period April 1, 2007 to March 31, 2009. We also re-present findings regarding lung cancer incidence in this cohort for the years 2005 to 2007 from the report 'Cancer in the Métis Nation of Ontario'<sup>6</sup>

## LITERATURE REVIEW

Several studies have looked at rates of CRD among Aboriginal people in Canada.

Most recently, the Manitoba Centre for Health Policy in collaboration with the Manitoba Metis Federation released a comprehensive report on the health status and healthcare utilization patterns of the Métis population in Manitoba<sup>7</sup>. This is a very detailed report offering information on a myriad of topics including mortality rates, prevalence of chronic disease conditions, prevalence of prevention and screening, ambulatory physician services and hospital separation rates. Included in this report are age- and sex-adjusted prevalence statistics on total respiratory morbidity (TRM), a measure of the population burden of the combination of asthma, chronic or acute bronchitis, emphysema and chronic airway obstruction among Métis in Manitoba for the year 2006/07. These statistics show that Métis have a higher prevalence of TRM compared with the general Manitoban population (13.6% versus 10.6%). Statistics for each of the various Regional Health Authorities (RHAs) showed that Métis had a higher TRM rate compared to others in all but 2 regions (Assiniboine and Churchill), and that the rate among Métis far exceeded the average rate for all Manitoban Métis in 3 RHAs (Brandon, Winnipeg and Parkland).

Another study compared the prevalence of asthma and risk factors of asthma in 2,404 Canadian Aboriginal and non-Aboriginal children in the North, using the North component of the National Longitudinal Survey of Children and Youth<sup>8</sup>. This study found asthma prevalence based on health-care professional diagnosis to be 4.3% lower

in Aboriginal children compared with non-Aboriginal children; however, prevalence of wheeze among Aboriginal children without an asthma diagnosis was higher. The authors proposed that these two findings point to a likely explanation of differences in access to health care services and health professionals to make asthma diagnoses between Aboriginal and non-Aboriginal populations.

Crichton et al. analysed data on Aboriginal children and adults living on- and off-reserve from the 2001 Aboriginal People's Survey and found that asthma diagnosis, attacks and inhalant use varied across geographic location, socio-economic and demographic groups<sup>9</sup>. They showed that asthma diagnosis rates were lower among those living in northern territories, on reserves or in rural locations. The authors again proposed that diagnosis rates were lower in Aboriginal people due to poorer health care access, not because Aboriginal people were healthier.

Cancer, and lung cancer specifically, is a significant cause of illness and death in Canada's general population. The report 'Cancer in the Métis Nation of Ontario' was, so far as we are aware, the first to present cancer incidence based on administrative data among a size-able cohort of Métis in Ontario<sup>6</sup>. The findings specific to lung cancer have been reproduced for this report. Unfortunately, there is little population-based information about lung cancer incidence among the Métis in Canada with which to compare these findings.

## RESEARCH METHODS

The research described here was commissioned by the Métis Nation of Ontario (MNO) and conducted at the Institute for Clinical Evaluative Sciences (ICES). ICES is the principal independent steward for health data in Ontario and a Prescribed Entity under the Personal Health Information Protection Act (On). ICES is an independent, non-profit corporation, whose core business is to conduct research that contributes to the effectiveness, quality, equity and efficiency of health care and health services in Ontario. Key to the knowledge produced at ICES is its ability to anonymously link population-based health information on an individual patient basis, using unique ICES identifiers that ensure the privacy and confidentiality of health information. Linked data allow researchers to obtain a more comprehensive view of specific health care issues than could be achieved with unlinked data.

## DATA SOURCES

Formed in 1994, the MNO is the representative body for Métis persons in Ontario. The Registry of the Métis Nation of Ontario issues Métis citizenship to those who can supply genealogical documentation and proof of Métis Nation ancestry<sup>10</sup>. The MNO's citizenship registry as of August 2009 was provided to ICES. It included 14,480 individuals at the time of this study.

Initial data cleaning of the citizenship registry included range checks and removal of duplicate records. Individual MNO Citizens were then linked with the Registered Persons Database (RPDB), a registry of all persons eligible for a health card in Ontario. Of the 14,480 individuals in the citizenship registry, 14,021 (96.8%) were successfully linked, of whom 13,181 (94.0%) were alive on April 1, 2007 and had a valid Ontario address. These individuals comprise the Métis cohort used in this study, hereafter referred to as "the Métis", or "the Métis population". All other Ontario residents were considered as the general population. Individuals under the age of 18 were excluded from analysis of respiratory disease incidence, prevalence and outcomes since the MNO citizenship registry under-represents this group.

After linkage, each person's health card number was anonymized using a reproducible encryption algorithm. The encrypted health card number was then linked with other Ontario health administrative data sources, all of which share the same encrypted health card number to identify individuals. Thus, individuals were linked between data sources and across time. These other health administrative data sources include the following:

- The Discharge Abstracts Database (DAD), which records detailed information about each hospitalization in Ontario, including diagnoses and procedures performed during the hospitalization.

- The Ontario Health Insurance Plan (OHIP) database, which records all fee-for-service billing claims from Ontario physicians for consultations, visits and procedures.
- The National Ambulatory Care Reporting System (NACRS) database, which contains diagnostic information related to all emergency department visits in Ontario.
- The Ontario Cancer Registry (OCR), which is a computerized database of information on all Ontario residents who have been newly diagnosed with cancer (“incidence”) or who have died of cancer (“mortality”). All new cases of cancer are registered, with the exception of non-melanoma skin cancer. The OCR is over 95% complete in the general Ontario population<sup>11</sup>.

## **DEFINITIONS OF CHRONIC RESPIRATORY DISEASE**

All Ontario residents as of April 1, 2007 were included in this study. Those who died or moved out of the province were excluded. Individuals with asthma were identified using the Ontario Asthma Surveillance Information System (OASIS) database that is a validated registry of all Ontario residents identified as having incident asthma between 1996/97 and 2009/10 and prevalent asthma between 1993/94 and 2009/10. It is constructed using a previously validated asthma health administrative database case definition consisting of 1 or more hospitalizations and/or 2 or more ambulatory visits in two years<sup>12</sup>. Individuals with COPD were identified using the Ontario COPD Database, which is a validated registry of all Ontario residents identified as having incident COPD between 1996/97 and 2009/10 and prevalent COPD from 1991/92 and 2009/10. It is constructed based on a validated COPD health administrative data definition consisting of 1 or more hospitalizations and/or one or more ambulatory in individuals age 35 years and older for COPD<sup>12</sup>. The two types of disease are listed in Appendix 1, along with their corresponding ICD-9 and ICD-10 codes and their validated case definitions.

## **DEFINITION OF LUNG CANCER**

Individuals with lung cancer were identified from the OCR between 2005 and 2007. The lung cancer International Classification of Diseases, 9th revision (ICD-9) codes and corresponding definitions that were included in this analysis are listed in Appendix 2. Person-time incidence rates of lung cancer (the number of persons newly diagnosed with lung cancer over a given period of time among a specified population) for the period 2005-2007 were calculated for both the Métis population and the general Ontario population. Crude rates were calculated by sex.

## **CHRONIC RESPIRATORY DISEASE: PROCESS OF CARE AND DISEASE OUTCOMES**

A number of CRD outcome variables were calculated and compared between the Métis and the general Ontario population. The mean and median number of visits per year to primary care and specialist physicians was evaluated using the two most recent years of data (2007/08 and 2008/09). Specialist physician was defined as any physician other than a primary care physician. We looked at those diagnosed with asthma and with COPD considering primary care and specialist visits overall as well as visits specific to the disease. We also examined and compared overall and disease-specific emergency department visits and hospitalizations (same-day and in-patient) among individuals in the Métis and the general populations. All-cause mortality was calculated for people diagnosed with COPD or asthma for the years 2007/08 and 2008/09. Both crude and age-sex standardized rates were generated for incidence, prevalence and mortality. Rates were age- and sex-standardized using direct standardization. Significance tests were conducted using indirect adjustments (model-based tests).

## FINDINGS

### DEMOGRAPHIC CHARACTERISTICS OF THE POPULATIONS

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

Characteristic	Métis Nation of Ontario Citizens Registry	Ontario Métis people identified in the 2006 Census
Number of persons	13,181	73,605
Median Age (IQR)	43 (24)	33 (N/A)
Sex		
Female	46.5	50.0
Male	53.5	50.0

The MNO citizenship registry included in this analysis represents approximately 18% of the total Métis population in Ontario, according to self-report in the 2006 Census by Statistics Canada<sup>13</sup>. The people included in the MNO citizenship registry are older and more likely to be male than the Métis census population.

**Table 2:** Demographic characteristics of the Métis Nation of Ontario citizenship registry versus the rest of the general population of Ontario.

Characteristic	Métis Nation of Ontario Citizens Registry	General population
Number of persons	13,181	13,496,154
Median Age (Inter-Quartile Range)	43(24)	39(34)
Sex (%)		
Female	46.5	50.6
Male	53.5	49.4
Rurality <sup>1</sup> (%)		
Urban	69.1	88.5
Rural	30.9	11.5
Income Quintile <sup>2</sup> (%)		
1 – Lowest	22.4	20.1
2	21.0	19.9
3	20.1	19.7
4	18.5	20.0
5 – Highest	17.4	19.9
Distribution of population by Local Health Integrated Network (LHIN) (%)		
Erie St. Clair	2.5	5.1
South West	3.8	7.1
Waterloo Wellington	2.4	5.5
Hamilton Niagara Haldimand Brant	5.4	10.5
Central West	1.4	6.2
Mississauga Halton	1.7	8.6
Toronto Central	2.5	9.3
Central	2.3	13.0
Central East	5.1	11.8
South East	2.8	3.7
Champlain	5.7	9.5
North Simcoe Muskoka	17.8	3.3
North East	30.9	4.4
North West	15.9	1.9

<sup>1</sup>Based on the Statistics Canada definition of rurality (Statistics Canada. Standard Geographical Classification (SGC): Volume 1 - The Classification. Ottawa, ON: 2007).

<sup>2</sup>Neighbourhood income is calculated by Statistics Canada and is updated every five years when new census data become available. Ontario neighbourhoods are classified into one of five approximately equal-sized groups (quintiles), ranked from poorest (Q1) to wealthiest (Q5). These income quintiles are related to population health status and levels of health care utilization.

Note that column totals may not sum to 100% due to missing values.

MNO Citizens are older and have a greater proportion of males than the general population. A higher proportion of the general population lives in urban areas compared with MNO Citizens. MNO Citizens were more likely to live in lower income neighbourhoods than the general population. The majority of MNO Citizens live in the North of the province, with the largest group in the North East.

## EPIDEMIOLOGY OF CHRONIC RESPIRATORY DISEASE

**Table 3:** Prevalence of chronic respiratory disease per 100 persons during 2007/08 and 2008/09 among the Métis and the Ontario general population, by disease type.

Prevalence per 100 population		Métis	General population	p-value
<b>Asthma</b>				
2007/08				
	Number of Cases	1,789	1,174,351	
	Crude Rate	14.00	11.72	
	Standardized Rate (CI)	14.49 (13.78, 15.22)	11.71 (11.69, 11.73)	<0.0001
2008/09				
	Number of Cases	1,843	1,231,050	
	Crude Rate	14.28	12.10	
	Standardized Rate (CI)	14.76 (14.06, 15.49)	12.08 (12.06, 12.11)	<0.0001
<b>Chronic Obstructive Pulmonary Disease</b>				
2007/08				
	Number of Cases	1,260	701,209	
	Crude Rate	14.24	9.91	
	Standardized Rate (CI)	16.13 (15.11, 17.19)	9.45 (9.43, 9.47)	<0.0001
2008/09				
	Number of Cases	1,340	728,250	
	Crude Rate	14.76	10.13	
	Standardized Rate (CI)	15.85 (14.92, 16.83)	9.55 (9.53, 9.57)	<0.0001

CI = 95% Confidence Interval

The prevalence of both asthma and COPD was significantly higher in the Métis than in the general population during both years of study. The rates of asthma and COPD generally increased slightly in both groups in 2008/2009, although the standardized rate of COPD in the Métis may have decreased.

The prevalence of asthma was higher among Métis across all age groups up to age 64, but the gap between Métis and general population was greatest for males and females age 18-24 (see Appendix 3). The prevalence of COPD was also higher among Métis across all age groups, with the gap between Métis and general population increasing with age over age 45.

**Table 4:** Incidence of chronic respiratory disease per 1000 persons during 2007/08 and 2008/09 among the Métis and the Ontario general population, by disease type.

Incidence per 1000 population		Métis	General population	p-value
<b>Asthma</b>				
2007/08				
	Number of Cases	40	30,188	
	Crude Rate	3.13	3.01	
	Standardized Rate (CI)	3.09 (2.20, 4.23)	3.01 (2.98, 3.04)	0.74
2008/09				
	Number of Cases	30	27,343	
	Crude Rate	2.33	2.69	
	Standardized Rate (CI)	2.30 (1.54, 3.32)	2.68 (2.65, 2.71)	0.46
<b>Chronic Obstructive Pulmonary Disease</b>				
2007/08				
	Number of Cases	95	55,525	
	Crude Rate	10.70	7.80	
	Standardized Rate (CI)	11.16 (8.85, 13.89)	7.62 (7.56, 7.69)	0.0010
2008/09				
	Number of Cases	113	59,860	
	Crude Rate	12.40	8.33	
	Standardized Rate (CI)	12.40 (10.10, 15.00)	8.06 (8.00, 8.13)	<0.0001

CI = 95% Confidence Interval

There was no significant difference in the incidence of asthma between the Métis and the general population during either year of study. The incidence of COPD, however, was 1.5 times higher among Métis during both years.

Appendix 4 shows the incidence of chronic respiratory disease for these same two years by sex. Métis females had higher COPD incidence than females in the general population in 2007/08 and Métis males had higher COPD incidence than general population males in 2008/09. Analysis of incidence by age group was not possible due to small cell counts.



## EPIDEMIOLOGY OF LUNG CANCER

**Table 5:** Frequency and crude incidence of lung cancer per 1000 persons during 2005 to 2007 among the Métis and the Ontario general population, by sex.

	Métis		General population	
	Number of Cases	Crude Rate (95% CI)	Number of Cases	Crude Rate (95% CI)
<b>Total</b>	29	0.74 (0.49, 1.06)	21,563	0.68 (0.67, 0.69)
Males	13	0.62 (0.32, 1.06)	11,546	0.74 (0.73, 0.76)
Females	16	0.88 (0.50, 1.43)	10,017	0.62 (0.61, 0.63)

CI = 95% Confidence Interval

Crude lung cancer rates were slightly lower among Métis men compared to men in the general population. In contrast, rates were 1.4 times higher among Métis women compared to women in the general population. However, these differences were not statistically significant.

## CHRONIC RESPIRATORY DISEASE OUTCOMES AND ACCESS TO CARE

**Table 6:** Primary care and specialist visits among people diagnosed with chronic respiratory disease: 2007/08 to 2008/09.

Visits per year	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	p-value <sup>1</sup>
<b>Asthma</b>					
Overall					
Primary Care	9.88 (12.33)	7.00 (10.00)	10.56 (12.42)	7.00 (11.00)	0.019
Specialist <sup>2</sup>	4.15 (6.83)	2.00 (5.00)	4.83 (8.58)	2.00 (6.00)	<.0001
Asthma-specific					
Primary Care	0.39 (1.15)	0.00 (0.00)	0.48 (1.47)	0.00 (0.00)	0.0049
Specialist	0.08 (0.44)	0.00 (0.00)	0.15 (0.84)	0.00 (0.00)	<.0001
<b>Chronic Obstructive Pulmonary Disease</b>					
Overall					
Primary Care	11.60 (12.20)	9.00 (10.00)	11.90 (12.10)	9.00 (12.00)	0.30
Specialist	5.80 (7.80)	3.00 (7.00)	6.60 (9.00)	4.00 (8.00)	<.0001
COPD-specific					
Primary Care	0.50 (1.80)	0.00 (0.00)	0.50 (1.70)	0.00 (0.00)	0.42
Specialist	0.10 (0.50)	0.00 (0.00)	0.20 (0.90)	0.00 (0.00)	<.0001

SD = Standard deviation; IQR = Interquartile Range

<sup>1</sup>Based on differences in means

<sup>2</sup>Specialist has been defined to include any physician who is not a general practitioner/family physician.

Among asthma cases, the mean number of overall and asthma-specific primary care and specialist visits was significantly lower in the Métis than in the general population. For COPD, there was no significant difference between Métis and the general population in overall or COPD-specific primary care visits; however, the mean number of overall and COPD-specific specialist visits was lower in the Métis.

**Table 7:** Emergency department (ED) visits per person per year among people diagnosed with chronic respiratory disease, 2007/08 and 2008/09.

Number of primary care visits	Métis	General population	p-value
None	7.9	11.0	<0.0001
1	8.9	6.6	
2 to 4	33.1	27.6	
5 or more	50.1	54.8	

SD = Standard deviation; IQR = Interquartile Range

<sup>1</sup> Based on differences in means

Overall ED visits among those diagnosed with asthma or COPD were, respectively, 1.4 times and 1.3 times higher among the Métis compared to the general population. Asthma-specific ED visits were also 1.4 times higher among Métis, while there was no significant difference in COPD-specific ED visits.

**Table 8:** Hospitalizations per person per year among people diagnosed with chronic respiratory disease, 2007/08 and 2008/09.

Hospitalizations per year	Métis		General Population		p-value <sup>1</sup>
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
<b>Asthma</b>					
Overall	0.47 (0.83)	0.00 (1.00)	0.41 (0.87)	0.00 (1.00)	0.011
Asthma-specific	0.00 (0.07)	0.00 (0.00)	0.00 (0.07)	0.00 (0.00)	0.54
<b>Chronic Obstructive Pulmonary Disease</b>					
Overall	0.85 (1.22)	1.00 (1.00)	0.77 (1.21)	0.00 (1.000)	0.018
COPD-specific	0.05 (0.34)	0.00 (0.00)	0.06 (0.37)	0.00 (0.00)	0.48

SD = Standard deviation; IQR = Interquartile Range

<sup>1</sup> Based on differences in means

Hospitalizations among those diagnosed with asthma or with COPD were each 1.1 times higher overall among Métis compared with the general population. There was no difference in disease-specific hospitalizations.

**Table 9:** All-cause mortality per 100 persons among individuals with chronic respiratory disease, 2007/08 and 2008/09.

Deaths per year	Métis	General Population	p-value
<b>Asthma</b>			
2007/08			
Crude Rate	0.78	1.07	
Standardized Rate (CI)	1.23 (0.62, 2.20)	0.99 (0.97, 1.01)	0.3345
2008/09			
Crude Rate	0.65	1.08	
Standardized Rate (CI)	1.19 (0.56, 2.22)	0.99 (0.98, 1.01)	0.7968
<b>Chronic Obstructive Pulmonary Disease</b>			
2007/08			
Crude Rate	2.62	4.56	
Standardized Rate (CI)	1.86 (1.22, 2.72)	2.18 (2.14, 2.21)	0.5703
2008/09			
Crude Rate	2.69	4.54	
Standardized Rate (CI)	2.34 (1.38, 3.70)	2.17 (2.13, 2.20)	0.6571

CI = 95% Confidence Interval

There was no difference in eye care visits between Métis people with diabetes and the general population with diabetes. In both groups, fewer than half of people with diabetes had an examination from an ophthalmologist or optometrist.

## LIMITATIONS

Health administrative data have been widely advocated for chronic disease surveillance; as such data provide an efficient means to obtain population-based measures of disease burden. Health administrative data in Ontario are readily available, electronically readable, easily linkable, relatively inexpensive and virtually population-based. However, health administrative data also have a number of limitations including lack of clinical detail, coding error, and biases related to the method of data collection, such as physician claims data. The OCR also has a number of limitations as it does not provide cancer stage information, and excludes certain types of cancer-related diagnoses such as non-melanoma skin cancer and carcinoma in situ of the breast (which accounts for over 30% of “breast cancer” diagnoses).

In addition, the citizenship registry of the MNO may not be representative of the entire Métis population in Ontario. Individuals who are not registered citizens may be different (in demographic, behavioural or clinical terms) than registered citizens, so generalizing these results to all Métis people in Ontario may not be appropriate. These non-registered Métis people were included in the general population of this study, which will tend to minimize any true differences in disease prevalence and incidence.

Finally, this study was limited by a relatively small sample size. While a slightly larger MNO registry was available as of 2009, using this cohort to look back in time for diseases with a high mortality rate would likely result in underestimation of the rates of disease in the Métis, since those individuals who died of the disease prior to 2009 would not be included. Thus, an analysis of the cohort as of 2006 was chosen, following these individuals forward in time to avoid this problem. However, this limited our sample size, particularly for incidence rates, where one year of follow-up information was required to look for outcomes in these patients.

## DISCUSSION

Our study found that both the prevalence and incidence of asthma and the prevalence of COPD were significantly higher among registered citizens of the Métis Nation of Ontario compared to the rest of the Ontario general population, even after accounting for age and sex differences. This study also showed slightly higher lung cancer rates among Métis women and lower rates among Métis men, although the rates were non-significant. Despite the higher rates of asthma and COPD among Métis, there seems to be a disparity in access to health care, reflected in the lower rates of physician visits in the Métis. In contrast, ED visit and hospitalization rates appeared to be higher among Métis who have been diagnosed with asthma or COPD compared with the general population similarly diagnosed.

These findings about patterns of care suggest that Métis who have been diagnosed with these ambulatory care-sensitive conditions may not be managed as well as others in a primary care setting and are instead requiring acute emergency care when symptoms become severe. This may reflect difficulties in accessing primary care in the Northern regions of Ontario and the greater reliance on emergency departments of hospitals for provision of non-urgent care.

These findings are consistent with the findings of a population-based cohort study of people residing in Alberta, Canada conducted between April 1 1996 and March 31 1997. This study found that, compared to age- and sex-matched non-Aboriginal persons, Aboriginal people have higher rates of emergency department visits and office visits for asthma or COPD (2.1 times and 1.6 times, respectively)<sup>14</sup>. In the same study, despite higher rates of disease, it was found that Aboriginal people were 55% less likely to see a specialist and 66% less likely to undergo spirometry. The authors suggested that this demonstrated barriers to access for health care for Aboriginal people.

While our findings did not suggest significant differences in all-cause mortality between Métis and the general population who have been diagnosed with asthma or COPD, the literature seems to suggest that an analysis of cause-specific mortality might demonstrate otherwise. Tjepkema et al. used the Canadian census mortality follow-up study to compare mortality rates of Métis and Registered Indian adults to the rest of the non-Aboriginal popula-

tion<sup>15</sup>. Disease-specific age-standardized mortality rates (ASMRs) per 100,000 person-years at risk were calculated for Métis, Registered Indians and non-Aboriginal persons. Age-standardized mortality rates of respiratory system diseases were high among Métis compared with the general population (58.2 per 100,000 person-years at risk for men aged 25 years and older and 39.5 per 100,000 person-years at risk for women aged 25 years and older). Looking at different types of respiratory disease by age and sex, when compared with the general population, ASMRs were higher for bronchitis, emphysema and asthma among Métis women. The ability of the present study to examine differences in mortality was constrained by sparse data but findings suggest this needs to be studied in future research.

The administrative data used here does not include information on risk factors, smoking rates in particular, which are believed to be higher in the Métis than in the non-Métis populations. This difference could account for the higher rates of chronic respiratory disease in the Métis. Differences in rates of respiratory disease were not stratified or standardized geographically and the Métis included in this study were more likely to reside in the North as compared to the general population. While it is not evident what, if any factors in the North might lead to higher rates of COPD or asthma, future research that takes geographic characteristics of the population into account could prove to be informative. Finally, future studies should also include persons under 18 wherever possible in the analysis, as respiratory diseases such as asthma tend to have a higher prevalence and burden in children than in adults. Therefore, we may be underestimating the total burden of asthma in the Métis.

While this study was somewhat compromised by small numbers of cases among Métis, it should be pointed out that lung cancer incidence rates are likely to increase in Aboriginal communities over the coming decades. This predicted increase is based on past cancer trends and information on risk factor prevalence among Aboriginal persons<sup>5</sup>. Most notably, smoking rates are estimated to be around 37% among the Métis population compared to 22% among the non-Aboriginal population in Canada<sup>4</sup>. It is likely that the high rate of smoking among Métis people will result in an increase in the incidence of lung cancer compared with the general population.

## CONCLUSIONS

Citizens of the Métis Nation of Ontario had higher rates of asthma and COPD in 2007/08 and 2008/09 compared with the Ontario general population, based on Ontario health administrative data. These analyses also suggest deficiencies in the health care that is accessed by Métis who have been diagnosed with asthma and COPD and, in particular, a greater reliance on emergency services. Based on the small numbers of cases, these findings are only suggestive and need to be confirmed by more comprehensive studies involving larger numbers of Métis studied over longer periods of time.

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## REFERENCES

1. Public Health Agency of Canada. Life and Breath: Respiratory disease in Canada. 2007. Ottawa, ON.
2. Canadian Cancer Society's Steering Committee. Canadian Cancer Statistics 2010. 2010. Toronto, ON.
3. Subbarao P, Mandhane PJ, Sears MR. Asthma: epidemiology, etiology and risk factors. CMAJ 2009; 181:E181-90.
4. Canadian Institute for Health Information. Improving the Health of Canadians: Aboriginal Peoples' Health. 2004. Ottawa, ON.
5. Métis Nation of Ontario. Literature Scan and Review: Métis Health and Healthcare. 2010. Ottawa, ON.
6. Klein-Geltink J, Saskin R, Manno M, Urbach D, Henry D, Gravelle M, Pigeau L, MacQuarrie J, Lyons D. Cancer in the Métis Nation of Ontario. Métis Nation of Ontario: 2010. Toronto, ON.
7. Manitoba Centre for Health Policy, Manitoba Metis Federation. Profile of Métis Health Status and Healthcare Utilization in Manitoba: A Population-Based Study. 2010. Winnipeg, MB.
8. Gao Z, Rowe BH, Majaesic C, O'Hara C, Senthilselvan A. Prevalence of asthma and risk factors for asthma-like symptoms in Aboriginal and non-Aboriginal children in the northern territories of Canada. Can Respir J 2008; 15:139-45.
9. Crighton EJ, Wilson K, Senecal S. The relationship between socio-economic and geographic factors and asthma among Canada's Aboriginal populations. Int J Circumpolar Health 2010; 69:138-150.
10. Métis Nation of Ontario. "Registry". <http://www.metisnation.org/registry.aspx>. Updated 2011. Accessed on July 1, 2011.
11. Robles SC, Marrett LD, Clarke EA, Risch HA. An application of capture-recapture methods to the estimation of completeness of cancer registration. J Clin Epidemiol 1988; 41:495-501.
12. Gershon AS, Wang C, Guan J, Vasilevska-Ristovska J, Cicutto L, To T. Identifying individuals with physician diagnosed COPD in health administrative databases. COPD 2009; 6:388-94.
13. Statistics Canada. "Aboriginal Peoples Survey (APS)". <http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3250&lang=en&db=imdb&adm=8&dis=2>. Updated December 2, 2008. Accessed on July 1, 2011.
14. Sin DD, Wells H, Svenson LW, Man SF. Asthma and COPD among Aboriginals in Alberta, Canada. Chest 2002; 121:1841-6.
15. Tjepkema M, Wilkins R, Senecal S, Guimond E, Penney C. Mortality of Métis and registered Indian adults in Canada: an 11-year follow-up study. Health Rep 2009; 20:31-51.

**Appendix 1:** Chronic respiratory disease types and corresponding definitions for incident and prevalent cases.

DISEASE	DEFINITION	ICD-9 CODES (OHIP)	ICD-10 CODES (DAD & NACRS)	Sensitivity/Specificity
Asthma	<i>Incident:</i> OHIP claims (2 claims in 2 consecutive years) <i>or</i> DAD (1 claim/year) <i>Prevalent:</i> OHIP claims (1 claim/year) <i>or</i> DAD (1 claim/year)	493	J45, J46	<i>Children (0-17):</i> Sensitivity: 89% Specificity: 72%  <i>Adults (18+):</i> Sensitivity: 84% Specificity: 76%
Chronic Obstructive Pulmonary Disease	DAD or SDS (1 claim/year) <i>or</i> OHIP claims (1 claim/year) in individuals ≥ 35 years of age	491, 492, 496	J41, J43, J44	Sensitivity: 85.0% Specificity: 78.4%

**Appendix 2:** Lung cancer ICD-9 codes and corresponding descriptions.

	ICD-9	DESCRIPTION
Lung	1620	MALIGNANT NEOPLASM OF THE TRACHEA
	1622	MALIGNANT NEOPLASM OF THE MAIN BRONCHUS
	1623	MALIGNANT NEOPLASM OF THE UPPER LOBE, BRONCHUS OR LUNG
	1624	MALIGNANT NEOPLASM OF THE MIDDLE LOBE, BRONCHUS OR LUNG
	1625	MALIGNANT NEOPLASM OF LOWER LOBE, BRONCHUS OR LUNG
	1628	MALIGNANT NEOPLASM OF OTHER PARTS OF BRONCHUS AND LUNG
	1629	MALIGNANT NEOPLASM OF BRONCHUS AND LUNG UNSPECIFIED

**Appendix 3:** Prevalent cases of chronic respiratory disease per 100 persons, by age and sex, 2007/2008 and 2008/2009.

Cases per 100 population	Métis			General Population		
	Count	Rate	95% Confidence Interval*	Count	Rate	95% Confidence Interval*
<b>Asthma</b>						
<b>2007/08</b>						
Males						
18-24 years	144	21.6	(18.606,24.833)	114,478	18.1	(18.001,18.191)
25-34 years	160	11.8	(10.220,13.665)	83,172	9.9	(9.793,9.920)
35-44 years	143	10.1	(8.624,11.761)	79,247	7.9	(7.841,7.946)
45-54 years	157	9.4	(8.093,10.896)	76,081	7.8	(7.728,7.835)
55-64 years	93	9.2	(7.553,11.116)	54,888	7.9	(7.815,7.942)
65-74 years	48	9.0	(6.886,11.782)	39,694	9.5	(9.416,9.594)
75-84 years	14	8.5	(5.153,13.818)	29,230	11.5	(11.378,11.627)
85 years+	*	16.7	(5.837,39.222)	7,758	11.7	(11.505,11.997)
<b>Overall</b>	*	11.2	(10.426,11.918)	484,548	9.9	(9.877,9.930)
Females						
18-24 years	155	21.5	(18.681,24.677)	101,278	16.8	(16.668,16.857)
25-34 years	232	19.4	(17.271,21.753)	115,808	13.4	(13.363,13.507)
35-44 years	187	15.6	(13.699,17.818)	124,894	12.6	(12.496,12.627)
45-54 years	208	14.8	(13.015,16.722)	125,415	12.8	(12.702,12.834)
55-64 years	144	18.3	(15.712,21.098)	94,944	13.1	(13.024,13.180)
65-74 years	69	15.3	(12.299,18.955)	63,296	13.5	(13.398,13.594)
75-84 years	26	16.0	(11.124,22.346)	47,044	13.6	(13.466,13.694)
85 years+	6	22.2	(10.607,40.757)	17,124	12.1	(11.958,12.298)
<b>Overall</b>	1027	17.3	(16.330,18.251)	689,803	13.5	(13.432,13.491)
<b>2008/09</b>						
Males						
18-24 years	132	21.7	(18.585,25.119)	126,471	19.7	(19.594,19.789)
25-34 years	179	13.2	(11.468,15.063)	90,066	10.6	(10.492,10.623)
35-44 years	144	10.4	(8.898,12.116)	79,204	8.1	(8.008,8.116)
45-54 years	164	9.7	(8.368,11.188)	80,578	8.0	(7.948,8.053)
55-64 years	97	9.2	(7.567,11.048)	57,790	8.0	(7.963,8.089)
65-74 years	49	8.5	(6.483,11.050)	40,979	9.5	(9.422,9.597)
75-84 years	18	9.3	(5.950,14.188)	29,908	11.5	(11.378,11.623)
85 years+	*	16.7	(6.679,35.853)	8,430	11.9	(11.615,12.090)
<b>Overall</b>	*	11.4	(10.676,12.176)	513,426	10.3	(10.309,10.363)
Females						
18-24 years	144	22.5	(19.434,25.894)	109,001	17.7	(17.638,17.829)
25-34 years	253	20.9	(18.665,23.234)	119,827	13.7	(13.629,13.774)
35-44 years	177	15.3	(13.351,17.502)	124,742	12.8	(12.685,12.817)
45-54 years	224	15.4	(13.642,17.352)	130,942	13.0	(12.929,13.060)
55-64 years	149	17.8	(15.340,20.514)	100,385	13.4	(13.289,13.443)
65-74 years	77	16.4	(13.312,19.999)	65,869	13.7	(13.577,13.771)
75-84 years	27	13.5	(9.447,18.929)	48,274	13.8	(13.715,13.944)
85 years+	*	16.7	(7.337,33.564)	18,584	12.4	(12.270,12.605)
<b>Overall</b>	*	17.6	(16.654,18.581)	717,624	13.8	(13.754,13.813)

\* Small cells (n≤5) and corresponding totals are suppressed

**Appendix 3 (continued):** Prevalent cases of chronic respiratory disease per 100 persons, by age and sex, 2007/2008 and 2008/2009.



Cases per 100 population	Métis			General Population		
	Count	Rate	95% Confidence Interval*	Count	Rate	95% Confidence Interval*
<b>Chronic Obstructive Pulmonary Disease 2007/08</b>						
Males						
35-44 years	38	2.7	(1.959,3.657)	18,981	1.9	(1.864,1.917)
45-54 years	174	10.4	(9.044,11.976)	64,184	6.6	(6.516,6.614)
55-64 years	215	21.2	(18.817,23.848)	82,647	11.9	(11.787,11.939)
65-74 years	154	29.0	(25.304,33.001)	83,481	20.0	(19.868,20.111)
75-84 years	71	43.3	(35.949,50.944)	73,103	28.8	(28.590,28.942)
85+ years	11	61.1	(38.619,79.695)	22,247	33.7	(33.332,34.053)
<b>Overall</b>	<b>663</b>	<b>13.8</b>	<b>(12.828,14.775)</b>	<b>344,643</b>	<b>10.1</b>	<b>(10.056,10.120)</b>
Females						
35-44 years	41	3.4	(2.539,4.621)	19,592	2.0	(1.943,1.998)
45-54 years	154	10.9	(9.412,12.675)	65,436	6.7	(6.612,6.711)
55-64 years	190	24.1	(21.228,27.186)	80,416	11.1	(11.025,11.169)
65-74 years	135	30.0	(25.950,34.389)	78,852	16.8	(16.706,16.920)
75-84 years	66	40.5	(33.258,48.161)	76,802	22.2	(22.032,22.308)
85+ years	11	40.7	(24.515,59.273)	35,468	25.1	(24.892,25.344)
<b>Overall</b>	<b>597</b>	<b>14.8</b>	<b>(13.744,15.936)</b>	<b>356,566</b>	<b>9.7</b>	<b>(9.717,9.778)</b>
<b>2008/09</b>						
Males						
35-44 years	45	3.2	(2.437,4.320)	19,764	2.0	(1.984,2.040)
45-54 years	189	11.2	(9.751,12.753)	66,691	6.6	(6.573,6.670)
55-64 years	224	21.2	(18.799,23.714)	87,233	12.1	(12.039,12.190)
65-74 years	166	28.8	(25.226,32.594)	85,702	19.9	(19.768,20.007)
75-84 years	79	40.7	(34.053,47.750)	74,508	28.6	(28.475,28.822)
85+ years	12	50.0	(31.427,68.573)	23,717	33.3	(32.994,33.687)
<b>Overall</b>	<b>715</b>	<b>14.5</b>	<b>(13.542,15.507)</b>	<b>357,615</b>	<b>10.3</b>	<b>(10.268,10.332)</b>
Females						
35-44 years	41	3.5	(2.625,4.776)	19,956	2.0	(2.012,2.068)
45-54 years	154	10.6	(9.112,12.278)	68,090	6.8	(6.708,6.806)
55-64 years	200	23.9	(21.104,26.868)	85,347	11.4	(11.292,11.436)
65-74 years	144	30.6	(26.642,34.949)	81,582	16.9	(16.830,17.042)
75-84 years	77	38.5	(32.033,45.400)	77,817	22.3	(22.154,22.430)
85+ years	9	30.0	(16.665,47.876)	37,843	25.3	(25.104,25.545)
<b>Overall</b>	<b>625</b>	<b>15.1</b>	<b>(14.011,16.188)</b>	<b>370,635</b>	<b>10.0</b>	<b>(9.940,10.001)</b>

**Appendix 4:** Incident cases of chronic respiratory disease per 1000 persons, by sex, 2007/2008 and 2008/2009

Cases per 100 population	Métis			General Population		
	Count	Rate	95% Confidence Interval*	Count	Rate	95% Confidence Interval*
<b>Asthma</b>						
<b>2007/08</b>						
Males - Overall	14	2.05	(1.22, 3.44)	12222	2.50	(2.45, 2.54)
Females - Overall	26	4.37	(2.99, 6.40)	17966	3.51	(3.46, 3.56)
<b>2008/09</b>						
Males - Overall	11	1.59	(0.89, 2.85)	11164	2.25	(2.21, 2.29)
Females - Overall	19	3.17	(2.03, 4.94)	16179	3.11	(3.06, 3.16)
<b>Chronic Obstructive Pulmonary Disease</b>						
<b>2007/08</b>						
Males - Overall	52	10.80	(8.25, 14.14)	28019	8.20	(8.11, 8.30)
Females - Overall	43	10.66	(7.93, 14.33)	27506	7.52	(7.43, 7.61)
<b>2008/09</b>						
Males - Overall	72	14.60	(11.61, 18.34)	30538	8.80	(8.70, 8.89)
Females - Overall	41	9.88	(7.29, 13.38)	29322	7.89	(7.80, 7.98)