

Mortality in metropolitan areas

Heather Gilmour and Jane F. Gentleman

Abstract

Objectives

This article examines differences in all causes mortality rates and rates for the leading causes of death (heart disease, cancer and cerebrovascular disease) by census metropolitan area (CMA).

Data source

The data are from the Canadian Vital Statistics Data Base maintained by Statistics Canada.

Analytical techniques

Annualized age-standardized mortality rates were calculated for Canada and for each CMA for the three-year period from 1994 to 1996. Differences between the CMA rates and the national rate were examined.

Main results

Mortality rates tend to be high in CMAs in the Atlantic provinces and Québec and low in CMAs in the Prairies and British Columbia. Ontario contains CMAs with some of the highest mortality rates in Canada, as well as others whose rates are among the lowest. The pattern of mortality for specific causes also differs within CMAs: a CMA may have a high death rate for one cause, but a low rate for another.

Key words

cause of death, death rate, urban health, heart diseases, neoplasms, cerebrovascular disease

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Big cities generally have a bad reputation. Pollution, noise, high stress levels, lack of space, and a hectic pace can all take a toll on an individual's health. Yet if mortality rates are any indication, the health of urban-dwellers varies sharply, depending on which city they call home.

Regional variations in mortality rates have been used as evidence of the importance of the social and physical environment to public health.¹ The spatial distribution of mortality rates may suggest the need for case detection and treatment programs, services and facilities. As well, to some degree, geographically based data indicate what is achievable. That is, particularly low mortality in one area suggests that improvements are feasible in regions where rates are elevated.²

Geographic variations in death rates have long been recognized. Decades ago in the United States, because of high cerebrovascular mortality rates, parts of the South became known as the "stroke belt."³ In England and Wales, a gradient in mortality rates for most causes has been observed: high in the north and west, low in the south and east.⁴ Canada, too, has a geographical gradient in

mortality, with higher rates in the Atlantic provinces and Québec than in the Prairie provinces and British Columbia.¹

To a considerable extent, this east-to-west gradient may be strongly influenced by mortality rates in census metropolitan areas (CMAs). CMAs are large urban centres having at least 100,000 inhabitants in their central core. In 1996, 62% of Canadians lived in Canada's 25 CMAs, and CMAs accounted for 57% of deaths that occurred in the 1994-1996 period.

The demographic, socioeconomic and physical characteristics of CMAs differ. In 1996, populations ranged from 125,600 in Thunder Bay to 4.3 million in Toronto. Immigrants made up substantial shares of the populations of Toronto and Vancouver.⁵ In Winnipeg, Saskatoon and Regina, Aboriginal people constituted a larger proportion of residents than was the case in other CMAs.⁶ The industries that form the economic base of each CMA vary as well. For example, Calgary has long been the

Methods

Data sources

Mortality data are from the Canadian Vital Statistics Data Base, which compiles vital statistics submitted by the offices of vital statistics in each province and territory. Intercensal population estimates by age, sex and census metropolitan area (CMA) for 1995 were used to calculate the three-year average rates. The decedent's place of residence, not the place where the death occurred, was used to determine death rates for each CMA.

Analytical techniques

The 1991 population of Canada (all ages) was used as the standard population for calculation of age-standardized mortality rates. All mortality rates were age-adjusted using the direct method. Age-adjustment means that the rates are comparable across CMAs, despite local variations in age distribution. The standard population was not disaggregated by sex. It is, therefore, possible to compare age-standardized rates for males with age-standardized rates for females. Although mortality rates refer to the total population (from age 0), for readability, the terms "men" and "women" rather than "males" and "females" are used in this article.

Comparisons between areas may reflect random variation rather than real differences. Confidence intervals were calculated to assess the variation of each CMA's mortality rate. Two-sided tests were performed to identify statistically significant differences between the age-adjusted rate for each CMA and the age-adjusted national rate. Because the mortality rates for large CMAs can influence the national rate, these rates cannot be assumed to be independent of the national rate. To account for the degree of correlation between a given CMA's mortality rate and the national rate, estimated covariances were calculated between the two rates and were used in the calculation of the variance of the difference between rates.

Limitations

The data in this analysis should be interpreted with caution. CMAs are defined to represent economically and socially integrated areas

(see *Definitions*). However, each CMA contains neighbourhoods whose social, economic and health characteristics vary widely. Thus, high or low mortality rates in specific parts of a CMA may be masked by the rates in the rest of the CMA.⁷

Because CMA boundaries must respect the administrative boundaries of census subdivisions (CSD), some CMAs include CSDs with large amounts of sparsely settled territory, and only the population closest to the urban core has a close relationship with that core.⁸

For most diseases, incidence rates provide the best measure of risk.⁷ It is unclear how reliably mortality rates can be used as a measure of risk of disease in particular CMAs.⁷

The analysis excludes Prince Edward Island, the Northwest Territories and the Yukon, which have no CMAs. However, any analysis below the provincial/territorial level would be difficult in these regions because their death counts are low.

The 1991 Census population counts were adjusted for net undercoverage and for non-permanent residents. Subsequent investigation by officials at Statistics Canada revealed that the adjustment overcompensated for the undercount, resulting in figures that were too high. Therefore, population figures for 1986 to 1991 are being re-estimated by Statistics Canada. Mortality rates in this article were calculated before the revision at the CMA level, and thus may be slightly low. However, the impact of such adjustments should be small, and the underlying patterns should be similar, even after revision.

Because the law requires all deaths to be reported, the registration of deaths is considered virtually complete. Nonetheless, there are differences in diagnostic practices and coding procedures among provinces. Consequently, the specific cause of death category to which a given death is attributed may vary from one CMA to another. As well, a small number of late registrations may result in some underestimation of rates.

administrative hub of the country's oil and gas industry.⁹ With seven degree-granting institutions, Halifax is Atlantic Canada's headquarters for education.¹⁰ Ottawa-Hull, which encompasses the national capital, is the only CMA to cross provincial boundaries.

The unique character of CMAs extends to the death rates of their residents. Even in the same province, differences between CMAs can be pronounced. And within a single CMA, the death rate for one cause may be well above the national level, while the rate for another cause is below it.

This article focuses on three years of data (1994 to 1996) from the Canadian Vital Statistics Data Base to analyze mortality patterns in Canada's 25 CMAs (see *Methods* and *Definitions*). Age-standardized mortality rates for men and women for all causes of death are examined, as well as rates for the three leading causes: heart disease, cancer, and cerebrovascular disease (stroke). Lung cancer, the leading type of cancer, influences overall patterns of cancer mortality and, therefore, is analyzed separately.

Death rates are the ultimate outcome of a multitude of factors: socioeconomic, environmental, medical, and lifestyle. This article is a descriptive analysis only. It is beyond its scope to explore the reasons underlying the death rates in particular CMAs.

East-to-west decline

Mortality rates for the leading causes of death tend to be relatively high in the Atlantic provinces and Québec, and relatively low in western Canada. There are, however, some notable exceptions. The province of Québec has low rates of cerebrovascular mortality.¹¹ And in Manitoba, unlike the other western provinces, mortality rates for each of the leading causes match levels in eastern Canada.¹¹ To a great extent, provincial mortality rates are influenced by the CMAs, which are home to a substantial share of each province's population.

High rates in Atlantic CMAs

The high mortality rates that characterize the Atlantic provinces are influenced by the situation in the region's three CMAs: St. John's (Newfoundland),

Saint John (New Brunswick) and Halifax (Nova Scotia).

All causes mortality rates in 1994-1996 were above the national level in each CMA, except for men in Halifax (Chart 1, Appendix Table A). In St. John's, this was the result of high mortality for heart disease, cancer (excluding lung) and cerebrovascular disease for both sexes, and lung cancer for men (Charts 2 to 5). Saint John, too, had high heart disease and lung cancer mortality rates, although rates for other cancers and cerebrovascular disease did not differ from the national level. Halifax residents had high lung cancer mortality rates, and among women, the rate for other cancers was also high. However, women in Halifax had a low mortality rate for cerebrovascular disease.

Definitions

All causes contributing to a death are entered on the death certificate in accordance with the Ninth Revision of the International Classification of Diseases (ICD-9).¹² A single underlying cause of death is coded. The following ICD-9 codes were used for this article: all causes (001-E999), lung cancer (162), other cancer (140-208, excluding 162), heart disease (391, 392.0, 393-398, 402, 404, 410-416, 420-429), and cerebrovascular disease (430-438). During the 1994-1996 period, heart disease and cancer together accounted for over half of all deaths for both sexes. Cerebrovascular disease, the third leading cause, made up an additional 7%.

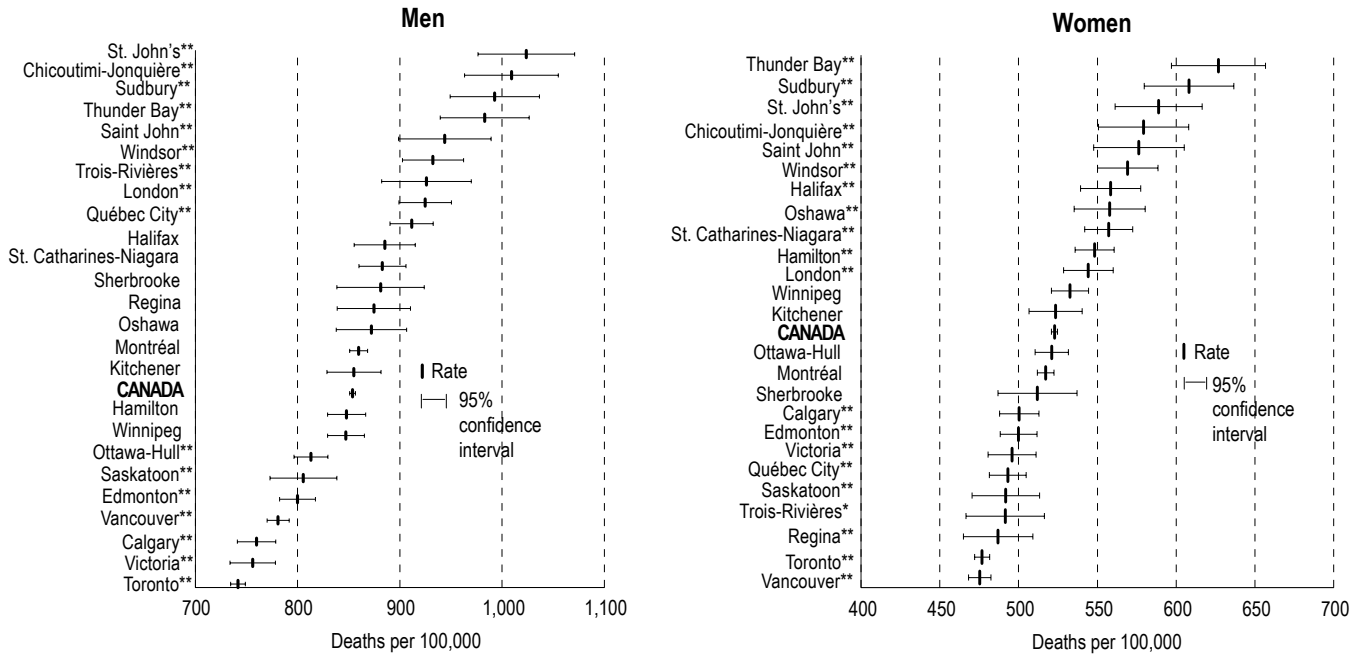
Mortality counts: The number of deaths during the year attributed to a particular cause, based on the underlying cause of death.

Underlying cause of death: The disease or injury that initiated the train of events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury.¹²

Age-standardized mortality rate: The number of deaths per 100,000 population that would have occurred in the standard population (1991 Canadian population) if the actual age-specific rates observed in a given population had prevailed in the standard population.

Census metropolitan area (CMA): A large urban centre consisting of an urbanized core, with 100,000 or more inhabitants in that core (based on a previous census), and adjacent urban and rural areas that have a high degree of economic and social integration with the urbanized core. Once an area is designated a CMA, it maintains that status even if its core population falls below 100,000.⁸

Chart 1
Annualized age-standardized all causes mortality rate, by sex and census metropolitan area, 1994-1996



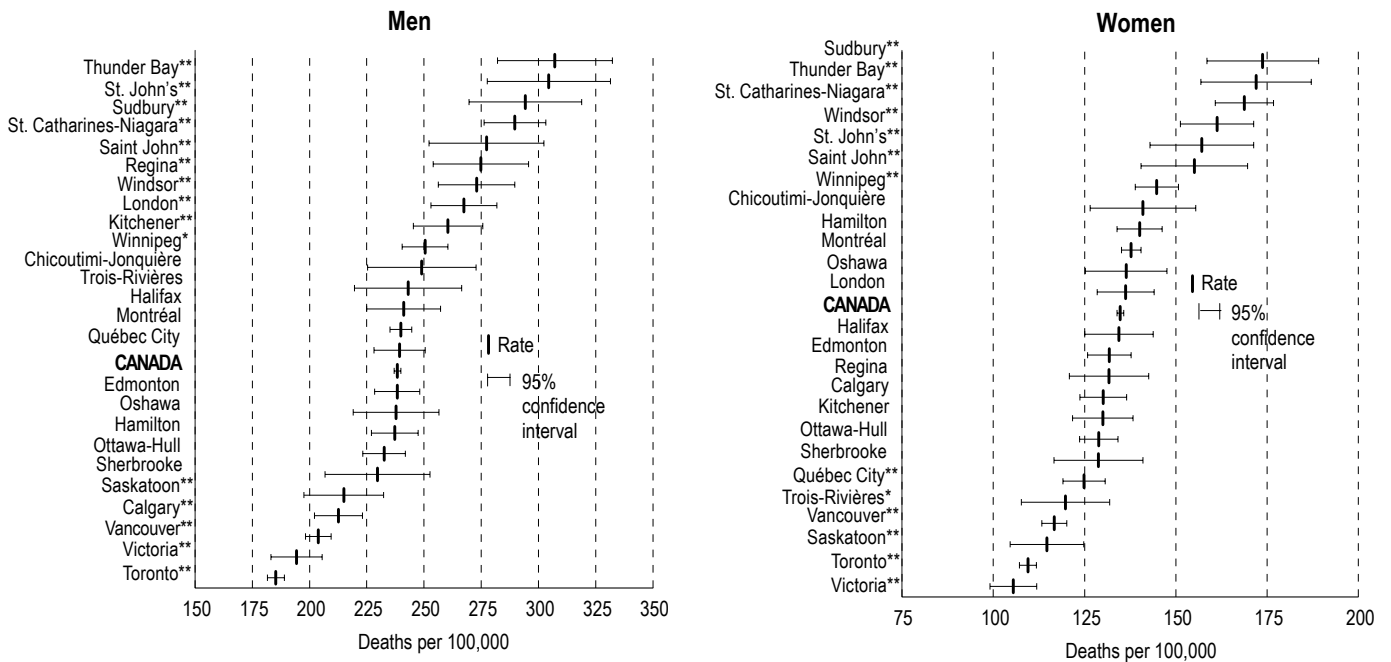
Data source: Canadian Vital Statistics Data Base

Note: Rates are age-standardized to the 1991 Canadian population adjusted for net census undercoverage. To show the data more clearly, different scales are used for male and female mortality rates.

* Significantly different from national rate ($p < 0.05$)

** Significantly different from national rate ($p < 0.01$)

Chart 2
Annualized age-standardized heart disease mortality rate, by sex and census metropolitan area, 1994-1996



Data source: Canadian Vital Statistics Data Base

Note: Rates are age-standardized to the 1991 Canadian population adjusted for net census undercoverage. To show the data more clearly, different scales are used for male and female mortality rates.

* Significantly different from national rate ($p < 0.05$)

** Significantly different from national rate ($p < 0.01$)

Cancer main factor in Québec

All causes male mortality rates were above the national level in three Québec CMAs: Chicoutimi-Jonquière, Trois-Rivières and Québec City. But in the province's other two CMAs, Sherbrooke and Montréal, rates were close to those for Canada as a whole. The high overall male mortality rates in Chicoutimi-Jonquière, Trois-Rivières and Québec City reflected high rates for lung cancer. Montréal men, too, had a high death rate from this disease. As well, male death rates from other forms of cancer were high in Chicoutimi-Jonquière, Québec City and Montréal. By contrast, heart disease death rates for men in the five Québec CMAs did not differ significantly from the national level. This was also true for cerebrovascular disease, except in Montréal, where the rate was low.

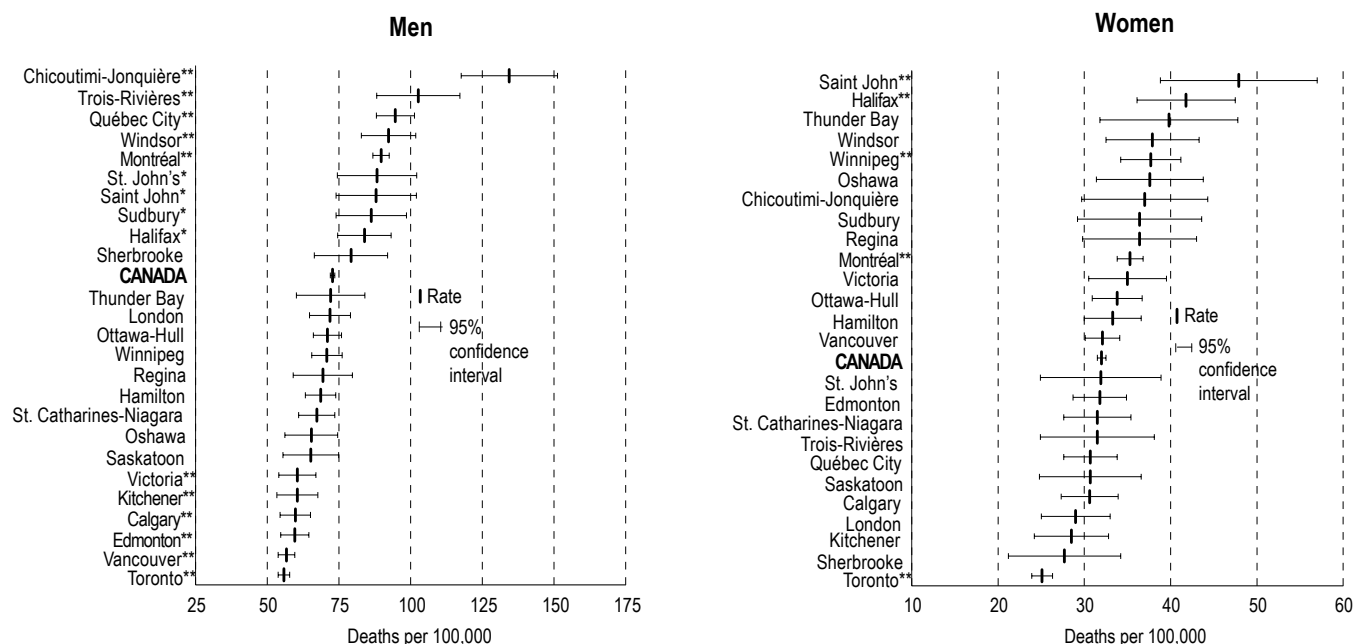
The pattern of mortality rates for women in Québec CMAs was different from that for men. The all causes rate was high only in Chicoutimi-Jonquière.

In Sherbrooke and Montréal, rates were close to the national level, and in the two other Québec CMAs, rates were low. Chicoutimi-Jonquière's high overall female mortality rate reflected a high death rate for cancers other than lung. Montréal women had a high death rate for lung cancer. Montréal, in fact, was the only Québec CMA where female lung cancer mortality rates were significantly different from the national rate. By contrast, Montréal women, like men, had a low cerebrovascular mortality rate. Low all causes mortality for women in Québec City and Trois-Rivières mirrored low rates for heart disease, and in Québec City, for cerebrovascular disease as well.

Mixed pattern in Ontario

In 1994-1996, mortality rates in some Ontario CMAs were among the highest in the country, while rates in others were among the lowest.

Chart 3
Annualized age-standardized lung cancer mortality rate, by sex and census metropolitan area, 1994-1996



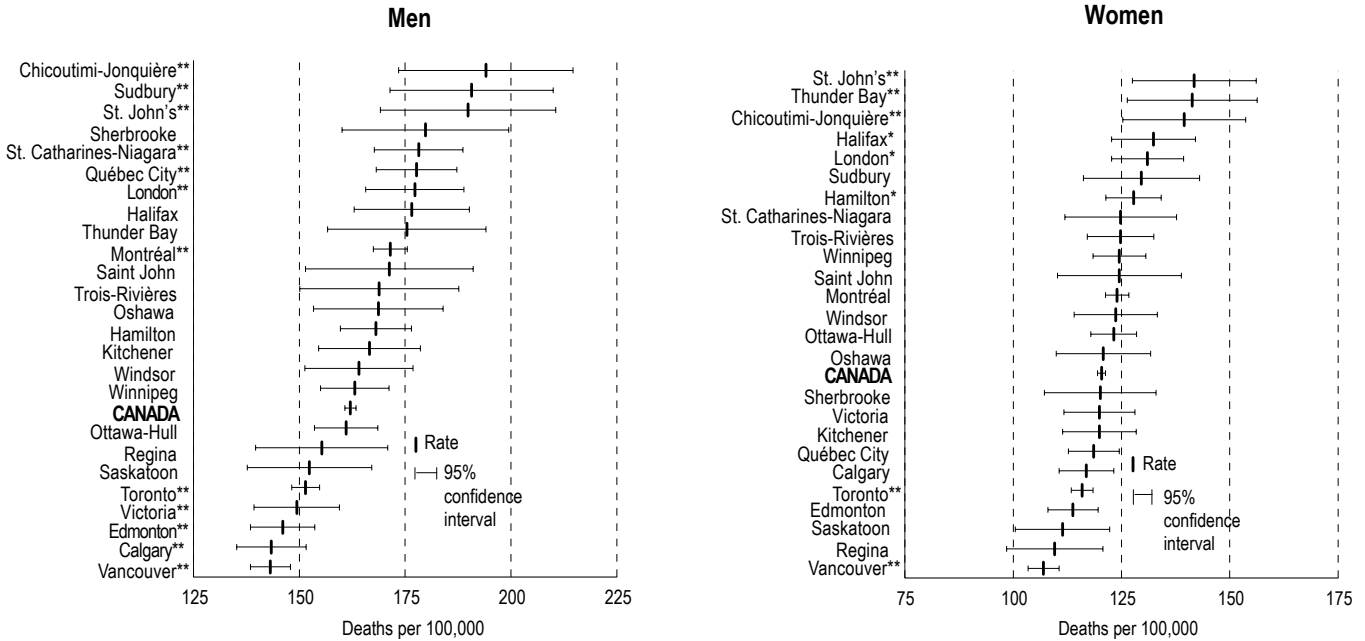
Data source: Canadian Vital Statistics Data Base

Note: Rates are age-standardized to the 1991 Canadian population adjusted for net census undercoverage. To show the data more clearly, different scales are used for male and female mortality rates.

* Significantly different from national rate ($p < 0.05$)

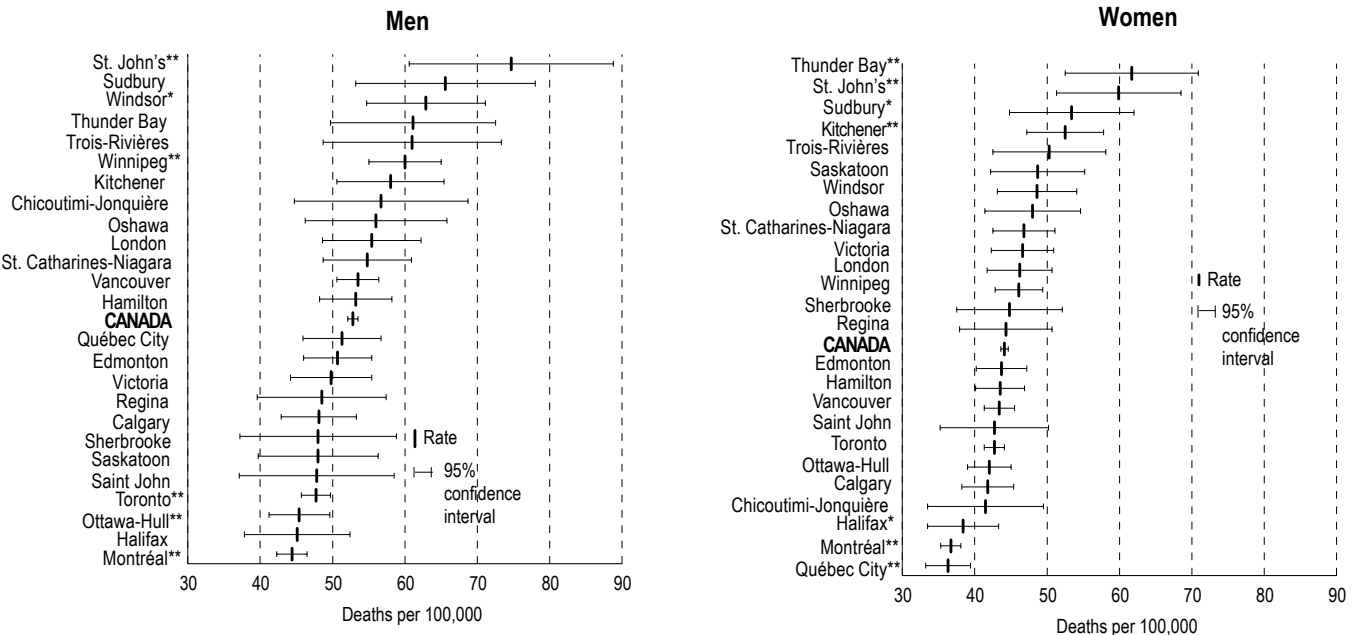
** Significantly different from national rate ($p < 0.01$)

Chart 4
Annualized age-standardized cancer (excluding lung) mortality rate, by sex and census metropolitan area, 1994-1996



Data source: Canadian Vital Statistics Data Base
Note: Rates are age-standardized to the 1991 Canadian population adjusted for net census undercoverage. To show the data more clearly, different scales are used for male and female mortality rates.
 * Significantly different from national rate ($p < 0.05$)
 ** Significantly different from national rate ($p < 0.01$)

Chart 5
Annualized age-standardized cerebrovascular disease mortality rate, by sex and census metropolitan area, 1994-1996



Data source: Canadian Vital Statistics Data Base
Note: Rates are age-standardized to the 1991 Canadian population adjusted for net census undercoverage.
 * Significantly different from national rate ($p < 0.05$)
 ** Significantly different from national rate ($p < 0.01$)

For men, all causes mortality was high in Sudbury, Thunder Bay, Windsor and London. Each of these CMAs had high heart disease mortality rates. In Sudbury, male mortality was also high for cancer (lung and other forms). Windsor's male death rates for lung cancer and cerebrovascular disease were high, as were rates for cancers other than lung among men in London. In St. Catharines-Niagara and Kitchener, men's heart disease death rates were high. Men in St. Catharines-Niagara also had a high death rate for cancers other than lung. In Kitchener, male lung cancer mortality was low.

Ottawa-Hull and Toronto had low overall male mortality rates. Toronto's rates for each of the leading causes of death were all low. Men in Ottawa-Hull had low mortality from cerebrovascular disease.

For women in Ontario CMAs, the all causes mortality rate was high in Thunder Bay, Sudbury, Windsor, Oshawa, St. Catharines-Niagara, Hamilton and London. Heart disease death rates were high in Sudbury, Thunder Bay, St. Catharines-Niagara and Windsor. Female lung cancer mortality rates were not significantly different from the national rate in any Ontario CMA, except Toronto, where the rate was low. Women in Thunder Bay, London and Hamilton had high death rates from other forms of cancer. Mortality from cerebrovascular disease was high for women in Thunder Bay, Sudbury and Kitchener.

Toronto, alone among Ontario CMAs, had low all causes female mortality in 1994-1996. This reflected low mortality rates for heart disease and cancer.

Rates low in western CMAs

Mortality rates among residents of CMAs in the western provinces tended to be low in 1994-1996, often well below national rates.

Among men, all causes mortality was below the national level in Saskatoon, Edmonton, Calgary Vancouver and Victoria. Except for Edmonton, men in these CMAs had low heart disease death rates. Cancer mortality was low for men in Edmonton, Calgary, Vancouver and Victoria. By contrast, men in Regina and Winnipeg had high heart disease mortality, and those in Winnipeg also had high cerebrovascular disease mortality.

For women, overall mortality rates were low in each western CMA except Winnipeg, where the rate did not differ significantly from the national level. Winnipeg was the only western CMA with high female mortality for any of the leading causes of death: heart disease and lung cancer. By contrast, female mortality rates for heart disease were low in Saskatoon, Vancouver and Victoria. The rate for cancers other than lung was low in Vancouver.

Concluding remarks

The east-to-west gradient in Canada's mortality rates largely reflects the situation in CMAs, which contain the majority of the population and account for well over half of all deaths. However, reasons for the sharp variations between CMAs are complex and based on multiple factors. Such differences may result from a joint effect of socioeconomic and environmental conditions.

Migration may play a role as well. Between 1991 and 1996, close to a quarter of Canadians moved to another municipality, either within the same province or to a different province.¹³ Migrants tend to be young, well-educated, relatively healthy individuals.¹³ By moving, they may leave behind a higher proportion of older, less educated, and perhaps, less healthy people. Thus, an influx of migrants to a CMA could lower mortality rates there. Conversely, a CMA losing mobile—and healthy—people might see an upturn in mortality rates.

In some cases, the effect of migration on mortality rates may have to do not so much with the net gain or loss of residents, but with the nature of the migrants, specifically immigrants, who tend to settle in the largest CMAs. For example, Toronto and Vancouver stand out as CMAs with low mortality rates. Both cities have received large numbers of immigrants in recent years, so the "healthy immigrant effect" may be a factor.¹⁴ Healthy people are more inclined to immigrate than those in poor health, and immigrants must undergo medical screening before they enter the country. Consequently, as a group, immigrants tend to be relatively healthy and are likely to have a positive influence on the overall health of any community.

But the impact of migration and immigration on a CMA's mortality rates may also be to obscure the effects of local conditions. The population at risk in any CMA includes people who lived elsewhere for various periods of time. Since many diseases that ultimately end in death take years to develop, it is difficult to determine where an individual was exposed to risk factors.⁷ Therefore, a high mortality rate in a given CMA cannot be interpreted as indicating the true presence of health problems, nor is it sufficient evidence to implicate specific causal factors, such as environment or occupation in a disease.¹⁷ In addition, some migration may actually be the result of illness. For instance, people with chronic conditions may relocate to large centres to be near treatment, and therefore, could inflate mortality rates in some CMAs.

Differences in mortality rates for various CMAs may be partially attributable to differences in lifestyle, particularly smoking. CMAs in Atlantic Canada and Québec, which tend to have high lung cancer mortality rates, also have high smoking prevalence.¹⁵

Thus, while geographic patterns show differences in mortality rates between large urban centres, it is very difficult to pinpoint a specific reason for particularly high or low mortality rates in a given CMA. Most likely, the reasons stem from complex interactions between a number of factors. Nonetheless, the wide ranges between the CMAs with the highest and lowest mortality rates suggest that there may be some potential for lowering mortality in a number of urban areas.² Public health strategies to reduce the prevalence of known modifiable risk factors may be particularly beneficial in CMAs with high mortality rates for specific causes of death. ●

References

- 1 Health and Welfare Canada and Statistics Canada. *Mortality Atlas of Canada. Volume 4. General Mortality Patterns and Recent Trends* (Catalogue H49-6/4-1990) Ottawa: Minister of Supply and Services Canada, 1991.
- 2 Wong T, Wilkins K. How many deaths from major chronic diseases could be prevented? *Chronic Diseases in Canada* 1990; 11(5): 73-6.
- 3 Pickle LW, Mungiole M, Jones GK, et al. *Atlas of United States Mortality* (DHHS Publication No. (PHS) 97-1015) Hyattsville, Maryland: U.S. Department of Health and Human Services, 1996.
- 4 Britton M. Geographic variation in mortality, 1973-83. In: Britton M, ed. *Mortality and Geography. A Review in the Mid-1980s, England and Wales*. London: Office of Population Censuses and Surveys, 1990.
- 5 Statistics Canada. 1996 Census: Immigration and citizenship. *The Daily* (Catalogue 11-001E) Tuesday, November 4, 1997.
- 6 Statistics Canada. 1996 Census: Aboriginal data. *The Daily* (Catalogue 11-001E) Tuesday, January 13, 1998.
- 7 Health and Welfare Canada and Statistics Canada. *Mortality Atlas of Canada, Volume 5, Seniors' Mortality* (Catalogue H49-6/5-1996) Ottawa: Minister of Supply and Services Canada, 1995.
- 8 Statistics Canada. *1996 Census Dictionary* (Catalogue 92-351-XPE) Ottawa: Industry Canada, 1997.
- 9 Stone N. Calgary: A statistical profile. *Canadian Social Trends* (Catalogue 11-008) 1987; Winter: 19-23.
- 10 Peters A. The historic city of Halifax. *Canadian Social Trends* (Statistics Canada, Catalogue 11-008-XPE) 1997; Summer: 8-12.
- 11 Statistics Canada. *Causes of Death* (Catalogue 84-208-XPB) Ottawa: Industry Canada, 1995.
- 12 World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death*. Based on the Recommendations of the Ninth Revision Conference, 1975. Geneva: World Health Organization, 1977.
- 13 Statistics Canada. 1996 Census: Education, mobility and migration. *The Daily* (Statistics Canada, Catalogue 11-001E), Tuesday, April 14, 1998.
- 14 Chen J, Wilkins R, Ng E. The health of Canada's immigrants in 1994-95. *Health Reports* (Catalogue 82-003) 1995; 7(4): 33-45.
- 15 Stephens M, Siroonian J. Smoking prevalence, quit attempts and successes. *Health Reports* (Statistics Canada, Catalogue 82-003) 1998; 9(4): 31-7.

Appendix

Table A

Annualized age-standardized mortality rate, selected causes, by sex and census metropolitan area, 1994-1996

	Men		Women		
	Rate	95% confidence interval	Rate	95% confidence interval	
All causes					
St. John's	1,023.7**	976.5, 1,070.9	Thunder Bay	626.9**	597.0, 656.8
Chicoutimi-Jonquière	1,009.3**	963.4, 1,055.2	Sudbury	608.2**	579.8, 636.6
Sudbury	992.9**	949.3, 1,036.5	St. John's	588.9**	561.3, 616.5
Thunder Bay	983.2**	939.7, 1,026.7	Chicoutimi-Jonquière	579.4**	550.7, 608.1
Saint John	944.1**	898.9, 989.3	Saint John	576.4**	547.6, 605.2
Windsor	932.5**	902.7, 962.3	Windsor	569.3**	550.1, 588.5
Trois-Rivières	926.2**	882.4, 970.0	Halifax	558.5**	539.4, 577.6
London	924.9**	899.3, 950.5	Oshawa	557.8**	535.3, 580.3
Québec City	911.6**	890.6, 932.6	St. Catharines-Niagara	557.2**	541.9, 572.5
Halifax	885.3	855.5, 915.1	Hamilton	548.2**	535.8, 560.6
St. Catharines-Niagara	883.0	860.0, 906.0	London	544.3**	528.5, 560.1
Sherbrooke	881.2	838.5, 923.9	Winnipeg	532.6	520.8, 544.4
Regina	874.7	838.8, 910.6	Kitchener	523.5	506.7, 540.3
Oshawa	872.4	838.0, 906.8	Canada	522.8	520.9, 524.7
Montréal	859.8	851.1, 868.5	Ottawa-Hull	521.0	510.4, 531.6
Kitchener	855.2	828.7, 881.7	Montréal	517.2	511.9, 522.5
Canada	853.9	851.1, 856.7	Sherbrooke	511.9	486.8, 537.0
Hamilton	847.9	829.3, 866.5	Calgary	500.4**	487.9, 512.9
Winnipeg	847.4	829.4, 865.4	Edmonton	500.0**	488.3, 511.7
Ottawa-Hull	813.2**	796.6, 829.8	Victoria	495.9**	480.7, 511.1
Saskatoon	805.7**	773.0, 838.4	Québec City	493.1**	481.4, 504.8
Edmonton	800.0**	782.5, 817.5	Saskatoon	491.8**	470.4, 513.2
Vancouver	781.0**	770.3, 791.7	Trois-Rivières	491.5*	466.6, 516.4
Calgary	760.0**	741.2, 778.8	Regina	487.0**	464.9, 509.1
Victoria	756.3**	734.1, 778.5	Toronto	476.8**	472.0, 481.6
Toronto	741.8**	734.6, 749.0	Vancouver	475.4**	468.3, 482.5
Heart disease					
Thunder Bay	307.2**	282.1, 332.3	Sudbury	173.8**	158.5, 189.1
St. John's	304.5**	277.6, 331.4	Thunder Bay	172.0**	156.9, 187.1
Sudbury	294.3**	269.7, 318.9	St. Catharines-Niagara	168.8**	160.8, 176.8
St. Catharines-Niagara	289.7**	276.2, 303.2	Windsor	161.3**	151.3, 171.3
Saint John	277.3**	252.2, 302.4	St. John's	157.1**	142.9, 171.3
Regina	274.8**	254.0, 295.6	Saint John	155.1**	140.5, 169.7
Windsor	273.0**	256.3, 289.7	Winnipeg	144.8**	138.9, 150.7
London	267.4**	253.0, 281.8	Chicoutimi-Jonquière	141.0	126.5, 155.5
Kitchener	260.5**	245.3, 275.7	Hamilton	140.1	133.9, 146.3
Winnipeg	250.5*	240.5, 260.5	Montréal	137.8	135.1, 140.5
Chicoutimi-Jonquière	249.0	225.3, 272.7	Oshawa	136.4	125.2, 147.6
Trois-Rivières	243.1	219.7, 266.5	London	136.3	128.5, 144.1
Halifax	241.1	225.0, 257.2	Canada	134.8	133.9, 135.7
Montréal	239.9	235.1, 244.7	Halifax	134.4	125.0, 143.8
Québec City	239.4	228.2, 250.6	Edmonton	131.8	125.8, 137.8
Canada	238.4	236.9, 239.9	Regina	131.7	120.8, 142.6
Edmonton	238.3	228.4, 248.2	Calgary	130.1	123.7, 136.5
Oshawa	237.8	219.0, 256.6	Kitchener	130.0	121.7, 138.3
Hamilton	237.3	227.1, 247.5	Ottawa-Hull	128.9	123.6, 134.2
Ottawa-Hull	232.6	223.3, 241.9	Sherbrooke	128.8	116.6, 141.0
Sherbrooke	229.7	206.8, 252.6	Québec City	124.9**	119.1, 130.7
Saskatoon	215.0**	197.6, 232.4	Trois-Rivières	119.8*	107.7, 131.9
Calgary	212.7**	202.2, 223.2	Vancouver	116.7**	113.3, 120.1
Vancouver	203.8**	198.2, 209.4	Saskatoon	114.7**	104.6, 124.8
Victoria	194.3**	183.1, 205.5	Toronto	109.5**	107.2, 111.8
Toronto	185.3**	181.6, 189.0	Victoria	105.5**	99.1, 111.9

Annualized age-standardized mortality rate, selected causes, by sex and census metropolitan area, 1994-1996 – continued

	Men		Women		
	Rate	95% confidence interval	Rate	95% confidence interval	
Lung cancer					
Chicoutimi-Jonquière	134.4**	117.6, 151.2	Saint John	47.9**	38.8, 57.0
Trois-Rivières	102.7**	88.2, 117.2	Halifax	41.8**	36.1, 47.5
Québec City	94.7**	88.1, 101.3	Thunder Bay	39.8	31.8, 47.8
Windsor	92.3**	82.8, 101.8	Windsor	37.9	32.5, 43.3
Montréal	89.7**	86.9, 92.5	Winnipeg	37.7**	34.2, 41.2
St. John's	88.3*	74.5, 102.1	Oshawa	37.6	31.4, 43.8
Saint John	88.0*	74.0, 102.0	Chicoutimi-Jonquière	37.0	29.7, 44.3
Sudbury	86.3*	74.0, 98.6	Sudbury	36.4	29.2, 43.6
Halifax	83.9*	74.6, 93.2	Regina	36.4	29.8, 43.0
Sherbrooke	79.2	66.4, 92.0	Montréal	35.3**	33.8, 36.8
Canada	72.8	72.0, 73.6	Victoria	35.0	30.5, 39.5
Thunder Bay	72.1	60.2, 84.0	Ottawa-Hull	33.8	30.9, 36.7
London	71.9	64.8, 79.0	Hamilton	33.3	30.0, 36.6
Ottawa-Hull	71.0	66.1, 75.9	Vancouver	32.1	30.1, 34.1
Winnipeg	70.8	65.5, 76.1	Canada	32.0	31.5, 32.5
Regina	69.4	59.1, 79.7	St. John's	31.9	24.9, 38.9
Hamilton	68.6	63.3, 73.9	Edmonton	31.8	28.7, 34.9
St. Catharines-Niagara	67.3	61.0, 73.6	St. Catharines-Niagara	31.5	27.6, 35.4
Oshawa	65.4	56.2, 74.6	Trois-Rivières	31.5	24.9, 38.1
Saskatoon	65.2	55.5, 74.9	Québec City	30.7	27.6, 33.8
Victoria	60.5**	54.0, 67.0	Saskatoon	30.7	24.8, 36.6
Kitchener	60.5**	53.4, 67.6	Calgary	30.6	27.3, 33.9
Calgary	59.8**	54.5, 65.1	London	29.0	25.0, 33.0
Edmonton	59.6**	54.7, 64.5	Kitchener	28.5	24.2, 32.8
Vancouver	56.7**	53.8, 59.6	Sherbrooke	27.7	21.2, 34.2
Toronto	55.8**	53.8, 57.8	Toronto	25.1**	23.9, 26.3
Other cancer					
Chicoutimi-Jonquière	194.1**	173.5, 214.7	St. John's	141.8**	127.5, 156.1
Sudbury	190.7**	171.4, 210.0	Thunder Bay	141.3**	126.3, 156.3
St. John's	189.9**	169.2, 210.6	Chicoutimi-Jonquière	139.5**	125.3, 153.7
Sherbrooke	179.8	160.1, 199.5	Halifax	132.4*	122.7, 142.1
St. Catharines-Niagara	178.2**	167.7, 188.7	London	131.0*	122.7, 139.3
Québec City	177.7**	168.2, 187.2	Sudbury	129.6	116.2, 143.0
London	177.3**	165.7, 188.9	Hamilton	127.8*	121.4, 134.2
Halifax	176.6	163.0, 190.2	St. Catharines-Niagara	124.8	117.1, 132.5
Thunder Bay	175.4	156.7, 194.1	Trois-Rivières	124.8	111.9, 137.7
Montréal	171.5**	167.5, 175.5	Winnipeg	124.5	118.4, 130.6
Saint John	171.3	151.5, 191.1	Saint John	124.5	110.2, 138.8
Trois-Rivières	168.9	150.1, 187.7	Montréal	124.0	121.3, 126.7
Oshawa	168.7	153.4, 184.0	Windsor	123.7	114.1, 133.3
Hamilton	168.1	159.7, 176.5	Ottawa-Hull	123.2	117.9, 128.5
Kitchener	166.6	154.6, 178.6	Oshawa	120.8	109.9, 131.7
Windsor	164.1	151.3, 176.9	Canada	120.4	119.5, 121.3
Winnipeg	163.1	155.0, 171.2	Sherbrooke	120.1	107.2, 133.0
Canada	162.1	160.8, 163.4	Victoria	119.9	111.7, 128.1
Ottawa-Hull	161.1	153.6, 168.6	Kitchener	119.9	111.4, 128.4
Regina	155.3	139.7, 170.9	Québec City	118.6	112.7, 124.5
Saskatoon	152.4	137.7, 167.1	Calgary	116.9	110.6, 123.2
Toronto	151.5**	148.2, 154.8	Toronto	115.9**	113.4, 118.4
Victoria	149.4**	139.3, 159.5	Edmonton	113.8	108.0, 119.6
Edmonton	146.1**	138.5, 153.7	Saskatoon	111.4	100.5, 122.3
Calgary	143.4**	135.2, 151.6	Regina	109.6	98.5, 120.7
Vancouver	143.2**	138.5, 147.9	Vancouver	107.0**	103.4, 110.6

Annualized age-standardized mortality rate, selected causes, by sex and census metropolitan area, 1994-1996 – concluded

	Men		Women		
	Rate	95% confidence interval	Rate	95% confidence interval	
Cerebrovascular disease					
St. John's	74.7**	60.6, 88.8	Thunder Bay	61.7**	52.5, 70.9
Sudbury	65.6	53.2, 78.0	St. John's	59.9**	51.3, 68.5
Windsor	62.9*	54.7, 71.1	Sudbury	53.4*	44.8, 62.0
Thunder Bay	61.1	49.7, 72.5	Kitchener	52.5**	47.2, 57.8
Trois-Rivières	61.0	48.7, 73.3	Trois-Rivières	50.3	42.5, 58.1
Winnipeg	60.0**	55.0, 65.0	Saskatoon	48.7	42.2, 55.2
Kitchener	58.0	50.6, 65.4	Windsor	48.6	43.1, 54.1
Chicoutimi-Jonquière	56.7	44.7, 68.7	Oshawa	48.0	41.4, 54.6
Oshawa	56.0	46.2, 65.8	St. Catharines-Niagara	46.8	42.5, 51.1
London	55.4	48.6, 62.2	Victoria	46.6	42.3, 50.9
St. Catharines-Niagara	54.8	48.7, 60.9	London	46.2	41.7, 50.7
Vancouver	53.5	50.6, 56.4	Winnipeg	46.1	42.8, 49.4
Hamilton	53.2	48.2, 58.2	Sherbrooke	44.8	37.5, 52.1
Canada	52.8	52.1, 53.5	Regina	44.3	37.9, 50.7
Québec City	51.3	45.9, 56.7	Canada	44.1	43.6, 44.6
Edmonton	50.7	46.0, 55.4	Edmonton	43.7	40.2, 47.2
Victoria	49.8	44.2, 55.4	Hamilton	43.5	40.1, 46.9
Regina	48.5	39.6, 57.4	Vancouver	43.4	41.3, 45.5
Calgary	48.1	42.9, 53.3	Saint John	42.7	35.2, 50.2
Sherbrooke	48.0	37.2, 58.8	Toronto	42.7	41.3, 44.1
Saskatoon	48.0	39.7, 56.3	Ottawa-Hull	42.0	39.0, 45.0
Saint John	47.8	37.1, 58.5	Calgary	41.8	38.2, 45.4
Toronto	47.7**	45.7, 49.7	Chicoutimi-Jonquière	41.5	33.5, 49.5
Ottawa-Hull	45.4**	41.2, 49.6	Halifax	38.4*	33.5, 43.3
Halifax	45.1	37.8, 52.4	Montréal	36.7**	35.3, 38.1
Montréal	44.4**	42.3, 46.5	Québec City	36.3**	33.2, 39.4

Data source: Canadian Vital Statistics Data Base

Note: Rates are age-standardized to the 1991 Canadian population adjusted for net census undercoverage.

* Significantly different from national rate ($p < 0.05$)

** Significantly different from national rate ($p < 0.01$)