A Profile of Cardiovascular Disease in Northern Ontario: Public Health Planning Implications

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Over the past century, remarkable progress has been made in improving the health status of people living in Ontario. However, health measures of the past, which have proven themselves effective at combating infectious diseases, have not had the same impact on today’s leading causes of death and disability. Although these leading causes of death (cancer, cardiovascular disease [CVD] and injuries) are non-infectious in nature, they are nevertheless preventable.1-3

Of these epidemics, CVD causes the most death, disability and illness and is the second leading cause of Potential Years of Life Lost (PYLL) in Ontario after cancer.4 The economic cost, both direct and indirect,5,6 is enormous and the individual and societal impact is highly significant. While there has been some progress made against CVD in Ontario, the mortality rates remain high relative to international benchmarks.5 This is especially true in the northern part of the province where the rates have remained well above the provincial average. Northern Ontario has traditionally higher rates of experienced risk factors associated with CVD; for example, smoking, physical inactivity, and dietary fat intake have been higher in the northern part of the province. The geography, population characteristics and the rural-urban mix all combine to set Northern Ontario apart from the rest of the province. As is typical of remote and rural areas of Canada, lack of access to health care and public health services makes prevention difficult.5

In order to develop effective and efficient prevention strategies for Northern Ontario, it is necessary to obtain relevant information pertaining to CVD for this area. The objectives of this study are as follows:

1) To examine CVD trends in Northern Ontario;
2) To identify the occurrence of variance in disease rate relative to those of the province;
3) To identify the occurrence of known risk factors associated with CVD;
4) To suggest some potential public health planning strategies for Northern Ontario.

DATA SOURCES

The following data sources were used to complete this study:

1) Census (1996): Data collected by Statistics Canada in the 1996 Census.8
2) Ontario Health Survey 1990 & 1996 (OHS ’90 & OHS ’96): The OHS ’90 and ’96 are province-wide population surveys that were administered to households throughout Ontario. Full description of the methodology can be obtained elsewhere. People living in institutions, on Native reserves and in extremely remote locations were not included in the survey.5,10
3) Canadian Institute for Health Information (1990-1995): In this report, hospital separation records were collected by the Canadian Institute for Health Information (CIHI).11


DATA ANALYSIS

The data were obtained via the Ontario Ministry of Health Provincial Health Planning Database, 1998.12 Frequencies of cases were obtained using GQL® - Hummingbird Corporation.13 Age-specific and crude rates were reported. Age-standardized mortality/morbidity rates (Direct Method) with corresponding 95% confidence intervals (Table I and Figure 1) were also reported and calculated in accordance with the methods described by Armitage and Berry.14 There were no statistical tests performed as the confidence intervals are provided to show significance. The 1991 Canadian Census population was used as the standard population.

GEOGRAPHY

Northern Ontario is made up of two very large geographical areas covering eighty percent of Ontario’s landmass. Northeastern Ontario contains the districts of Algoma, Cochrane, Manitoulin, Muskoka, Nipissing, Parry Sound, Sudbury District, Sudbury Regional Municipality, and Timiskaming. Northwestern Ontario encompasses the districts of Thunder Bay, Rainy River and Kenora. The two northern areas are geographically and culturally distinct.8 For example, Northwestern Ontario has a much greater Aboriginal (Table II) population relative to Northeastern Ontario. The health data are not collected by ethnicity, therefore we cannot say that the higher mortality/morbidity rates are a result of a large Aboriginal population in the North. For these reasons we choose to report the statistics for the two northern areas separately to point out any potential differences in their health status.

### RESULTS

#### Mortality

Over the years 1984 to 1995, the rate of CVD had been steadily decreasing, especially in males. However, the male rate still remains higher relative to its female counterpart (Figure 1). In Northern Ontario, CVD is the leading cause of death. Between the years 1993-1997, CVD accounted for 40% of female deaths (6,602) and 40% of male deaths (7,474). Ischemic heart disease (includes both “Other IHD” and “Acute Myocardial Infarction”) accounted for the greatest percentage of these deaths (55.6% for females [2,096 deaths] and 63.4% for males [2,597 deaths]), of which approximately half are attributable to heart attacks (Figure 2).

| TABLE I  
Risk Factors of Cardiovascular Disease, Weighted Percentage*† & 95% Confidence Intervals‡ |
<table>
<thead>
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<tbody>
<tr>
<td>Variables</td>
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<tr>
<td>Current Cigarette Smokers - Both Genders (Years)†</td>
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<tr>
<td>12-19</td>
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<tr>
<td>20-44</td>
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<td>45-64</td>
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<td>65+</td>
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<td>Overall 12+</td>
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<tr>
<td>Current Cigarette Smoker†</td>
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<tr>
<td>Males</td>
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<td>Females</td>
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<tr>
<td>Regular Physical Activity - Both Genders - Three or more times/week (Years)†</td>
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<td>12-19</td>
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<tr>
<td>20-44</td>
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<tr>
<td>45-64</td>
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<tr>
<td>65+</td>
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<tr>
<td>Overall 12+</td>
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<tr>
<td>Body Mass Index &gt; 27: Ages 20-64†</td>
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<td>Both Genders</td>
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<td>Males</td>
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<tr>
<td>Females</td>
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<tr>
<td>Degree to which life is very/fairly stressful - Ages 12+*</td>
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<td>Both Genders</td>
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<tr>
<td>Males</td>
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<tr>
<td>Females</td>
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<tr>
<td>Over 30% Calories from Fat per day*</td>
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<td>Both Genders</td>
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<td>Males</td>
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<tr>
<td>Females</td>
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<td>Consumes Five or More Vegetables &amp; Fruits per day - Ages 12+*</td>
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<tr>
<td>Both Genders</td>
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<td>Males</td>
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<td>Females</td>
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</tbody>
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* Ontario Health Survey 1990
† Ontario Health Survey 1996
‡ 95% confidence intervals are stated in parentheses
Figure 3 indicates that the two northern regions, particularly Northeastern Ontario, have significantly higher age-adjusted mortality rates than do the southern regions and the province as a whole.

Potential years of life lost
Despite the higher mortality of CVD in Northern Ontario, the trends are similar to the rest of the province. CVD is the second leading cause of premature death in Ontario after cancer. In 1995, cancer was responsible for 1,045,968 potential years of life lost (PYLL) while CVD was responsible for 683,869 PYLL. In Northern Ontario, CVD is the third leading cause of premature death (72,886 PYLL), the first being injuries and poisoning (93,402 PYLL) and the second being cancer (91,258 PYLL).

Hospital separations
The hospitalization results are displayed in Figure 4. The northern regions had consistently higher hospital separation rates relative to the province as a whole. Also, males were more likely to be hospitalized relative to their female counterparts. The CVD readmission rates for the North (1993-1997) is 23.4% and is comparable to the provincial rate of 20.4%. Therefore, the rate difference cannot be explained by readmission of the same people.

Figure 1. Age-standardized Mortality Rates per 10,000 population: Cardiovascular Disease (ICD-9 CODE 390-459) 1986-1997
Source: Registrar General, Vital Statistics

Table II
Demographic and Socio-Economic Health Factors - 1996

<table>
<thead>
<tr>
<th>Factors</th>
<th>Ontario</th>
<th>Northeastern</th>
<th>Northwestern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of Population with Grade Nine or Less Years of Schooling</td>
<td>10%</td>
<td>13.5%</td>
<td>13%</td>
</tr>
<tr>
<td>Female Average Employment Income</td>
<td>$22,000</td>
<td>$16,000</td>
<td>$19,000</td>
</tr>
<tr>
<td>Male Average Employment Income</td>
<td>$34,700</td>
<td>$30,800</td>
<td>$33,000</td>
</tr>
<tr>
<td>Incidence of Low Income of Population in Private Households</td>
<td>18%</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>Unemployment Rates for Females Ages 15+</td>
<td>9.6%</td>
<td>12.2%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Unemployment Rates for Males Ages 15+</td>
<td>8.7%</td>
<td>14.0%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Aboriginal Population*</td>
<td>1.3%</td>
<td>5.6%</td>
<td>14.4%</td>
</tr>
</tbody>
</table>

* In the 1986 Census, many First Nations people boycotted the census. Thus, an accurate count was not taken. In the 1996 Census, the undercounts remain a problem.  
Source: Statistics Canada, 1996 Census

RISK FACTORS

Smoking
There are more smokers in Northwestern Ontario (32%) and Northeastern Ontario (30%) compared with Ontario (21%). Smoking rates also vary by age, with 20-44 year olds having the highest rates (Northeastern Ontario - 39%, Northwestern Ontario - 41%, Ontario - 26%). There is little difference in the overall smoking rates of men and women. In Northern Ontario, there is a significantly higher proportion of women smoking relative to women living in Ontario (Table I).

Physical inactivity
Despite the presence of longer winters in Northern Ontario, the proportion of the population that participates in physical activity three or more times a week is roughly equivalent to the provincial norm. Age is also associated with level of physical activity in general. Younger age groups tend to exercise at a greater rate than the older age groups. (Table I)

Nutrition
Canada’s Food Guide recommends 5-10 servings of vegetables and fruits daily. Vegetables and fruits are known to contain compounds that alter or prevent the development of cancer and/or heart disease. In the OHS ’90 data, 44% of respondents reported consuming at least the minimum five servings of vegetables and fruits per day. Table I gives a more detailed breakdown of these data by gender. The overall Ontario trends are seen across the North.

Fat intake
Table I shows that over three quarters of the people living in Ontario consume
more than 30% of calories from fat in the diet (the recommended maximum intake). This percentage was significantly greater in the North. Unfortunately, data on saturated fats in the diet were not available.

Obesity
Obesity is interrelated with both diabetes and high blood cholesterol, and is also more prevalent in Northern Ontario than in the rest of the province. The obesity indicator used in the OHS ’96 was a Body Mass Index (BMI) greater than 27 (The National Population Health Survey 1996 uses the following criteria for levels of obesity: (i) “some excess weight” = BMI 25-27, and (ii) “overweight” = BMI>27). Thirty-five percent of residents of Northeastern Ontario and 35% of residents of Northwestern Ontario are obese compared to the provincial average of 28%. Prevalence of obesity is significantly greater among men than women (Table I).

Stress
While stress plays an important role in the etiology and pathogenesis of CVD, stress levels are reported to be lower in Northeastern Ontario (45%) and Northwestern Ontario (49%) than in Ontario as a whole (50%) (Table I).

Shift work
Knutsson has shown that shift work and CVD are associated. This is true for both genders. Although there are no data on shift work in Ontario, the OHS ’90 asked the following question which can be used as a proxy indicator: “Does your job or business require you to work rotating shifts?” In the North, 30% of the respondents answered “yes” in comparison to 20% of their southern counterparts, representing a significant difference in rates.

Socio-economic health factors
Lower education, lesser income and employment status play varying roles in determining health status. These indicators have also been found to vary with higher rates of smoking, diabetes, a greater tendency to be overweight, lower physical activity, higher levels of blood cholesterol and high blood pressure. It has been shown that adult occupational status is inversely associated with current smoking, leisure time, physical activity and obesity risk factors (low status-high risk). The majority of the socio-economic health fac-
tors for Northeastern and Northwestern Ontario fall short of the provincial average. For example, the Northern rates for employment, education and income are lower when compared to the provincial rates (Table II).

**Diabetes**

Diabetes is a predisposing factor to CVD. Residents of Northern Ontario make more visits to hospitals because of diabetes than do their Southern counterparts. In 1996, the hospital utilization rate for males was 1.61 per 1,000 in Northeastern Ontario, 1.38 per 1,000 in Northwestern Ontario compared to 0.92 per 1,000 for Ontario. The hospital utilization rate for females was 1.80 per 1,000 in Northeastern Ontario, 1.59 per 1,000 in Northwestern Ontario compared to 1.17 per 1,000 for Ontario.5

**LIMITATIONS**

- The OHS '90 represents one of the most significant undertakings ever to measure health status in Ontario. While more information is available from the OHS '96 of the National Population Health Survey (NPHS 1996-97), recent information concerning some risk factors related to CVD are not included in the OHS '96, which makes comparison very difficult.
- Because of the time lag in the reporting of Census, CIHI and Vital Statistics data, the most recent information is not available for analysis.
- CIHI and Vital Statistics do not have an ethnic variable and therefore the effects of ethnicity cannot be quantified.

**DISCUSSION AND PLANNING IMPLICATIONS**

CVD is the leading cause of death in Northern Ontario, accounting for approximately 40% of all deaths. Not only does this take a personal cost from its victims, but also a monetary cost. CVD results in billions of dollars per year in health care expenditures as well as lost productivity. CVD also has one of the highest indirect costs of all disease categories in Canada:6 that is, the loss of future earnings from premature death and the value of lost productivity from illness or disability. This paper demonstrates that cardiovascular mortality observed in Northern Ontario exceeds similar provincial rates. The higher mortality rates most likely reflect a greater incidence of CVD disease in the North, which may be linked to the high levels of risk factors. Further to this, high prevalence of modifiable risk factors for CVD is experienced in Northern Ontario. By reducing these risk factors through public health interventions such as education, environmental support and policy development, the impact of CVD can be lessened. Success, however, depends on individuals, communities, organizations, businesses and government working together.

**Collaboration**

Districts in the North share many similarities in terms of risk factors and disease burden. Mechanisms should be set in place to allow agencies with a heart health mandate to collaborate effectively on common problems and solutions.

**Delivery/treatment of services**

Treatment service forms an important component in the continuum of care for CVD. The large geographical area, harsh winters, and poor driving conditions make it difficult to travel long distances in Northern Ontario thus creating challenges both in the accessibility and the delivery of services. Further to this, the lack of critical mass results in a lack of human resources and technology for CVD services in many Northern communities. As a result, many Northern Ontario communities do not have the full range of cardiovascular services. Therefore, community development and mobilization approaches must be used to develop and deliver heart health programs across a vast area.

**Determinants of health**

Factors such as income, employment, and poverty should be taken into account in the development and delivery of heart health programs. Further, health professionals should be leading advocates in policy development for these areas.

**Multiple risk factors**

Many individuals have more than one risk factor for CVD. Therefore, a multifactorial approach comprising education, environmental support and policy development should be considered to simultaneously address a variety of factors.

**Monitoring and evaluation**

Regular monitoring, evaluation and benchmarking assist in determining the effectiveness of heart health programs. The information has stimulated public action;
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in much the same way the evaluation will be the force that consolidates the results of this initiative. It is important that timely, accurate and consistent baseline data be collected. These data are necessary to track mortality and morbidity, the prevalence of modifiable risk factors and the socioeconomic and environmental conditions.

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REFERENCES


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