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Vol. 13 No. 2

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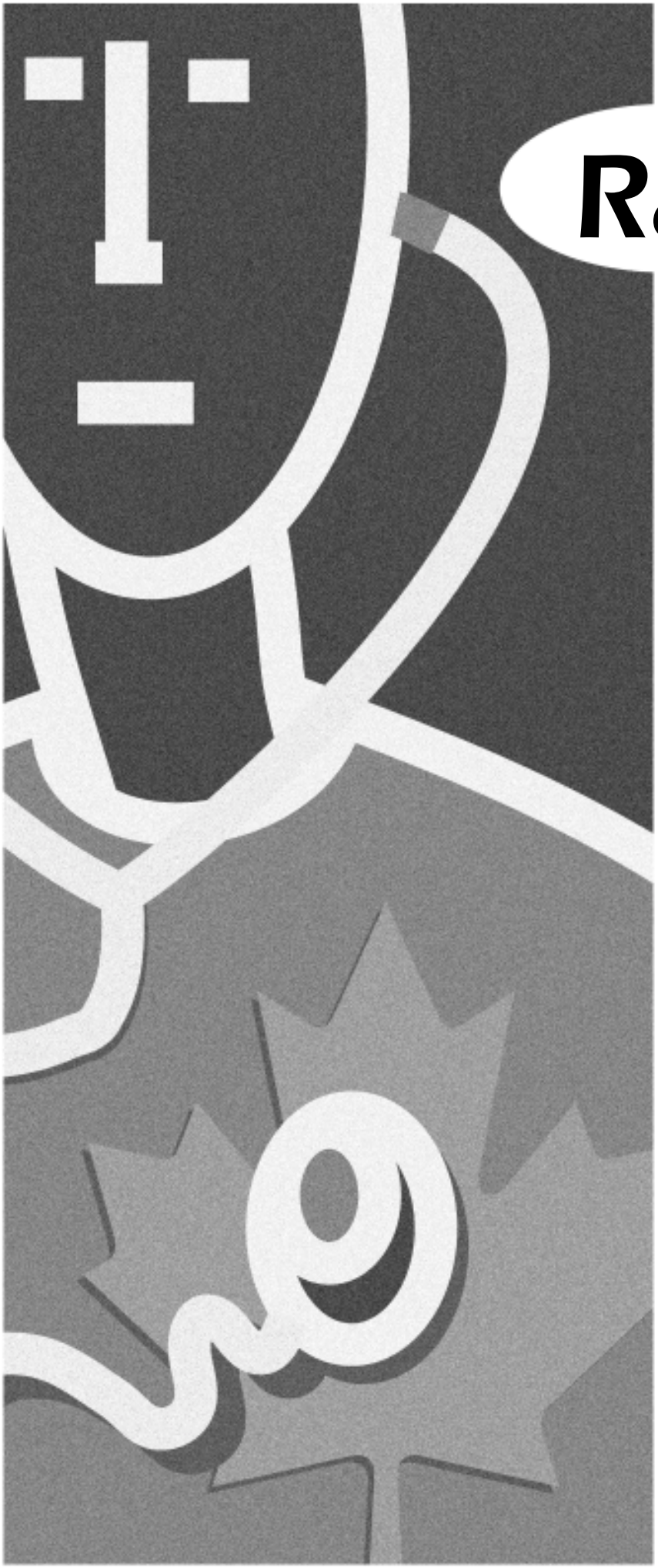

Research Articles

In-depth research and analysis in the fields of health and vital statistics

Suicide deaths and suicide attempts

Stéphanie Langlois and Peter Morrison

Abstract

Objectives

This article examines suicide deaths among Canadians aged 10 or older between 1979 and 1998. It also examines hospital records for 1998/99 to provide some insight into suicide attempts.

Data sources

Data are mainly from the Vital Statistics Database, the Hospital Morbidity Database, and the Person-oriented Information Database. Supplementary data are from the Adult Correctional Services and Homicide surveys, the National Longitudinal Survey of Children and Youth, and the World Health Organization.

Analytical techniques

Age-standardized rates for suicide deaths and hospitalized suicide attempts were calculated by sex and province/territory for Canadians aged 10 or older. Age- and sex-specific rates for suicide deaths and parasuicide-related hospitalizations were also calculated for seven age groups.

Main results

The suicide death rate remained fairly stable between 1979 and 1998. The suicide rate of males was four times that of females, but females were hospitalized for attempted suicide at about one and a half times the rate of males. In 1998/99, about 9% of individuals who were hospitalized for an attempted suicide had been discharged more than once for a suicide attempt the same year.

Key words

parasuicide, hospital discharge records, hospital utilization, multiple hospitalizations

Authors

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In 1998, approximately 3,700 Canadians took their own lives, an average of about 10 suicides per day. Canadians are seven times more likely to die from suicide than to be the victim of a homicide.[1] Between 1993 and 1998, suicide claimed considerably more lives than motor vehicle accidents.[2] In fact, from adolescence to middle-age, suicide is one of the leading causes of death for both males and females.[3]

While the number of attempted suicides is known to exceed that of completed suicides, it is difficult to determine exactly how many attempts do occur. The World Health Organization recently estimated as many as 20 attempts for every suicide death.[4]

This article presents a comprehensive statistical picture of national and provincial/territorial suicide deaths from 1979 to 1998 among Canadians aged 10 or older (see *Methods*). These figures are supplemented by estimates of suicide attempts that do not end in death, based on hospital records for 1998/99. Methods used in completed suicides and hospitalized suicide attempts are also examined. The data are presented by sex and age group to give a general outline of the demographic groups most at risk (see *Limitations*).

Methods

Data sources

Data on suicide deaths for 1979 to 1998 were obtained from the Canadian Vital Statistics Database, which contains information provided by the vital statistics registrars in each province and territory. The database is maintained by Statistics Canada, and is a virtually complete count of all vital statistics. Annual figures refer to the calendar year.

Data on hospitalization related to suicide attempts and self-inflicted injuries were drawn from the Hospital Morbidity Database (HMD), maintained by the Canadian Institute for Health Information. The information in this database comes from the admission/separation form completed by hospitals at the end of each uninterrupted patient stay, when the patient is "separated," either as a discharge or a death. The file contains data on all inpatient cases that were separated from general and allied special care hospitals (acute care, convalescent, and chronic care hospitals) during the fiscal year. Because a patient may be admitted to and discharged from hospital several times a year, the statistics are a count of separations rather than individual patients. To avoid double-counting, only in-province hospitalizations (residents and non-residents of the province/territory where the hospitalization occurred) were included in the analysis.

Statistics Canada's Person-oriented Information (POI) database is a subset of the Hospital Morbidity Database. POI contains patient identification numbers, making it possible to determine readmissions of the same individual (patient names are not provided to Statistics Canada). POI excludes records for non-residents. For this analysis, out-of-province hospitalizations were also excluded.

Population estimates used to calculate rates were provided by Statistics Canada's Demography Division, and were adjusted for net census undercoverage and non-permanent residents. July-adjusted population estimates were used to calculate suicide death rates. October-adjusted estimates were used to determine parasuicide-related hospitalization rates.

Analytical techniques

Based on the *International Classification of Diseases, Ninth Revision* (ICD-9),[5] a *suicide death* was defined as the presence of codes E950 to E959 (suicide and self-inflicted injury) for cause of death.

Hospitalizations related to suicide attempts were defined as the presence of ICD-9 codes E950 to E959 in the first accident code for a patient discharged alive. This ICD-9 category includes injuries resulting from attempted suicide, as well as self-inflicted injuries specified as intentional, but without suicidal intent.

Since suicide deaths and hospitalizations for suicide attempts are rare among young children, this analysis pertains only to Canadians aged 10 or older.

Suicide rates were calculated by dividing the number of suicide deaths occurring in a calendar year among people aged 10 or older by the corresponding population estimates (as of July), and multiplying by 100,000.

Hospitalization rates for attempted suicides (parasuicides) were calculated by dividing the number of hospital separations for a suicide attempt occurring in a fiscal year among those aged 10 or older by the corresponding population estimates (as of October), and multiplying by 100,000.

Age-standardized rates were calculated using the age distribution of Canadians aged 10 or older in 1991 as a standard population. The age-standardized rate represents the number of suicide deaths or parasuicide-related hospitalizations per 100,000 that would have occurred in the standard population if the actual age-specific rates observed in a given population had prevailed in the standard population. This procedure allows comparisons between sexes, provinces/territories, and years.

Age-specific rates were calculated by dividing the number of suicide deaths or parasuicide-related hospitalizations in each age group by the corresponding estimated population, and multiplying by 100,000. The initial analysis was done using five-year age groups (data not shown), but since many of the groups showed similar suicide rates over time, larger age categories were created to facilitate the presentation of results.

Comparisons between areas may reflect random variation rather than real differences. Confidence intervals (see Appendix A, Tables A through D) were calculated to assess the variation of each province/territory's suicide and hospitalization rates.[6,7] Two-sided tests were performed to identify statistically significant differences between the age-standardized rate for each province/territory and the age-standardized national rate. Because the suicide and hospitalization rates for large provinces 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 the rate for each province/territory and the national rate, an estimated covariance was calculated between the two rates and was used to calculate the variance of the difference between rates.[6,8]

Average length of stay was calculated by dividing the total number of patient-days spent in hospital for a suicide attempt by the number of separations related to parasuicides.

To estimate the percentage of people who had multiple hospitalizations for suicide attempts in 1998/99, it was necessary to determine if the hospital discharge records for an individual were for a suicide attempt or for a transfer to another hospital. An examination of admission and separation dates, as well as hospital numbers, made it possible to eliminate records that represented transfers.

Because the POI database is a subset of the Hospital Morbidity Database it gives a less complete picture of the number of suicide attempts resulting in hospitalization. For example, in 1998/99, 94% of all hospital morbidity records representing hospitalizations for a suicide attempt for which the patient was discharged alive were included in the POI database. However, unlike the POI database, the HMD cannot be used to determine the number of individuals who were hospitalized for a suicide attempt once, twice, or more during the fiscal year. Therefore, the POI database was used as a complement to calculate the ratios of number of individuals hospitalized for a suicide attempt (or suicide attempts) over the number of hospital discharges related to suicide attempts. These ratios were then applied to the HMD.

The social, economic and psychological factors associated with suicide and suicide attempts are beyond the scope of this analysis.

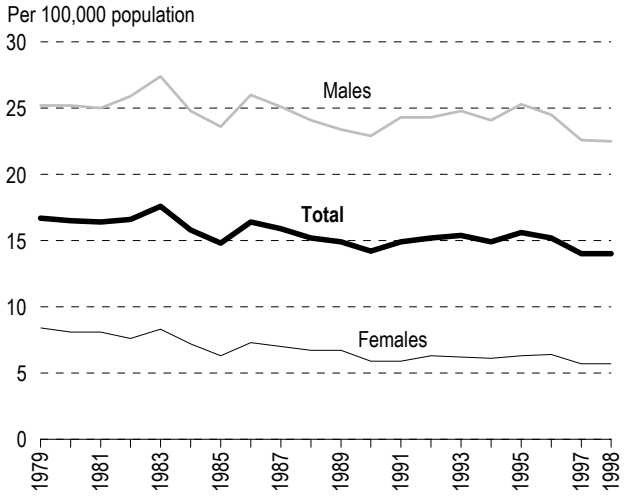
Rate remains fairly stable

In 1998 (most recent statistics available), 3,698 suicide deaths were reported among Canadians aged 10 or older. That year, the age-standardized suicide rate was 14 suicides per 100,000 population. The rate remained fairly stable between 1979 and 1998, reaching a high of 18 in 1983 (Chart 1). (See also *International comparisons*.) Since single-year statistics may provide less reliable rates due to random events, three-year moving averages of these age-standardized rates were examined, revealing a similar stable long-term trend (data not shown).

In 1998, suicide was the leading cause of death for men in the age groups between 25 to 29 and 40 to 44, and for women between the ages of 30 to 34. And for the three age groups from 10 to 14, 15 to 19 and 20 to 24, it was the second-leading cause of death for both sexes, surpassed only by motor vehicle accidents.[3]

Trends and rates should be interpreted with caution, as official statistics tend to under-report suicide. Further, year-to-year changes may reflect differences in the reporting and certification of suicide deaths.[9] Medical and legal authorities can certify a death as suicide only when the victim's intent is clearly proven.[10]

Chart 1
Age-standardized suicide rates,† population aged 10 or older, by sex, Canada, 1979 to 1998



Data source: *Canadian Vital Statistics Database*
† Age-standardized to the 1991 Canadian population aged 10 or older, adjusted for net census undercoverage and non-permanent residents

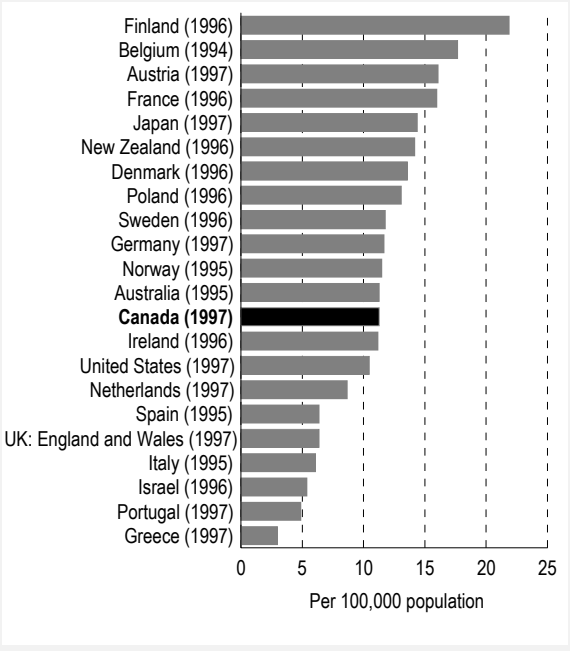
International comparisons

According to information from the World Health Organization, Canada's suicide rate for the entire population ranked in the middle of 22 western industrialized countries.[11] Age-standardized suicide rates ranged from 3 per 100,000 population in Greece (1997) to 22 per 100,000 in Finland (1996). Canada's 1997 suicide rate was similar to those reported in Australia, Ireland, Norway, Germany and Sweden. However, international comparisons should be interpreted with caution as methods of death certification can vary.[12]

The overrepresentation of men in suicide deaths was consistent across all 22 countries. The male–female ratio ranged from 2 to 1 in the Netherlands to 7 to 1 in Greece, with most around 3 or 4 to 1 (4 in Canada).

Suicide rates for males varied from 5 per 100,000 in Greece to 35 in Finland. Female suicide rates ranged from 1 per 100,000 in Greece to 9 in Finland. Again, Canada ranked in the middle: 18 per 100,000 males; 5 per 100,000 females (data not shown).

Age-standardized suicide rates,† selected countries, 1994 to 1997



Data source: *World Health Organization database (Reference 11)*
† Age-standardized to new world population standard (constructed for 2000-to-2025 period)

Rate higher for males

Earlier studies have found males to be at least four times more likely than females to commit suicide.[9,10,12,13] Males are also more likely to die in their first attempt.[14] In 1998, the age-standardized rate for Canadian males aged 10 or older was 23 suicides per 100,000, compared with 6 per 100,000 for their female counterparts (Appendix A, Table A) (see also *Murder–Suicide*).

Since 1979, both the male and female age-standardized suicide rates have not varied markedly (Chart 1; Appendix B, Tables A and B). The male rate peaked at 27 per 100,000 in 1983, while the female rate never surpassed 8 per 100,000.

The age groups in which suicide was most likely to occur differed somewhat for males and females. Among men, in 1998, rates for the 20 to 29, 30 to

Limitations

The definitions used for suicide deaths and suicide attempts resulting in hospitalization were determined using the *International Classification of Diseases, Ninth Revision* (ICD-9).[5] This could overestimate the number of suicide deaths, as well as the number of hospital discharges for suicide attempts, because self-inflicted injuries specified as intentional, but without a suicidal intent, are included.

On the other hand, a number of studies have examined the extent of underreporting of suicide deaths due mainly to possible classification bias in reporting causes of death or failure to include amended death certificates in the national database.[15-18] For example, some ICD-9 categories such as "injury undetermined whether accidentally or purposely inflicted" (E-980 to E-989) could conceal suicide deaths. Differences in the underreporting of suicide deaths were found when the Canadian Vital Statistics Database and individual provincial/territorial coroners' databases were compared. This is partly because amendments such as reclassification of causes of death made at the provincial/territorial level are not included in the national database.[17,18] For example, when a cause of death is uncertain, coroners may initially code the death as undetermined and then, after further investigations (which can vary in timeliness among different jurisdictions and exceed the deadline set by Statistics Canada), may reclassify it to a more specific cause, thereby creating some discrepancies with the Canadian Vital Statistics Database. Moreover, a study found that the underreporting of suicide deaths differs by province/territory,[17] which is important to consider when comparing provincial/territorial suicide rates. Unfortunately, the magnitude of potential errors introduced by such limitations cannot be determined. Nonetheless, the Vital Statistics Database remains a reliable source of suicide statistics.[15,16]

Similarly, this analysis underreports the total number of suicide attempts. The Hospital Morbidity Database (HMD) does not include cases of attempted suicide that involved outpatient treatment in hospital emergency rooms or other medical facilities. As well, patients who were institutionalized in psychiatric hospitals and who attempted suicide during their stay but did not require acute care hospitalization are not included. And of course, cases for which no medical attention was sought could not be counted. Because of these exclusions, the data from the HMD could be describing a subgroup of suicide attempters who may not be representative of the entire population of attempters.

Hospitalizations for suicide attempts were also underestimated, since only the first accident code of the Hospital Morbidity Database was considered in the analysis. A relatively small number of hospitalizations with a suicide and a self-inflicted injury code (E950 to E959) were found in the second to fifth accident code fields, but because the quality of these variables was doubtful, they were excluded. On the other hand, hospital discharges for attempted suicide could also be overestimated. For example, a person transferred from one hospital to another would result in two different separations in the HMD, although both refer to the same episode.

The risk of suicide is not the same for all members of a population. Certain groups may be considered "high-risk" because they often have higher than average suicide rates: Aboriginal peoples, the young and the elderly, inmates (see *Suicide in correctional institutions*), homosexuals, people who have previously attempted suicide, and those suffering from mental disorders.[12] While a number of studies have attempted to estimate suicide rates among high-risk groups, accurate national suicide rates for these groups cannot be calculated from existing databases. For instance, several studies have estimated that the risk of suicide for the Aboriginal population is two to four times that of the general population.[19-24] However, in the absence of reliable national data, it is difficult to determine the suicide rates of Aboriginals or other high-risk groups.

44 and 45 to 59 age groups were significantly higher than the overall crude male rate, while the rate at ages 15 to 19 was significantly lower (Chart 2). Women's rates were significantly higher than the overall female crude rate at ages 30 to 44 and 45 to 59, but were lower at ages 20 to 29.

In every age group, males had a higher suicide rate than did females. The gaps were particularly wide among people in their twenties and those aged 75 or older. Boys and girls aged 10 to 14 had the lowest suicide rates: 3 and 2 deaths per 100,000, respectively.

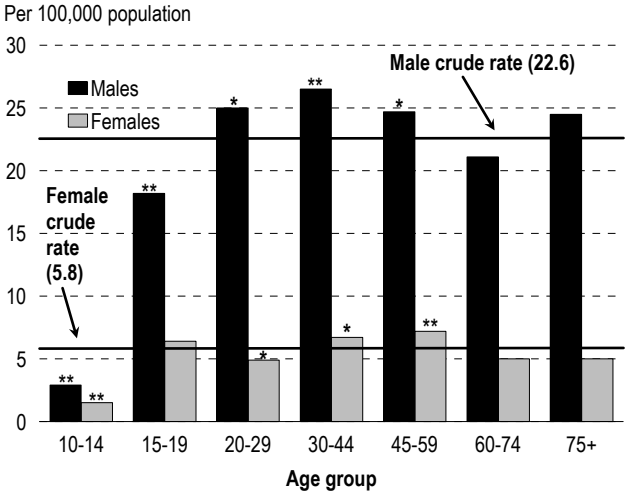
Provincial differences

Looking beyond the national picture reveals a number of provincial differences, although these should be interpreted with caution. Historically, suicide rates have tended to increase from east to west.[10] However, since 1993, Québec has had the highest age-standardized provincial rate (Appendix B, Table C). In 1998, at 21 suicide deaths per 100,000 population aged 10 or older, Québec's rate was significantly above the national rate of 14. Alberta's rate of 16 was also significantly higher than that for Canada. Newfoundland, Ontario and British Columbia reported rates significantly below the national level (Chart 3).

Some of the difference in provincial suicide rates may be attributed to variations in coding practices for causes of death, as well as in the timeliness of reporting mortality data (see *Limitations*). To acquire a partial view of suicide underreporting in 1998, a ratio of the number of undetermined deaths over the number of suicides was calculated by province (data not shown). New Brunswick had the lowest percentage (1%), followed by Québec (3%), while Ontario and Manitoba had the highest (16% and 24%, respectively). However, these ratios are only partial indicators of potential biases and thus their effects on provincial differences and the magnitude of these effects are not known.

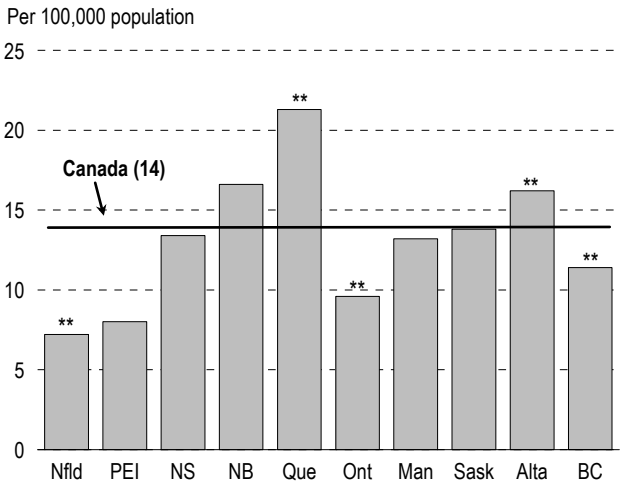
In 1998, the Yukon and the Northwest Territories reported rates of 26 and 56 suicides per 100,000 population aged 10 or older (5 and 35 deaths, respectively). Particular caution is necessary when analyzing suicide rates for the Yukon and the Northwest Territories. Because of their small populations and the low number of suicide deaths, slight changes in the number of suicides may cause dramatic annual fluctuations in the rates when no substantial changes have actually occurred. Despite

Chart 2
Age- specific suicide rates, by sex, Canada, 1998



***Data source**: Canadian Vital Statistics Database*
** Significantly different from sex-specific crude rate (p < 0.05)*
*** Significantly different from sex-specific crude rate (p < 0.01)*

Chart 3
Age-standardized suicide rates,† population aged 10 or older, Canada and provinces, 1998



***Data source:** Canadian Vital Statistics Database*
***Note:** The age-standardized rate was 26.1 for the Yukon and 55.5 for the Northwest Territories. Only the latter was significantly different from the national rate (p < 0.05).*
† Age-standardized to 1991 Canadian population aged 10 or older, adjusted for net census undercoverage and non-permanent residents
*** Significantly different from age-standardized national rate (p < 0.01)*

this high variability, the Northwest Territories' suicide rate (but not the Yukon's) was significantly above the national level.

Methods differ

In 1998, the most common means of suicide in Canada was suffocation (39%), principally hanging or strangulation (Table 1). Poisoning, which includes drug overdoses and inhalation of motor vehicle exhaust, was the next most common (26%), followed by firearms (22%). By contrast, a recent study in the United States found that nearly 60% of suicides were committed with a firearm.[14]

Males tend to use more violent methods than do females.[10,12] In 1998, 26% of male suicides were committed with firearms, compared with 7% of female suicides. Females were much more likely than males to use poisoning: 41% versus 22%. The most common method for males was suffocation (40%); among females, this method ranked second, accounting for 34% of suicides.

Between 1979 and 1998, the proportion of male suicides committed with firearms declined from 41%

Murder–Suicide

Homicide, the murder of one person by another, is rare in Canada. Even more rare are homicides followed by the suicide of the offender.

Research indicates that the closer the ties between victim and offender, the greater the ensuing guilt and the greater the likelihood of a suicide after the homicide,[25,26] particularly if the homicide victim is a child.[26] Of the 503 separate homicide incidents (an incident could involve more than one victim) reported to police in 1999, 40 (8%) were murder–suicides.[27] These incidents resulted in the deaths of 52 homicide victims, where the accused, predominantly male (93%), committed suicide. Almost 9 out of 10 of these murder–suicides were family-related, a trend that has shown relatively little change over the last 20 years.

In 1999, one in four murder–suicide incidents involved more than one victim, and the accused in each of these multiple victim murder–suicides was male. In close to half (48%) of all murder–suicide incidents, men killed their spouse; in 15% of cases, men killed their child(ren). Men killed their spouse and child(ren) in 13% of cases. There were no murder–suicides in which women killed a spouse, but there were two incidents in which women killed their child(ren).[27]

Table 1
Suicide methods, by sex, population aged 10 or older, Canada, 1998

	Total		Males		Females	
Method (ICD-9 codes)	**Number**	**%**	**Number**	**%**	**Number**	**%**
Total suicide deaths (E950-E959)	**3,698**	**100.0**	**2,925**	**100.0**	**773**	**100.0**
Suffocation (E953), total	1,433	38.8	1,171	40.0	262	33.9
Poisoning (E950-E952), total	965	26.1	646	22.1	319	41.3
Drugs and medication (E950.0-E950.5)	487	13.2	246	8.4	241	31.2
Motor vehicle exhaust (E952.0)	269	7.3	229	7.8	40	5.2
Other carbon monoxide (E952.1)	164	4.4	135	4.6	29	3.8
Other/Unspecified poisoning (E950.6-E950.9, E951, E952.8, E952.9)	45	1.2	36	1.2	9	1.2
Firearms (E955.0-E955.4, E955.9)	816	22.1	765	26.2	51	6.6
Jumping from high place (E957)	160	4.3	115	3.9	45	5.8
Drowning/Submersion (E954)	122	3.3	79	2.7	43	5.6
Cutting/Piercing instruments (E956)	59	1.6	48	1.6	11	1.4
Other/Unspecified means (E955.5, E958, E959)†	143	3.9	101	3.5	42	5.4

Data source: *Canadian Vital Statistics Database*
Note: *Because of rounding, detail may not add to totals.*
† Includes jumping or lying before moving objects, fires/burns, crashing of motor vehicle, other or unspecified means, late effects of self-inflicted injury, explosives.

to 26%, while those involving suffocation rose from 24% to 40%. The pattern among females was similar, with the most dramatic increase in suffocation (from 19% to 34%) (data not shown).

Hospitalization for suicide attempts

Many people who try to kill themselves do not die in their attempts. Therefore, information about attempts would provide a more complete picture of suicide as a public health issue. It is difficult, however, to arrive at accurate national figures for attempted suicide.[12] Suicide attempts may not be reported, and data collection methods for those that are reported vary. Nevertheless, some data can be derived from hospital records.

In 1998/99, a total of 23,225 hospital separations (the discharge or death of an in-patient) of Canadians aged 10 or older were related to suicide and intentional self-inflicted injuries. In 338 of these cases (less than 2%), the patient died. The remaining 22,887 were parasuicide-related hospitalizations (non-lethal, attempted suicide or intentional self-inflicted injuries) after which the patient was discharged alive. Based on these discharges, the crude hospitalization rate for attempted suicide was 87 per 100,000 population aged 10 or older.

Attempts—females at greater risk

While males were far more likely than females to take their own lives, female hospitalization rates for attempted suicide were higher than rates for males (Table 2, Chart 4). In 1998/99, the age-standardized hospitalization rate for attempted suicide was 108 per 100,000 females aged 10 or older and 70 per 100,000 of their male counterparts. Some research has indicated that women are more likely than men to make suicide attempts that are actually intended to be non-fatal, but this view remains controversial.[28,29]

The hospitalization rate for attempted suicide among females peaked at ages 15 to 19. In 1998/99, the rate was 221 per 100,000 for girls in this age group, over twice the rate for 15- to 19-year-old boys (87 per 100,000). Even among 10- to 14-year-olds, the hospitalization rate for suicide attempts was much higher among girls than boys: 68 versus 16 per 100,000.

Table 2
Rates of suicide death (1998) and hospitalization for attempted suicide (1998/99), population aged 10 or older, by age group and sex, Canada

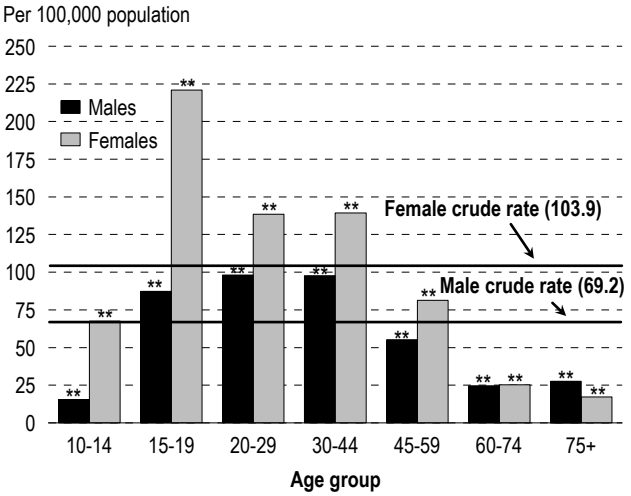
	Suicide deaths			Hospitalizations for attempted suicide		
Age group	Total	Males	Females	Total	Males	Females
	Rate per 100,000 age-specific population					
10-14	2.2	2.9	1.5	40.8	15.5	67.5
15-19	12.5	18.2	6.4	152.2	87.3	220.8
20-29	15.1	25.0	4.9	117.9	98.0	138.4
30-44	16.7	26.5	6.7	118.3	97.6	139.3
45-59	15.9	24.7	7.2	68.3	55.1	81.3
60-74	12.6	21.1	5.0	25.0	24.7	25.2
75+	12.3	24.5	5.0	21.0	27.6	17.2

Data sources: *Canadian Vital Statistics Database, Hospital Morbidity Database*

These figures parallel results from the 1996/97 National Longitudinal Survey of Children and Youth, which found that among young adolescents, girls are more likely than boys to have suicidal thoughts. An estimated 44,000 12- and 13-year-olds (7%) reported that they had contemplated suicide in the previous year: 8.4% of girls and 4.6% of boys.[30]

Males' hospitalization rates for attempted suicide were highest at ages 20 to 29 and 30 to 44 (about 98 per 100,000), but were still well below those of

Chart 4
Age-specific hospitalization rates for suicide attempts, by sex, Canada, 1998/99



Data source: *Hospital Morbidity Database, 1998/99*
*** Significantly different from sex-specific crude rate (p < 0.01)*

Suicide in correctional institutions

Over the last decade, there have been 354 suicides in Canadian correctional institutions, including 36 in 1998/99. Suicide is the most frequent cause of death in correctional facilities, accounting for over one-third (35%) of prison deaths in 1998/99.[31] It is also well-documented that the rate of suicide among inmates in correctional institutions is more than twice as high as the rate for the general population.[32,33]

women in the same age ranges (about 138 per 100,000). In fact, up to age 60, rates for women exceeded those for men.

At older ages, hospitalization for suicide attempts was less common. There was little difference between rates for men and women at ages 60 to 74, and by age 75 or older, men's rate surpassed women's.

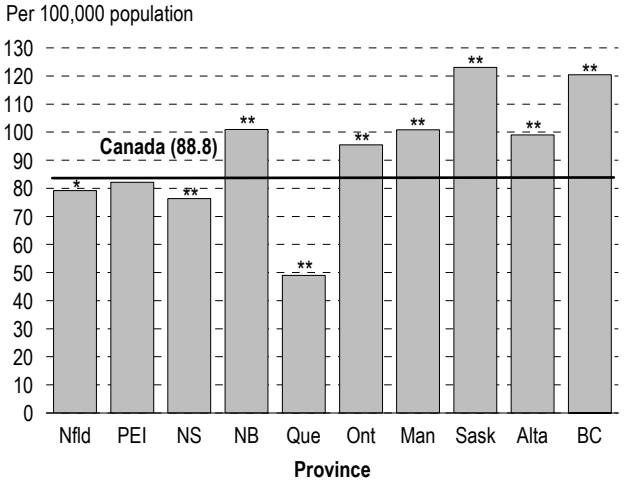
Hospitalization rate lower in Québec

Québec reported the lowest age-standardized hospitalization rate for suicide attempts: 49 per 100,000 population aged 10 or older in 1998/99 (Chart 5). This contrasts sharply with Québec's suicide death rate, which was highest among the provinces.

Newfoundland and Nova Scotia also had relatively low hospitalization rates for suicide attempts. Prince Edward Island's rate did not differ significantly from the national age-standardized rate (89 per 100,000). The other provinces reported rates above the national level. The highest provincial rate was in Saskatchewan at 123 per 100,000, followed by British Columbia with 120. Again, varying methods of reporting hospitalization data could be partly responsible for provincial differences.

In the Yukon and the Northwest Territories, hospitalization rates for attempted suicide were much higher: 169 and 219 per 100,000, respectively. But as was true of suicide death rates, these figures are based on relatively small numbers and so can fluctuate substantially from year to year.

Chart 5
Age-standardized hospitalization rates for suicide attempts,† population aged 10 or older, Canada and provinces, 1998/99



***Data source**: Hospital Morbidity Database, 1998/99*
***Note:** The age-standardized rate was 169.2 for the Yukon and 218.5 for the Northwest Territories. Both were significantly different from the national rate ($p < 0.05$ and $p < 0.01$, respectively).*
† Age-standardized to 1991 Canadian population aged 10 or older, adjusted for net census undercoverage and non-permanent residents
** Significantly different from age-standardized national rate ($p < 0.05$)*
*** Significantly different from age-standardized national rate ($p < 0.01$)*

Less lethal methods for attempts

Suicide attempts typically involve less lethal methods than do completed suicides. In 1998/99, poisoning accounted for 83% of hospitalizations for a suicide attempt (data not shown). The figure for females was somewhat higher than that for males: 88% versus 76%. Cutting or piercing instruments were next most common (10%), although the proportion of males using such methods (13%) exceeded the proportion of females (8%).

Repeat admissions

Total discharges for suicide attempts do not indicate the number of individuals who were hospitalized, as one person could make several attempts and be discharged more than once during a year. The 22,887 discharges for attempted suicide in 1998/99 involved approximately 20,000 individuals. About 9% had been discharged more than once during that year for a suicide attempt. Repeat attempts accounted for 10% of total female discharges and 8% of male discharges. Among these repeat

attempters, about 23% of both males and females had been discharged on at least three occasions after a suicide attempt.

Public health impact

In 1998/99, patients admitted for attempted suicide stayed in hospital an average of 7.1 days, a total of 162,498 hospital days that year. Hospital records also indicate that nearly half of these patients had a primary diagnosis of a mental illness, including manic depression (bipolar disorder), schizophrenia, personality disorder, or alcohol or drug dependence syndrome. Patients hospitalized for attempting suicide are likely referred to psychologists or psychiatrists, suicide intervention centres, or other health and social support institutions.

While hospital and other health care services represent one of the direct costs of suicide, the indirect costs include the estimated value of lost productivity due to premature death. Because suicide is a leading cause of death during the teenage years and young adulthood, the loss of potential years of life is high, particularly for men. Potential years of life lost is calculated by subtracting the age at which a death occurs from an arbitrary age, often 75. In 1997, suicide ranked third after cancer and heart diseases in potential years of life lost for men.[34] For women, suicide was tied at fourth with congenital anomalies in potential years of life lost, after cancer, heart diseases, and motor vehicle traffic accidents.[34]

To date, no national figures on the economic cost of suicide are available, although a 1996 New Brunswick study estimated the average cost per suicide death (direct and indirect) at $850,000.[35]

Concluding remarks

In 1998, the suicide death rate among Canadians aged 10 or older was around 14 per 100,000, a figure far exceeded by the hospitalization rate for attempted suicides. No age group is without the risk of suicide, as it occurred among children as young as 10 and among seniors aged 75 or older.

Suicide rates for males were three to four times greater than for females, due in large part to males using more lethal methods. Yet females were hospitalized for attempted suicide at a rate nearly one and a half times that of males. Consequently, suicidal behaviour cannot be characterized as either a male or female phenomenon.

Hospitalizations for attempted suicide occur at a rate six to seven times that of completed suicides. Furthermore, approximately 1 in 10 persons hospitalized for attempted suicide in 1998/99 had been discharged for at least one previous attempt the same year. Earlier research has found that most people who attempt suicide, even repeatedly, do not die this way.[9,12] On the other hand, although an attempt is a predictor of suicide, many who do commit suicide have not previously attempted it.[9,12] Thus, it may be that the underlying motivations and emotional state of people who attempt but do not complete suicide differ from those whose attempt ends in death.

Men's suicide rates are highest in the ages from 20 to 59, although the rate is also high at age 75 or older. For women, the age range most at risk is somewhat narrower: 30 to 59. The age distribution of hospitalization rates for attempted suicide is somewhat younger, with the highest rates in the 15-to-44 age range for both sexes. Teenage girls are the group most likely to be hospitalized for having attempted suicide.

Most researchers and professionals involved with suicide agree that it is associated with a complex array of factors: mental illness, social isolation, a previous suicide attempt, family violence, physical illness, and substance abuse, for example.[12-14,36,37] Some risks vary with age, while others frequently occur in combination. It has been estimated that 90% of people who commit suicide are suffering from depression or another mental illness, or a substance abuse disorder, which could potentially be diagnosed.[37] Several studies have pointed to the widespread use of alcohol and drugs among adolescents as influential contributing factors to adolescent suicide.[38,39]

The gender differences and age differences in completed suicides, hospitalization for suicide attempts, and choice of method suggest that there may also be differences in underlying problems, in responses to stressful situations, and in reaching out for help.[9]

The provincial and territorial differences in suicide rates and hospitalization rates for suicide attempts likely reflect social, economic and cultural factors that cannot be addressed with mortality and hospital statistics.

References

1 Fedorowycz O. Homicide in Canada, 1998. *Juristat* (Statistics Canada, Catalogue 85-002) 2000; 19(10): 1.

2 Transport Canada. *Transportation in Canada, 1999 Annual Report.* Ottawa: Transport Canada, 2000.

3 Statistics Canada. *Leading Causes of Death at Different Ages, Canada, 1998: Shelf Tables* (Catalogue 84-208-XPB) Ottawa: Minister of Industry, 2001.

4 World Health Organization. *Prevention of Suicidal Behaviours: A Task for All.* Available at http://www.who.int/mental_health/topic_suicide/suicide4.htm. Accessed March 2, 2001.

5 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.

6 Gentleman J. *Variances, Covariances, and Confidence Intervals for Age-standardized Central Rates.* Internal document. Ottawa: Statistics Canada, 1999.

7 World Health Organization. *Manual of Mortality Analysis: A Manual on Methods of Analysis of National Mortality Statistics for Public Health Purposes.* Geneva: World Health Organization, 1977 (reprint 1980).

8 Gilmour H, Gentleman J. Mortality in metropolitan areas. *Health Reports* (Statistics Canada, Catalogue 82-003) 1999; 11(1): 9-19.

9 Federal, Provincial and Territorial Advisory Committee on Population Health. *Toward a Healthy Future: Second Report on the Health of Canadians* (Catalogue H39-468/1999E) Ottawa: Minister of Public Works and Government Services, 1999.

10 Beneteau R. Trends in suicide. *Canadian Social Trends* (Statistics Canada, Catalogue 11-008) 1988; Winter: 22-4.

11 World Health Organzation. Website database available at http://www.who.int/whosis. Accessed March 27, 2001.

12 Health Canada. *Suicide in Canada: Update of the Report of the Task Force on Suicide in Canada* (Catalogue H39-107/1995E) Ottawa: Minister of Supply and Services Canada, 1994.

13 US Public Health Service. *The Surgeon General's Call to Action to Prevent Suicide.* Washington, DC: 1999.

14 Centers for Disease Control and Prevention. *Preventing Suicide.* Available at http://www.dcd.gov/safeusa/suicide. Accessed March 7, 2001.

15 Mao Y, Hasselback P, Davies JW, et al. Suicide in Canada: An epidemiological assessment. *Canadian Journal of Public Health* 1990; 81(4): 324-8.

16 Speechley M, Stavraky KM. The adequacy of suicide statistics for use in epidemiology and public health. *Canadian Journal of Public Health* 1991; 82(1): 38-42.

17 Hudson S, Elsaadany S, Sherman G, et al. *Suicide Statistics: Gold Standard for Suicide Surveillance?* Oral/poster presentation. Ottawa: Health Canada, 1996.

18 Young JG, Wagner JM. Speaking for the dead to protect the living: The role of the Coroner in Ontario. *Health Reports* (Statistics Canada, Catalogue 82-003) 1994; 6(3): 339-52.

19 Health Canada. *Trends in First Nations Mortality, 1979-1993* (Catalogue 34-79/1993E) Ottawa: Health Canada, 1996.

20 The Royal Commission on Aboriginal Peoples. *Choosing Life: Special Report on Suicide among Aboriginal People.* Ottawa: The Royal Commission on Aboriginal Peoples, 1995.

21 Health Canada. *A Second Diagnostic on the Health of First Nations and Inuit People in Canada.* Ottawa: Health Canada, 1999.

22 Bobet E. Indian mortality. *Canadian Social Trends* (Statistics Canada, Catalogue 11-008) 1989; Winter: 11-4.

23 Mao Y, Moloughney BW, Semenciw RW, et al. Indian reserve and registered Indian mortality in Canada. *Canadian Journal of Public Health* 1992; 83: 350-3.

24 Malchy B, Murray WE, Young TK, et al. Suicide among Manitoba's Aboriginal people, 1988 to 1994. *Canadian Medical Association Journal* 1997; 156(8): 1133-8.

25 Stack S. Homicide followed by suicide: An analysis of Chicago data. *American Society of Criminology* 1997; 35(3): 435-53.

26 Gillespie M, Hearn V, Silverman R. Suicide following homicide in Canada. *Homicide Studies* 1998; 2(1): 46-63.

27 Fedorowycz O. Homicide in Canada, 1999. *Juristat* (Statistics Canada, Catalogue 85-002) 2000; 20(9): 1-17.

28 Canetto S, Sakinofsky I. The gender paradox in suicide. *Suicide and Life-threatening Behaviour* 1998; 28(1): 1-23.

29 Moscicki EK. Gender differences in completed and attempted suicides. *Annals of Epidemiology* 1994; 4: 152-8.

30 Statistics Canada. National Longitudinal Survey on Children and Youth: Transition into adolescence, 1996/97. *The Daily* (Catalogue 11-001E) July 6, 1999.

31 Statistics Canada. *Adult Corrections Survey, 1998/99.* Unpublished data, special request from Correctional Services Program, Canadian Centre for Justice Statistics.

32 DuRand CJ, Burtka GJ, Federman EJ, et al. A quarter century of suicide in a major urban jail: Implications for community psychiatry. *American Journal of Psychiatry* 1995; 152(7): 1077-80.

33 Reed M, Roberts J. Adult correctional services in Canada, 1997-98. *Juristat* (Statistics Canada, Catalogue 85-002) 1999; 19(4): 8.

34 Health Statistics Division, Statistics Canada. Death—Shifting trends. In: The Health Divide—How the Sexes Differ. *Health Reports* (Catalogue 82-003) 2001; 12(3): 41-6.

35 Clayton D, Barcelü A. The cost of suicide mortality in New Brunswick, 1996. *Chronic Disease in Canada* 1999; 20(2): 89-95.

36 Moscicki EK. Epidemiology of Suicide: In: Jacobs DG, ed. *The Harvard Medical School Guide to Suicide Assessment and Intervention.* San Francisco: Jossey-Bass Publishers, 1999.

37 Conwell Y, Brent D. Suicide and aging: patterns of psychiatric diagnosis. *International Psychogeriatrics* 1995; 7(2): 149-64.

38 Crumley FE. Substance abuse and adolescent suicidal behaviour. *Journal of the American Medical Association* 1990; 263: 3051-6.

39 Berman AL, Schwartz RH. Suicide attempts among adolescent drug users. *American Journal of Diseases of Children* 1990; 144: 310-4.

Appendix A

Table A
Age-standardized suicide rate,† population aged 10 or older, by sex and province/territory, 1998

	Both sexes		Males		Females	
	Rate per 100,000 population	95% confidence interval	Rate per 100,000 population	95% confidence interval	Rate per 100,000 population	95% confidence interval
Canada	**14.0**	**13.5, 14.4**	**22.5**	**21.7, 23.4**	**5.7**	**5.3, 6.1**
Newfoundland	7.2**	4.6, 9.8	12.3**	7.1, 17.5	2.2	-1.3, 5.7
Prince Edward Island	8.0	1.0, 15.0	15.0	0.0, 30.0	1.4	-11.3, 14.1
Nova Scotia	13.4	10.9, 15.9	22.5	17.8, 27.3	4.6	2.1, 7.2
New Brunswick	16.6	13.4, 19.8	27.7	21.8, 33.7	5.6	2.6, 8.5
Québec	21.3**	20.2, 22.5	33.4**	31.4, 35.5	9.5**	8.4, 10.6
Ontario	9.6**	9.0, 10.2	15.6**	14.5, 16.7	3.9**	3.4, 4.5
Manitoba	13.2	10.9, 15.5	21.3	17.1, 25.4	5.6	3.2, 7.9
Saskatchewan	13.8	11.2, 16.3	24.6	19.8, 29.4	3.2*	1.1, 5.4
Alberta	16.2**	14.6, 17.8	25.9*	23.0, 28.7	6.4	4.9, 7.8
British Columbia	11.4**	10.3, 12.5	18.3**	16.3, 20.4	4.6*	3.6, 5.6
Yukon	26.2	-30.4, 82.9	24.8	-115.8, 165.3	19.7	-84.0, 123.4
Northwest Territories	55.5*	17.1, 93.8	88.7	13.2, 164.2	19.3	-51.9, 90.5

Data source: *Canadian Vital Statistics Database, 1998*
† Age-standardized to 1991 Canadian population, adjusted for net census undercoverage and non-permanent residents
** Significantly different from age-standardized national rate, both sexes or sex-specific ($p < 0.05$)*
*** Significantly different from age-standardized national rate, both sexes or sex-specific ($p < 0.01$)*

Table B
Age-specific suicide rate, by sex, Canada, 1998

	Both sexes		Males		Females	
	Rate per 100,000 population	95% confidence interval	Rate per 100,000 population	95% confidence interval	Rate per 100,000 population	95% confidence interval
Total (crude rate)	**14.1**	**13.6, 14.5**	**22.6**	**21.7, 23.4**	**5.8**	**5.4, 6.2**
Age group						
10-14	2.2**	1.6, 2.9	2.9**	1.9, 3.9	1.5**	0.8, 2.3
15-19	12.5*	11.0, 14.0	18.2**	15.7, 20.8	6.4	4.8, 8.0
20-29	15.1	13.9, 16.3	25.0*	22.9, 27.1	4.9*	3.9, 5.8
30-44	16.7**	15.8, 17.6	26.5**	24.9, 28.2	6.7*	5.9, 7.6
45-59	15.9**	14.9, 17.0	24.7*	22.8, 6.5	7.2**	6.2, 8.2
60-74	12.6*	11.4, 13.8	21.1	18.8, 23.4	5.0	4.0, 6.1
75+	12.3*	10.6, 14.0	24.5	20.5, 28.5	5.0	3.6, 6.4

Data source: *Canadian Vital Statistics Database, 1998*
** Significantly different from total crude rate, both sexes or sex-specific ($p < 0.05$)*
*** Significantly different from total crude rate, both sexes or sex-specific ($p < 0.01$)*

Table C
Age-standardized hospitalization rate for suicide attempts,† by sex and province/territory, population aged 10 or older, 1998/99

	Both sexes		Males		Females	
	Rate per 100,000 population	95% confidence interval	Rate per 100,000 population	95% confidence interval	Rate per 100,000 population	95% confidence interval
Canada	**88.8**	**87.6, 89.9**	**69.8**	**68.4, 71.3**	**108.4**	**106.6, 110.2**
Newfoundland	79.2*	71.1, 87.2	70.0	58.9, 81.1	88.7**	76.8, 100.7
Prince Edward Island	82.1	65.2, 99.0	71.2	47.4, 94.9	93.0	67.2, 118.9
Nova Scotia	76.3**	70.1, 82.5	66.1	57.9, 74.4	86.6**	77.4, 95.9
New Brunswick	101.0**	93.2, 108.8	81.6*	71.6, 91.5	120.8*	108.6, 133.0
Québec	49.0**	47.2, 50.7	41.4**	39.1, 43.7	56.9**	54.2, 59.6
Ontario	95.5**	93.5, 97.5	74.9**	72.4, 77.3	116.6**	113.5, 119.7
Manitoba	100.8**	94.3, 107.3	67.7	60.2, 75.3	135.2**	124.5, 146.0
Saskatchewan	123.0**	115.4, 130.7	92.7**	83.3, 102.2	154.6**	142.4, 166.8
Alberta	99.0**	95.1, 102.9	76.9**	72.1, 81.8	122.5**	116.4, 128.7
British Columbia	120.4**	116.7, 124.1	93.0**	88.4, 97.7	148.8**	142.9, 154.7
Yukon	169.2*	96.4, 242.0	86.7	-62.1, 235.5	256.1**	127.6, 384.6
Northwest Territories	218.5**	168.8, 268.1	138.1	60.4, 215.8	308.1**	215.3, 400.9

Data source: *Hospital Morbidity Database, 1998/99*
† Age-standardized to 1991 Canadian population aged 10 or older, adjusted for net census undercoverage and non-permanent residents
** Significantly different from age-standardized national rate, both sexes or sex-specific ($p < 0.05$)*
*** Significantly different from age-standardized national rate, both sexes or sex-specific ($p < 0.01$)*

Table D
Age-specific hospitalization rate for suicide attempts, by sex, Canada, 1998/99

	Both sexes		Males		Females	
	Rate per 100,000 population	95% confidence interval	Rate per 100,000 population	95% confidence interval	Rate per 100,000 population	95% confidence interval
Total (crude rate)	**86.8**	**85.7, 87.9**	**69.2**	**67.8, 70.7**	**103.9**	**102.1, 105.6**
Age group						
10-14	40.8**	38.0, 43.6	15.5**	13.1, 17.9	67.5**	62.4, 72.7
15-19	152.2**	146.9, 157.6	87.3**	81.7, 92.9	220.8**	211.6, 230.0
20-29	117.9**	114.6, 121.1	98.0**	93.8, 102.2	138.4**	133.3, 143.4
30-44	118.3**	115.9, 120.8	97.6**	94.5, 100.7	139.3**	135.5, 143.0
45-59	68.3**	66.1, 70.4	55.1**	52.3, 57.9	81.3**	77.9, 84.7
60-74	25.0**	23.3, 26.7	24.7**	22.3, 27.2	25.2**	22.8, 27.5
75+	21.0**	18.8, 23.3	27.6**	23.3, 31.8	17.2**	14.6, 19.7

Data source: *Hospital Morbidity Database, 1998/99*
** Significantly different from total crude rate, both sexes or sex-specific ($p < 0.05$)*
*** Significantly different from total crude rate, both sexes or sex-specific ($p < 0.01$)*

Appendix B

Table A

Number of suicide deaths, by sex and age group, Canada, 1979 to 1998

		Age group						
	Total†	10-14	15-19	20-29	30-44	45-59	60-74	75+
Both sexes								
1979	3,356	22	308	885	853	765	426	95
1980	3,358	21	278	869	815	773	442	157
1981	3,402	34	293	810	898	769	448	147
1982	3,522	27	282	912	928	799	453	115
1983	3,755	23	289	941	1,019	780	524	179
1984	3,439	27	253	852	956	746	444	160
1985	3,258	17	221	817	939	669	449	145
1986	3,669	24	241	902	1,109	722	492	179
1987	3,594	30	244	837	1,090	746	480	164
1988	3,509	27	242	844	1,103	679	440	174
1989	3,492	25	247	790	1,117	697	444	171
1990	3,378	29	225	763	1,189	621	369	181
1991	3,592	28	253	798	1,207	680	456	170
1992	3,709	34	249	808	1,264	753	429	171
1993	3,802	44	237	734	1,333	822	439	193
1994	3,749	49	252	699	1,325	804	422	197
1995	3,970	43	264	729	1,442	883	427	180
1996	3,940	40	231	698	1,422	907	447	195
1997	3,681	51	261	577	1,265	916	413	198
1998	3,698	45	256	629	1,273	876	422	197
Males								
1979	2,520	15	251	705	634	536	314	64
1980	2,534	15	234	702	615	538	301	126
1981	2,569	25	250	666	667	533	320	107
1982	2,725	23	247	749	691	582	339	90
1983	2,885	20	250	792	751	556	374	142
1984	2,660	23	221	715	719	547	311	124
1985	2,565	12	186	695	722	501	337	111
1986	2,849	19	199	757	853	528	350	143
1987	2,794	25	201	698	825	566	360	117
1988	2,733	23	212	694	828	494	352	130
1989	2,696	19	218	648	843	501	335	131
1990	2,673	23	182	649	910	478	282	149
1991	2,874	19	217	673	947	533	346	139
1992	2,923	26	198	667	1,003	573	319	136
1993	3,013	26	193	629	1,057	632	338	138
1994	2,969	37	205	584	1,050	602	330	160
1995	3,158	22	217	615	1,161	676	319	146
1996	3,092	31	190	589	1,101	662	357	162
1997	2,914	39	207	475	1,010	708	319	156
1998	2,925	30	192	529	1,017	676	334	147
Females								
1979	836	7	57	180	219	229	112	31
1980	824	6	44	167	200	235	141	31
1981	833	9	43	144	231	236	128	40
1982	797	4	35	163	237	217	114	25
1983	870	3	39	149	268	224	150	37
1984	779	4	32	137	237	199	133	36
1985	693	5	35	122	217	168	112	34
1986	820	5	42	145	256	194	142	36
1987	800	5	43	139	265	180	120	47
1988	776	4	30	150	275	185	88	44
1989	796	6	29	142	274	196	109	40
1990	705	6	43	114	279	143	87	32
1991	718	9	36	125	260	147	110	31
1992	786	8	51	141	261	180	110	35
1993	789	18	44	105	276	190	101	55
1994	780	12	47	115	275	202	92	37
1995	812	21	47	114	281	207	108	34
1996	848	9	41	109	321	245	90	33
1997	767	12	54	102	255	208	94	42
1998	773	15	64	100	256	200	88	50

***Data source**: Canadian Vital Statistics Database*

† Age groups may not add to totals, as totals may include records for which age was not stated.

Table B

Age-specific suicide death rates, by sex, Canada, 1979 to 1998

	Age group						
	10-14	15-19	20-29	30-44	45-59	60-74	75+
	Suicides per 100,000 age-specific population						
Both sexes							
1979	1.1	12.7	19.6	17.8	20.9	18.3	11.4
1980	1.1	11.5	18.8	16.5	21.0	18.4	18.3
1981	1.8	12.4	17.1	17.5	20.8	18.1	16.5
1982	1.4	12.3	18.9	17.5	21.5	17.8	12.5
1983	1.2	13.2	19.3	18.6	20.9	20.0	18.7
1984	1.4	12.1	17.3	16.9	19.9	16.5	16.2
1985	0.9	10.9	16.5	16.1	17.7	16.3	14.1
1986	1.3	12.1	18.3	18.4	19.0	17.5	16.8
1987	1.6	12.5	17.2	17.5	19.3	16.7	14.8
1988	1.5	12.4	17.6	17.2	17.2	15.0	15.1
1989	1.3	12.7	16.5	16.8	17.2	14.8	14.2
1990	1.5	11.6	16.2	17.3	15.0	12.1	14.5
1991	1.5	13.1	17.4	17.1	16.0	14.6	13.1
1992	1.8	12.9	17.9	17.7	17.1	13.5	12.9
1993	2.2	12.2	16.7	18.3	17.9	13.6	14.2
1994	2.5	12.9	16.3	17.9	16.9	13.0	14.1
1995	2.2	13.3	17.3	19.2	17.9	13.0	12.5
1996	2.0	11.5	16.7	18.7	17.7	13.6	13.1
1997	2.5	12.9	13.8	16.6	17.3	12.5	12.8
1998	2.2	12.5	15.1	16.7	15.9	12.6	12.3
Males							
1979	1.4	20.3	30.9	26.1	29.5	29.0	19.8
1980	1.5	19.0	30.1	24.5	29.4	27.1	37.9
1981	2.5	20.6	28.0	25.7	28.9	28.0	31.3
1982	2.3	21.0	30.9	25.8	31.5	28.9	25.6
1983	2.1	22.3	32.1	27.2	29.9	31.1	39.2
1984	2.4	20.6	28.7	25.3	29.2	25.3	33.1
1985	1.3	17.9	27.8	24.6	26.6	26.8	28.6
1986	2.0	19.5	30.2	28.2	27.7	27.3	35.8
1987	2.7	20.0	28.1	26.3	29.2	27.4	28.1
1988	2.5	21.3	28.4	25.6	25.0	26.1	30.1
1989	2.0	21.9	26.7	25.2	24.7	24.3	29.0
1990	2.4	18.3	27.2	26.4	23.0	20.0	31.7
1991	2.0	21.9	28.9	26.8	25.0	24.0	28.6
1992	2.6	20.0	29.2	27.9	25.9	21.6	27.3
1993	2.6	19.4	28.2	28.9	27.5	22.5	27.1
1994	3.6	20.3	26.8	28.2	25.3	21.7	30.8
1995	2.1	21.3	28.8	30.8	27.4	20.7	27.2
1996	3.0	18.4	27.8	28.9	26.0	23.0	29.1
1997	3.8	19.8	22.4	26.4	26.8	20.4	27.0
1998	2.9	18.2	25.0	26.5	24.7	21.1	24.5
Females							
1979	0.7	4.8	8.0	9.3	12.4	9.0	6.1
1980	0.6	3.7	7.3	8.2	12.7	10.9	5.9
1981	1.0	3.7	6.1	9.2	12.7	9.6	7.3
1982	0.4	3.1	6.8	9.1	11.6	8.3	4.4
1983	0.3	3.7	6.2	9.9	12.0	10.6	6.2
1984	0.4	3.1	5.6	8.5	10.6	9.1	5.8
1985	0.6	3.6	5.0	7.5	8.9	7.5	5.3
1986	0.6	4.3	6.0	8.6	10.2	9.3	5.4
1987	0.6	4.5	5.8	8.6	9.3	7.7	6.8
1988	0.4	3.2	6.4	8.6	9.4	5.5	6.1
1989	0.7	3.1	6.0	8.3	9.7	6.7	5.3
1990	0.7	4.6	4.9	8.1	6.9	5.3	4.1
1991	1.0	3.8	5.5	7.4	6.9	6.6	3.8
1992	0.9	5.4	6.4	7.3	8.2	6.5	4.2
1993	1.9	4.7	4.9	7.6	8.3	5.9	6.4
1994	1.2	4.9	5.4	7.4	8.5	5.3	4.2
1995	2.2	4.9	5.5	7.5	8.4	6.2	3.8
1996	0.9	4.2	5.3	8.5	9.5	5.2	3.5
1997	1.2	5.5	5.0	6.7	7.8	5.4	4.3
1998	1.5	6.4	4.9	6.7	7.2	5.0	5.0

***Data source**: Canadian Vital Statistics Database*

Table C

Number of suicide deaths and age-standardized suicide death rates,† population aged 10 or older, Canada, provinces and territories, 1979 to 1998

	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Yukon	N.W.T.
Suicides													
1979	3,356	25	16	106	84	981	1,105	151	142	314	418	6	8
1980	3,358	19	14	97	81	947	1,121	121	153	389	396	11	9
1981	3,402	24	9	92	77	1,054	1,074	144	171	344	398	5	10
1982	3,522	34	11	104	90	1,071	1,111	139	171	359	417	7	8
1983	3,755	36	16	104	100	1,208	1,139	165	148	393	417	8	21
1984	3,439	39	15	86	90	1,027	1,101	133	136	405	385	5	17
1985	3,258	23	5	106	86	1,124	1,038	127	133	296	300	8	12
1986	3,669	23	14	94	96	1,147	1,130	153	138	424	425	10	15
1987	3,594	28	11	111	75	1,179	1,069	170	132	384	413	7	15
1988	3,509	44	13	106	108	1,088	1,045	154	145	400	378	7	21
1989	3,492	29	11	96	84	1,042	1,142	147	124	362	419	5	31
1990	3,378	58	14	115	84	1,104	887	140	151	403	399	5	18
1991	3,592	41	22	113	93	1,114	997	136	125	462	464	3	22
1992	3,709	50	16	97	85	1,255	987	132	140	473	455	3	16
1993	3,802	57	12	107	110	1,318	1,078	142	122	414	408	7	27
1994	3,749	49	16	97	104	1,263	1,083	118	143	425	423	7	21
1995	3,970	42	19	122	121	1,431	1,087	118	128	451	426	9	16
1996	3,940	38	12	116	95	1,468	1,086	118	139	454	385	6	23
1997	3,681	46	14	92	89	1,370	925	144	140	403	425	5	28
1998	3,698	34	10	110	108	1,373	960	128	118	405	412	5	35
Age-standardized suicide rates						Per 100,000 population							
1979	16.7	6.0	18.6	15.2	14.8	17.8	15.4	17.6	17.6	18.1	18.5	29.4	22.6
1980	16.5	4.1	13.8	13.9	14.6	17.3	15.4	13.8	18.9	21.5	17.0	47.7	24.0
1981	16.4	5.2	9.0	13.2	13.6	19.0	14.5	16.0	21.0	18.8	16.6	20.9	16.3
1982	16.6	7.9	11.3	14.4	15.1	18.9	14.7	15.8	20.0	18.6	16.8	34.6	17.1
1983	17.6	7.9	14.3	14.4	17.3	21.3	14.8	18.8	18.0	20.1	16.8	53.3	42.5
1984	15.8	7.8	15.0	11.6	14.8	17.9	14.0	14.6	16.3	20.9	15.3	19.4	45.4
1985	14.8	5.5	4.9	13.8	14.4	19.5	13.0	13.6	15.9	14.9	11.8	34.5	24.1
1986	16.4	5.7	13.7	12.3	16.0	19.6	13.9	16.2	16.4	20.8	16.3	39.9	34.3
1987	15.9	6.2	10.2	14.4	12.0	19.9	12.9	18.4	15.1	19.1	15.7	28.2	22.9
1988	15.2	9.4	11.9	13.7	17.3	18.2	12.2	16.2	17.1	19.7	14.0	37.8	35.1
1989	14.9	6.1	10.1	12.3	13.5	17.2	13.1	15.6	14.8	17.5	15.1	19.7	57.8
1990	14.2	11.9	13.0	14.6	13.3	18.0	9.9	15.1	18.2	18.8	13.9	22.4	32.3
1991	14.9	8.1	20.4	14.3	14.6	18.0	11.0	14.5	15.4	21.3	15.8	13.4	34.9
1992	15.2	9.9	14.9	12.4	13.2	20.2	10.8	14.2	17.1	21.4	15.2	10.8	27.8
1993	15.4	11.4	10.9	13.2	17.0	21.0	11.6	15.2	15.0	18.6	13.2	35.1	44.5
1994	14.9	10.3	14.0	12.1	16.0	20.1	11.5	12.3	17.2	18.7	13.2	34.7	34.3
1995	15.6	8.4	16.3	15.0	18.8	22.4	11.4	12.5	15.5	19.5	12.9	28.4	24.3
1996	15.2	7.9	10.1	14.2	14.2	23.0	11.1	12.4	16.8	19.1	11.2	28.1	36.6
1997	14.0	9.6	12.1	11.1	13.6	21.1	9.3	15.1	16.3	16.6	12.1	26.3	53.6
1998	14.0	7.2	8.0	13.4	16.6	21.3	9.6	13.2	13.8	16.2	11.4	26.2	55.5

Data source: *Canadian Vital Statistics Database*

† Age-standardized to 1991 Canadian population aged 10 or older, adjusted for net census undercoverage and non-permanent residents

Unmet needs for health care

Jiajian Chen and Feng Hou

Abstract

Objectives

This analysis examines the prevalence of self-reported unmet needs for health care and the extent to which they were attributable to perceived problems with service availability or accessibility or acceptability.

Data source

Most data are from the 1998/99 cross-sectional household component of Statistics Canada's National Population Health Survey; 1994/95 and 1996/97 cross-sectional data are used to present trends from 1994/95 to 1998/99. The primary analysis is based on 14,143 respondents aged 18 or older.

Analytical techniques

Multivariate logistic regression was used to estimate the association of risk factors with the three types of unmet health care need.

Main results

In 1998/99, about 7% of Canadian adults, an estimated 1.5 million, reported having had unmet health care needs in the previous year. Around half of these episodes were attributable to acceptability problems such as being too busy. In 39% of cases, service availability problems, such as long waiting times, were mentioned. Just under 13% of episodes were related to accessibility problems (cost or transportation). Unmet needs attributable to service availability problems were not significantly associated with socio-economic status. By contrast, unmet needs due to accessibility problems were inversely associated with household income.

Key words

health care services accessibility, patient acceptance of health care, delivery of health care, socio-economic status

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Canada's universal health care system was established to ensure reasonable access to health services for all Canadians, regardless of their ability to pay.[1] Recent budget cuts have raised concern about how well the system is fulfilling that mandate.[2-7] Many studies have addressed the issue by examining the association between socio-economic status and health care use.[6,8-15] However, another way of approaching the issue has been less thoroughly explored: socio-economic differences in unmet health care needs.

Unmet needs have been identified as a critical indicator of access problems,[16-18] as they may result from limited availability or unavailability of health care services when and where they are required.[19] But unmet needs can also arise from individual accessibility problems, such as cost and transportation, or from acceptability problems, such as attitudes toward and knowledge about health care.[19-21] Therefore, to assess unmet health care needs, it is important to understand the barriers associated with them.

With data from Statistics Canada's National Population Health Survey (NPHS), this article examines the prevalence of self-reported unmet health care needs (see *Methods* and

Methods

Data source

The data in this article are from the National Population Health Survey (NPHS), conducted by Statistics Canada. The NPHS, which began in 1994/95, collects information about the health of the Canadian population every two years. It covers household and institutional residents in all provinces and territories, except persons living on Indian reserves, on Canadian Forces bases, and in some remote areas. The NPHS has both a cross-sectional and a longitudinal component.

Socio-demographic and some health information was obtained for each member of participating households and is found in the General file. In-depth health information, which was collected for one randomly selected household member, as well as the information in the General file pertaining to that person, is in the Health file.

The primary analysis in this article is based on the 1998/99 (cycle 3) cross-sectional household component, which is made up mostly of longitudinal respondents and their cohabitants. To keep the 1998/99 sample representative, infants born in 1995 or later and immigrants who entered Canada after 1994 were randomly selected. To replace sample lost to attrition, individuals in dwellings that were part of the original sampling frame, but whose household members did not respond in 1995/95, were contacted and asked to participate. The overall response rate for 1998/99 was 88.2%. The data were weighted to represent the household population in the 10 provinces. The sub-sample for this analysis consisted of 14,143 randomly selected respondents aged 18 or older who were asked if they had required heath care in the previous year, but had not received it (Appendix Table A). The analysis is restricted to respondents aged 18 or older, because several explanatory variables, such as attitudes toward physicians, were not available for younger respondents.

To analyze trends in the prevalence of unmet needs at the national level, cross-sectional data from the first two cycles (1994/95 and 1996/97) were also used. The samples consist of 16,286 and 68,208 randomly selected respondents aged 18 or older, respectively.

Analytical techniques

Unmet health care needs were classified into one of three groups according to the type of problem reflected: service availability; accessibility; or acceptability. Because respondents could give more than one reason for unmet needs, the proportions assigned to each category total more than 100%.

For convenience of presentation, unadjusted prevalence estimates are shown alongside adjusted odds ratios for unmet needs due to the three types of problems.

Multivariate logistic regression was used to estimate the association between potential risk factors and each type of reported unmet need. Factor selection was guided by the research literature. Factors selected to predict unmet health care needs were: age, sex, marital status, household income, education, employment status, urban/rural residence, Aboriginal status, country of birth, self-reported health, any chronic condition, chronic pain, distress, consultations with general practitioners and specialists, and attitudes toward doctors' authority and self-care (see *Definitions*).

The NPHS was based on a complex sample design. In addition, the cross-sectional NPHS Health files from cycles 1, 2, and 3 contain all longitudinal respondents who were in-scope for cross-sectional purposes. Therefore, the NPHS cross-sectional samples at any two time points are not independent. To take into account both sample weights and survey design, this analysis used bootstrap procedures to estimate the variance and covariances.[23,24]

Limitations). It also examines factors associated with unmet needs stemming from perceived unavailability of services, from accessibility problems, and from acceptability. Based on existing literature,[16,19,22] the factors examined in relation to the three types of unmet needs are: age, sex, marital status, household income, education, employment, urban/rural residence, Aboriginal status, country of birth, health status, chronic conditions, chronic pain, distress, physician consultations, and attitudes towards physicians' authority and self-care (see *Definitions*).

Three types of unmet need

The most commonly reported reason for an unmet health care need, cited by 23% of people who reported having had one, was that waiting time was too long (Table 1). The second most frequent was that the service had not been available when it was required (15%). Between 13% and 14% of people with unmet needs reported that they had been too busy, that they did not get around to it, or that they felt the care would be inadequate. Around one in ten (11%) cited cost. Smaller proportions gave reasons such as unavailability of service in their area,

Table 1
Frequency of reasons for unmet health care needs, household population aged 18 or older with unmet needs, Canada excluding territories, 1998/99

	%
Availability†	**39.3**
Waiting time too long	22.9
Not available when required	14.7
Not available in area	7.0
Accessibility†	**12.9**
Cost	11.4
Transportation	1.6
Acceptability†	**53.1**
Too busy	13.6
Didn't get around to it/Didn't bother	13.5
Felt it would be inadequate	13.2
Decided not to seek care	5.4
Didn't know where to go	3.9
Dislike doctors/Afraid	1.8
Personal/Family responsibilities	0.7
Language problems	--
Other	6.8
Availability only	35.6
Accessibility only	10.5
Acceptability only	48.7
Availability and **accessibility**	0.6
Availability and **acceptability**	2.7
Availability, **accessibility**, and **acceptability**	0.3
Accessibility and **acceptability**	1.3

Data source: *1998/99 National Population Health Survey, cross-sectional sample, Health file*
† Because respondents could report more than one reason, detail adds to more than total.
-- Sample size too small to provide reliable estimate

not knowing where to go, or dislike or fear of doctors. Because respondents could give more than one reason, the total adds to more than 100%. However, most people with unmet needs gave only one reason (87%); 11% reported two; and less than 3%, three or more (data not shown).

Unmet health care needs can be divided into three groups, depending on whether they related to problems with availability of services, accessibility or acceptability. Unmet needs are considered to be related to availability if the reason was long waiting time, service unavailable when required, or service not available in the area. Accessibility refers to unmet needs due to cost or transportation concerns. All the other reasons (too busy, ignored problem, doubts about efficacy of treatment, fear of doctors) are considered to be related to acceptability.

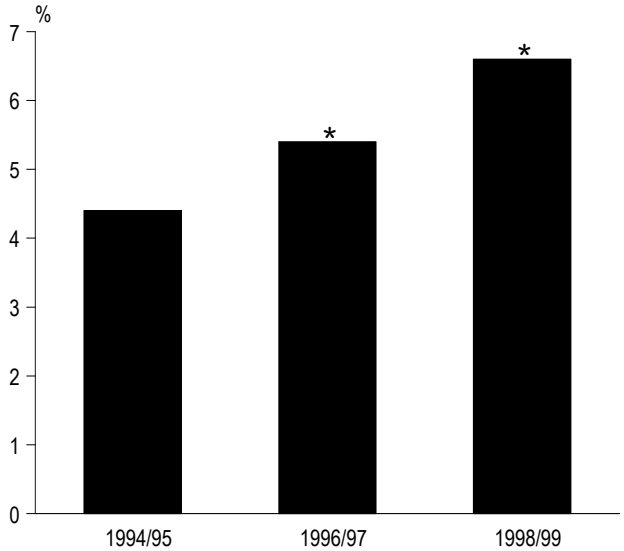
Service availability problems accounted for 39% of unmet needs. Just 13% of unmet needs were attributed to accessibility problems. In most instances (9 out of 10), accessibility problems were due to cost (data not shown). The largest group, accounting for 53% of unmet needs, was acceptability problems stemming from personal circumstances and attitudes.

Although respondents could give more than one reason for unmet health care needs, there was relatively little overlap between the three groups. Such cases accounted for only 5% of responses (Table 1).

Unmet need increasing

In 1998/99, 6.6% of Canadians aged 18 or older, an estimated 1.5 million people, reported having had an unmet health care need in the previous year (Chart 1). This was a small but significant increase over 1994/95 and 1996/97, when the figures were 4.4% and 5.4%, respectively.

Chart 1
Prevalence of unmet health care needs, household population aged 18 or older, Canada excluding territories, 1994/95, 1996/97 and 1998/99



Data source: *1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
** Significantly different from previous year ($p \leq 0.05$)*

Definitions

Unmet health care need was based on the following question: "During the past 12 months, was there ever a time when you needed health care but you didn't receive it?" Respondents who answered "yes" were asked the reasons for the most recent episode. The reasons were classified as follows: (1) not available in the area; (2) not available at time required; (3) waiting time too long; (4) cost; (5) transportation problems; (6) felt it would be inadequate; (7) too busy; (8) didn't get around to it/didn't bother; (9) didn't know where to go; (10) language problems; (11) personal or family responsibilities; (12) dislike doctors/afraid; (13) decided not to seek care; and (14) other.

These reasons were classified into three groups, depending on whether they were due to: service availability (service not available where or when required or waiting time too long); accessibility (cost or transportation), or acceptability (the remaining reasons, which concern attitudes and competing responsibilities). Only 5% of respondents cited reasons that fell in more than one group.

For this analysis, *age* was classified into four groups: 18 to 34, 35 to 44, 45 to 64, and 65 or older.

Three *marital status* categories were identified: married/common-law; never married; and widowed/divorced/separated.

Household income was based on total annual income and number of household members. The following income groups were derived:

Household income group	People in household	Total household income
Lowest	1 or 2	Less than $15,000
	3 or 4	Less than $20,000
	5 or more	Less than $30,000
Lower-middle	1 or 2	$15,000 to $29,999
	3 or 4	$20,000 to $39,999
	5 or more	$30,000 to $59,999
Upper-middle/High	1 or 2	$30,000 or more
	3 or 4	$40,000 or more
	5 or more	$60,000 or more

Education was grouped into two levels: less than high school graduation and high school graduation or more.

Employment status was defined as currently working or other.

Residence was defined as urban or rural.

Aboriginal status was based on responses to questions on race (or colour) and the ethnic (or cultural) groups with which respondents identified. Those who indicated Native or Aboriginal peoples of North America, such as North American Indian, Métis, Inuit or Eskimo, were considered to be Aboriginal persons.

Immigrant status was defined as immigrant or Canadian-born.

Four variables were selected to measure health status: self-reported health, chronic conditions, chronic pain, and distress. *Self-reported health* was grouped into two categories: poor/fair and good/very good/excellent. The presence of a *chronic condition* was determined by asking respondents if they had any long-term health condition that had lasted or was expected to last six months or more and that had been diagnosed by a health professional. A list of conditions was read to respondents who answered "yes" or "no" to each one. Those replying affirmatively to one or more of the conditions were considered to have a chronic condition. *Chronic pain* was based on the question: "Are you usually free of pain or discomfort?" Respondents who answered "no" were defined as having chronic pain.

Distress was derived based on responses to six questions: "During the past month, how often did you feel: so sad that nothing could cheer you up? nervous? restless or fidgety? hopeless? worthless? that everything is an effort?" The response options—all of the time, most of the time, some of the time, a little of the time, and none of the time—were given weights of 4, 3, 2, 1 and 0, respectively. The score could range from 0 to 24, with higher scores indicating more distress.[25] The Cronbach's alpha was 0.76. Respondents scoring 7 or more (11% of the total) were classified as having distress. Respondents scoring less than 7 or with missing information (408 cases) were considered as not having distress.

General practitioner consultations and *specialist consultations* were determined from responses to the question: "In the past 12 months, how many times have you seen or talked with: a family doctor or general practitioner? other medical doctor (such as a surgeon, allergist, orthopaedist, gynaecologist or psychiatrist)?"

Attitude toward *doctors' authority* was based on three statements: "I prefer doctors who give me choices or options and let me decide for myself what to do"; "Patients should never challenge the authority of the doctor" and "I prefer that the doctor assume all of the responsibility for my medical care." Attitude toward *self-care* was based on responses to two statements: "Except for serious illness, it is generally better to take care of your own health than to go to a doctor" and "It is better to go to a doctor than to try to treat yourself." For each statement, respondents were asked if they strongly agreed, agreed, neither agreed nor disagreed, disagreed, or strongly disagreed. The respective scores were 4, 3, 2, 1, and 0. The values for the first doctor authority statement and the second self-care statement were reversed. The two variables were constructed by taking the mean score of the answers to the questions. Missing values were imputed with a value equivalent to "neither agree nor disagree." The scores for attitude toward doctors' authority could range from 0 to 4, with higher scores representing a greater tendency to trust doctors; the Cronbach's alpha was 0.62. The scores for attitude toward self-care could range from 0 to 4, with a higher score representing a greater tendency to rely on self-care; the Cronbach's alpha was 0.56. The scores were classified into three levels: high for a score one standard deviation above the mean, low for a score one standard deviation below the mean, and middle for a score in between.

Service availability

Less than 3% of the population reported an unmet health care need due to service availability (see *Provincial patterns*). Unmet needs of this kind reflect perceived deficiencies in health care delivery, a situation that may have been exacerbated in recent years as health budgets were cut. One concern is that cost-cutting places an unequal burden on less advantaged groups. However, based on the NPHS, the prevalence of unmet health care needs resulting from service availability did not vary significantly by household income, education, employment, Aboriginal status or immigrant status (Table 2). Nor was there any significant relationship with age, marital status or urban/rural residence.

Table 2
Prevalence of and adjusted odds ratios for unmet health care needs related to availability, by selected characteristics, household population aged 18 or older, Canada excluding territories, 1998/99

	Number	Prevalence	Adjusted odds ratio	95% confidence interval
	'000	%		
Total	**588**	**2.6**	**...**	**...**
Sex				
Men†	229	2.1	1.00	...
Women	358	3.1*	1.17	0.87, 1.58
Age group				
18-34	145	2.1	0.99	0.58, 1.67
35-44	132	2.4	0.99	0.59, 1.68
45-64	226	3.4	1.30	0.79, 2.14
65+†	85	2.4	1.00	...
Marital status				
Married/Common-law†	376	2.7	1.00	...
Never married	109	2.2	1.01	0.66, 1.54
Widowed/Divorced/ Separated	102	3.1	0.89	0.48, 1.65
Household income				
Lowest	91	3.2	1.16	0.70, 1.91
Lower-middle	143	2.6	1.02	0.72, 1.44
Upper-middle/High†	322	2.6	1.00	...
Missing	32	2.0	0.88	0.46, 1.69
Education				
Less than high school graduation†	140	2.7	1.00	...
High school graduation or more	448	2.6	0.98	0.67, 1.43
Employment status				
Currently working	357	2.5	1.31	0.90, 1.92
Other†	231	2.8	1.00	...
Residence				
Urban	443	2.4	0.67	0.43, 1.03
Rural†	145	3.5	1.00	...
Aboriginal status				
Yes	16	3.2	1.08	0.50, 2.36
No†	572	2.6	1.00	...
Immigrant status				
Immigrant	95	2.0	0.74	0.47, 1.16
Canadian-born†	492	2.8	1.00	...
Self-reported health				
Poor/Fair	149	6.6*	1.84*	1.26, 2.70
Good/Very good/Excellent†	439	2.2	1.00	...
Chronic condition				
Yes	470	3.4*	1.46*	1.02, 2.07
No†	117	1.4	1.00	...
Chronic pain				
Yes	187	5.6*	1.45	0.92, 2.30
No†	400	2.1	1.00	...
Distress				
Yes	146	5.7*	1.71*	1.15, 2.54
No†	441	2.2	1.00	...
GP consultation in past year				
Yes	545	3.1*	2.24*	1.35, 3.72
No†	43	0.9	1.00	...
Specialist consultation in past year				
Yes	316	5.3*	2.33*	1.73, 3.14
No†	272	1.6	1.00	...
Doctors' authority score				
High	72	1.6*	0.42*	0.22, 0.80
Middle	413	2.6*	0.70	0.48, 1.03
Low†	103	4.2	1.00	...
Self-care score				
High	142	2.4	1.07	0.75, 1.53
Middle	273	2.8	1.20	0.84, 1.73
Low†	173	2.5	1.00	...

Data source: *1998/99 National Population Health Survey, cross-sectional sample, Health file*
Note: *Respondents with missing values on distress were assigned to the "no" group. Respondents with missing values on items measuring doctors' authority and self-care were given a neither agree nor disagree response.*
† Reference group
··· Not applicable
** Significantly different from reference group ($p \leq 0.05$)*

Unmet needs due to service availability were strongly associated with an individual's health. For example, 6.6% of people in poor or fair health reported this type of unmet need, compared with just 2.2% of people in good, very good or excellent health. Similarly, people with chronic conditions, chronic pain or distress were more likely than those who were not afflicted to report unmet needs related to service availability. Even when the effects of other factors were taken into account, poor/fair health, chronic conditions, and distress were independently associated with reporting this type of unmet need; the relationship with chronic pain was no longer significant.

Somewhat paradoxically, people who had consulted a general practitioner or a specialist in the previous year were more likely than those who had not to report unmet needs related to service availability. Of course, physician consultations are linked to many other factors that might affect unmet needs, notably health status. Yet when these other variables were considered, consultation with a general practitioner or specialist significantly increased the odds of reporting unmet needs related to service availability problems.

It is quite likely that people with medical problems are those most in need of health care services. They are therefore also more likely than people in better health to recognize deficiencies in the delivery of those services, particularly if their medical problems remained unsolved. The associations may also reflect unmet needs at different stages of treatment.

Provincial patterns

The prevalence of each type of unmet health care needs of all types was close to the national figure in most provinces. In 1998/99, the percentage of people reporting unmet needs related to service availability significantly exceeded the national level only in Nova Scotia (4.6%), and was significantly lower only in New Brunswick (1.5%) and Ontario (1.9%). The number of physicians per 100,000 population cannot explain these disparities, since Nova Scotia was one of the three provinces (the others were Québec and British Columbia) where the ratio surpassed the national level in 1998.[26]

The prevalence of accessibility-related unmet health care needs (cost and transportation) was significantly higher only in British Columbia (1.5%) and significantly lower only in Ontario (0.6%). The percentage of the population in low-income households cannot account for these differences: according to the 1998/99 National Population Health Survey, the proportion was about the same in both provinces (data not shown).

In each province except Nova Scotia, acceptability-related unmet health care were the most common. The prevalence of such unmet needs was not significantly different from the national level in any province except Newfoundland, where it was significantly lower (2.2%).

Prevalence of unmet health care needs, by reason and province, household population aged 18 or older, Canada, 1998/99

	Availability		Accessibility		Acceptability	
	Number	Prevalence	Number	Prevalence	Number	Prevalence
	'000	%	'000	%	'000	%
Canada	**588†**	**2.6**	**192**	**0.9**	**794†**	**3.5**
Newfoundland	8	2.1	--	--	9	2.2*
Prince Edward Island	2	2.3	--	--	3	3.0
Nova Scotia	32	4.6*	6	0.9	29	4.2
New Brunswick	9	1.5*	--	--	22	3.9
Québec	176	3.2	34	0.6	194	3.5
Ontario	161	1.9*	54	0.6*	271	3.2
Manitoba	29	3.7	--	--	37	4.6
Saskatchewan	18	2.5	--	--	29	4.0
Alberta	48	2.3	29	1.4	80	3.8
British Columbia	103	3.4	44	1.5*	120	3.9

Data source: *1998/99 National Population Health Survey, cross-sectional sample, Health file*
† Because of rounding, detail may not add to totals.
** Significantly different from national figure ($p \leq 0.05$)*
-- Sample size too small to provide reliable estimate

A related factor is attitudes toward physicians. People with a high level of trust in doctors were less likely than those with a low level of trust to report unmet health care needs stemming from service availability. Even when other factors including health status and physician consultations were considered, the tendency to trust doctors was associated with low odds of reporting unmet needs of this kind.

Accessibility

In 1998/99, slightly less than 1% of Canadians aged 18 or older (about 200,000) reported having had a need for health care in the previous year that was not met because of problems related to accessibility; that is, cost or transportation (Table 3).

Not surprisingly, the prevalence of such unmet needs was related to household income. Over 3% of residents of low-income households reported

Table 3
Prevalence of and adjusted odds ratios for unmet health care needs related to accessibility, by selected characteristics, household population aged 18 or older, Canada excluding territories, 1998/99

	Number	Prevalence	Adjusted odds ratio	95% confidence interval
	'000	%		
Total	**192**	**0.9**	**...**	**...**
Sex				
Men†	81	0.7	1.00	...
Women	111	1.0	0.79	0.48, 1.28
Age group				
18-34	64	0.9	4.01*	1.59,10.08
35-44	70	1.3*	4.53*	1.81,11.34
45-64	40	0.6	1.77	0.77, 4.06
65+†	18	0.5	1.00	...
Marital status				
Married/Common-law†	79	0.6	1.00	...
Never married	47	0.9	0.89	0.51, 1.58
Widowed/Divorced/ Separated	66	2.0*	1.74	0.96, 3.14
Household income				
Lowest	87	3.1*	9.71*	4.32, 21.79
Lower-middle	55	1.0*	3.88*	1.84, 8.16
Upper-middle/High†	34	0.3	1.00	...
Missing	--	--	5.43*	1.70, 17.40
Education				
Less than high school graduation†	37	0.7	1.00	...
High school graduation or more	155	0.9	1.36	0.77, 2.40
Employment status				
Currently working	99	0.7*	1.09	0.61, 1.97
Other†	93	1.1	1.00	...
Residence				
Urban	170	0.9*	1.79	0.99, 3.23
Rural†	22	0.5	1.00	...
Aboriginal status				
Yes	--	--	2.41	0.73, 7.91
No†	175	0.8	1.00	...
Immigrant status				
Immigrant	29	0.6	0.70	0.35, 1.43
Canadian-born†	163	0.9	1.00	...
Self-reported health				
Poor/Fair	65	2.9*	1.68	0.87, 3.26
Good/Very good/Excellent†	127	0.6	1.00	...
Chronic condition				
Yes	168	1.2*	2.87*	1.37, 6.01
No†	25	0.3	1.00	...
Chronic pain				
Yes	81	2.4*	2.00*	1.17, 3.43
No†	111	0.6	1.00	...
Distress				
Yes	74	2.9*	2.17*	1.23, 3.82
No†	118	0.6	1.00	...
GP consultation in past year				
Yes	164	0.9	1.00	0.48, 2.08
No†	28	0.6	1.00	...
Specialist consultation in past year				
Yes	85	1.4*	1.30	0.76, 2.21
No†	108	0.7	1.00	...
Doctors' authority score				
High	36	0.8*	0.44	0.18, 1.07
Middle	107	0.7*	0.37*	0.21, 0.67
Low†	49	2.0	1.00	...
Self-care score				
High	80	1.4	1.77	0.97, 3.23
Middle	59	0.6	0.78	0.42, 1.45
Low†	53	0.8	1.00	...

Data source: *1998/99 National Population Health Survey, cross-sectional sample, Health file*
Note: *Respondents with missing values on distress were assigned to the "no" group. Respondents with missing values on items measuring doctors' authority and self-care were given a neither agree nor disagree response.*
† Reference group
-- Coefficient of variation greater than 33.3%
··· Not applicable
** Significantly different from reference group ($p \leq 0.05$)*

unmet health care needs due to cost or transportation concerns, compared with less than half of one percent of people in upper-middle-/high-income households. Even when the effects of the other selected factors, the odds that people in low-income households would report such needs were about 10 times those for residents of upper-middle-/high-income households. Even residents of lower-middle-income households had significantly higher odds of reporting accessibility-related unmet needs, compared with those in more affluent households.

These results are consistent with a recent Canadian study, in which the main reason that low-income people, especially the working poor, gave for not obtaining physician services was the belief that they would be unable to afford prescribed medications.[27] The same study also showed that transportation was one of the main reasons given by social assistance recipients for not seeing a physician.[27]

Limitations

National Population Health Survey (NPHS) data are subject to the problems inherent in self-reporting. For instance, while the measure of unmet need for health care in the NPHS is often used in community surveys, there is a possibility of recognition error and recall error. Respondents may have difficulty recognizing the existence of health care needs and recalling the specific situation in which care was needed but not received.[16] Self-reports of unmet health care needs also reflect the perception of an individual. For example, the interpretation of "waiting time too long" may vary from one person to another. As well, there is no indication of what the respondent was waiting for: an appointment, a diagnostic test, or surgery.

More objective determinations of whether necessary care was foregone might be made by health professionals through clinical examination.[16,28] Clinical assessment, however, is often complex and costly,[17,29] and such information is not available from the NPHS.

The data in this study do not include people on Indian reserves and in some remote areas of Québec and Ontario. Therefore, the prevalence of unmet needs for health care may be underestimated. Furthermore, since the survey was conducted in English or French, unmet needs due to language difficulties or lack of information about the health delivery system may also be underestimated.

When the other selected factors were controlled, the odds of having unmet health care needs stemming from cost or transportation concerns were high for people reporting chronic conditions, chronic pain, or distress. Also, the odds that people younger than 45 would have an accessibility-related unmet need were at least four times the odds for seniors.

Acceptability

Most people with unmet health care needs attributed them to personal circumstances and attitudes such as being too busy, deciding not to bother, believing that care would be inadequate, not knowing where to go, or disliking or fearing doctors. In 1998/99, about 4% of Canadians aged 18 or older reported that in the previous year they had an unmet need for health care because of such problems with acceptability (Table 4).

Unmet health care needs due to acceptability problems were more common among young people than older people. Even when other factors were taken into account, 18- to 34-year-olds still had significantly higher odds of reporting acceptability-related unmet health care needs than did people aged 65 or older. The higher odds among younger people may reflect their busier schedules, and attitudes toward and knowledge about health care.

Attitudes toward health care were, in fact, important. The more respondents trusted doctors' authority, the lower the prevalence of unmet health care needs related to acceptability. Even when other factors were taken into account, high regard for physician authority lowered the odds of having acceptability-related unmet health care needs. Conversely, a tendency to rely on self-care raised the odds of reporting unmet needs growing out of these reasons.

Many of the factors associated with unmet needs due to service availability were also associated with unmet needs resulting from acceptability problems: self-reported health, chronic conditions, chronic pain and distress. Almost 9% of people in poor or fair health had unmet needs due to acceptability problems, compared with 3% whose health was good to excellent. When the other potentially

influential factors were taken into account, the odds of reporting acceptability-related unmet needs were significantly high for people in poor or fair health. As well, individuals suffering from a chronic condition, chronic pain or distress had higher odds of reporting unmet needs due to acceptability problems, compared with those who did not.

Relatively large percentages of people who had consulted a general practitioner or specialist in the past year reported acceptability-related unmet health care needs. When the effects of the other factors were controlled, the association with specialist consultations was still significant, but the relationship with GP consultations was not.

Table 4
Prevalence of and adjusted odds ratios for unmet health care needs related to acceptability, by selected characteristics, household population aged 18 or older, Canada excluding territories, 1998/99

	Number	Prevalence	Adjusted odds ratio	95% confidence interval
	'000	%		
Total	**794**	**3.5**	**...**	**...**
Sex				
Men†	324	2.9	1.00	...
Women	470	4.1*	1.03	0.80, 1.33
Age group				
18-34	358	5.1*	3.26*	1.93, 5.50
35-44	178	3.3	1.51	0.90, 2.52
45-64	177	2.7	1.09	0.70, 1.71
65+†	82	2.4	1.00	...
Marital status				
Married/Common-law†	391	2.8	1.00	...
Never married	208	4.1*	0.96	0.67, 1.37
Widowed/Divorced/ Separated	195	5.9*	2.01*	1.48, 2.71
Household income				
Lowest	149	5.2*	1.11	0.77, 1.58
Lower-middle	171	3.1	0.86	0.64, 1.16
Upper-middle/High†	426	3.4	1.00	...
Missing	48	3.1	0.99	0.54, 1.81
Education				
Less than high school graduation†	138	2.7	1.00	...
High school graduation or more	654	3.8*	1.21	0.84, 1.75
Employment status				
Currently working	526	3.7	1.47*	1.07, 2.02
Other†	267	3.2	1.00	...
Residence				
Urban	684	3.7*	1.25	0.92, 1.70
Rural†	109	2.6	1.00	...
Aboriginal status				
Yes	41	8.3*	1.76*	1.00, 3.11
No†	753	3.4	1.00	...
Immigrant status				
Immigrant	122	2.5*	0.78	0.53, 1.13
Canadian-born†	672	3.8	1.00	...
Self-reported health				
Poor/Fair	196	8.7*	1.93*	1.34, 2.77
Good/Very good/Excellent†	598	3.0	1.00	...
Chronic condition				
Yes	623	4.5*	1.76*	1.29, 2.39
No†	171	2.0	1.00	...
Chronic pain				
Yes	262	7.8*	1.99*	1.45, 2.75
No†	532	2.8	1.00	...
Distress				
Yes	254	9.9*	2.44*	1.84, 3.24
No†	540	2.7	1.00	...
GP consultation in past year				
Yes	678	3.8*	1.09	0.78, 1.53
No†	116	2.4	1.00	...
Specialist consultation in past year				
Yes	359	6.0*	1.70*	1.30, 2.24
No†	435	2.6	1.00	...
Doctors' authority score				
High	113	2.5*	0.60*	0.39, 0.93
Middle	537	3.4*	0.72*	0.52, 1.00
Low†	144	5.9	1.00	...
Self-care score				
High	271	4.7*	1.72*	1.26, 2.36
Middle	326	3.3	1.19	0.88, 1.61
Low†	197	2.8	1.00	...

Data source: *1998/99 National Population Health Survey, cross-sectional sample, Health file*
Note: *Because of rounding, some confidence intervals with 1.00 as the upper/lower limit were significant. Respondents with missing values on distress were assigned to the "no" group. Respondents with missing values on items measuring doctors' authority and self-care were given a neither agree nor disagree response.*
† Reference group
··· Not applicable
** Significantly different from reference group ($p \leq 0.05$)*

Aboriginal people (off-reserve) had a higher prevalence of acceptability-related unmet needs than did non-Aboriginal people: 8% versus 3%. The relationship still held when the effects of factors such as household income and health status were considered.

Residents of low-income households had a higher prevalence of unmet health care needs due to acceptability problems, compared with people in upper-middle-/high-income households. However, when the other factors were taken into account, the income difference was not statistically significant. Similarly, relationships between education, residence (rural or urban) or immigrant status and acceptability-related unmet needs were no longer statistically significant when the other variables were considered.

Gender difference

Women were more likely than men to report unmet health care needs due to service availability and acceptability problems, but not to accessibility (cost and transportation).

The gender gap in availability-related unmet needs persisted when demographic and socio-economic characteristics were controlled (data not shown). However, when health status was taken into account, the difference was not statistically significant (data not shown). Health status, it appears, was a key factor linking gender with availability-related unmet needs, since women's health tended to be poorer than men's.

The gender difference in acceptability-related unmet health care needs was still statistically significant when the selected demographic and socio-economic factors were controlled (data not shown). But when attitudes toward doctors' authority and self-care were taken into account, the difference disappeared. Such attitudes may act as mediators linking gender with acceptability-related unmet health care needs.

Concluding remarks

In 1998/99, close to 7% of Canadian adults reported that they had had an unmet need for health care in the previous year. About half of these instances arose from acceptability problems such as competing demands on the individual's time, and attitudes toward and knowledge about illness. Unmet needs related to service availability problems, such as lengthy waiting times, were mentioned by around a third of people who reported an episode. Problems related to accessibility (in the majority of cases, cost) were cited by 13% of people with unmet needs.

The factors associated with these three different types of unmet need tended to be different. Just two factors—chronic conditions and distress—were significantly related to all three types. Other measures of health status and physician consultations were associated with unmet needs related to service availability and acceptability. This is not surprising, as people in good health would have fewer occasions to encounter difficulty securing services. And it may be that greater use of services makes people aware of shortcomings in the delivery of those services.

People who trusted doctors had relatively low odds of reporting unmet needs due to service availability or to acceptability problems. It is not clear if this was because such people were less skeptical about health care services[30] or because of positive experiences receiving health care in the past.[31]

A tendency to rely on self-care was associated only with unmet needs related to acceptability problems. This was not unexpected, as the acceptability category includes items such as feeling that the care would be inadequate and disliking or fearing doctors.

Unmet health care needs attributable to perceived service availability were not associated with household income, education, rural or urban residence, country of birth, or Aboriginal status. It appears, then, that health care cutbacks do not place a disproportionate burden on socio-economically disadvantaged groups.

This analysis has not presented evidence of income inequality in unmet needs due to the perceived availability of health care services. Nevertheless, there was a notable income gradient in accessibility-related unmet health care needs. ●

References

1 Canada, House of Commons. *Canada Health Act*. Ottawa: Queen's Printer, 1984.

2 Sanmartin C, Shortt SED, Barer ML, et al. Waiting for medical services in Canada: lots of heat, but little light. *Canadian Medical Association Journal* 2000; 162(9): 1305-10.

3 Gray C. Hospital crisis? What crisis? *Canadian Medical Association Journal* 2000; 162(7): 1043.

4 Lewis S, Barer ML, Sanmartin C. Ending waiting-list mismanagement: principles and practice. *Canadian Medical Association Journal* 2000; 162(9): 1297-1300.

5 DeCoster C, Carriere KC, Peterson S, et al. Waiting times for surgical procedures. *Medical Care* 1999; 37(6): JS187-205.

6 Eyles J, Birch S, Newbold KB. Delivering the goods? Access to family physician services in Canada: a comparison of 1985 and 1991. *Journal of Health and Social Behavior* 1995; 36:322-32.

7 Canadian Institute for Health Information (CIHI). *Health Care in Canada 2001*. Ottawa: Canadian Institute for Health Information, 2001.

8 Finkelstein MM. Do factors other than need determine utilization of physicians' services in Ontario? *Canadian Medical Association Journal* 2001; 165(5): 565-70.

9 Dunlop S, Coyte PC, McIsaac W. Socioeconomic status and the utilization of physicians' services: results from the Canadian National Population Health Survey. *Social Science and Medicine* 2000; 51: 123-33.

10 Alter DA, Naylor CD, Austin P, et al. Effects of socioeconomic status on access to invasive cardiac procedures and on mortality after acute myocardial infarction. *The New England Journal of Medicine* 1999; 341(18): 1359-67.

11 Gentleman JF, Lee J. Who doesn't get a mammogram? *Health Reports* (Statistics Canada, Catalogue 82-003) 1997; 9(1): 19-28.

12 Ross NP, Mustard CA. Variation in health and health care use by socioeconomic status in Winnipeg, Canada: does the system work well? Yes and no. *The Milbank Quarterly* 1997; 75(1): 89-111.

13 McIsaac W, Goel V, Naylor D. Socioeconomic status and visits to physicians by adults in Ontario, Canada. *Journal of Health Services Research and Policy* 1997; 2(2): 94-102.

14 Johansen H, Millar W J. Health care services – recent trends. *Health Reports* (Statistics Canada, Catalogue 82-003) 1999; 11(3): 91-109.

15 Coyte P, Wright JG, Hawker GA, et al. Waiting times for knee-replacement surgery in the United States and Ontario. *The New England Journal of Medicine* 1994; 331(16): 1068-71.

16 Newacheck PW, Hughes DC, Hung YY, et al. Health needs and consumer services: the unmet health needs of America's children. *Pediatrics* 2000; 105(4): 989-97.

17 Liberatos P, Elinson J, Schaffzin T, et al. Developing a measure of unmet health care needs for a pediatric population. *Medical Care* 2000; 38(1): 19-34.

18 Anderson R. Health status indices and access to medical care. *American Journal of Public Health* 1978; 68(5): 458-63.

19 Aday LA, Andersen R. A framework for the study of access to medical care. *Health Services Research* 1974; 9: 208-20.

20 Thomas JW, Penchansky R. Relating satisfaction with access to utilization of services. *Medical Care* 1984; 22(6): 553-68.

21 Penchansky R, Thomas JW. The concept of access: definition and relationship to consumer satisfaction. *Medical Care* 1981; 19(2): 127-40.

22 Anderson RM. Revisiting the behavioral model and access to medical care: does it matter? *Journal of Health and Social Behavior* 1995; 36: 1-10.

23 Yeo D, Mantel H, Liu TP. Bootstrap variance estimation for the National Population Health Survey. *American Statistical Association: Proceedings of the Survey Research Methods Section*. Baltimore; August 1999.

24 Roberts G, Kavacevic M. Comparison of cross-sectional estimates from two waves of longitudinal survey. *SSC Annual Meeting: Proceedings of the Survey Methods Section*. June, 1999.

25 Statistics Canada. Appendix F: Derived variables in *National Population Health Survey, 1994/95 Public Use Microdata Files* (Catalogue 82F0001XCB) Ottawa: Minister of Industry, 1995.

26 Canadian Institute for Health Information (CIHI). *Supply, Distribution and Migration of Canadian Physicians, 2000 Report: Executive Summary*. Ottawa: Canadian Institute for Health Information, 2001.

27 Williamson DL, Fast JE. Poverty and medical treatment: when public policy compromises accessibility. *Canadian Journal of Public Health* 1998; 89(2): 120-4.

28 Carr W, Wolfe S. Unmet needs as socioeconomic indicators. *International Journal of Health Services* 1976; 6(3): 417-30.

29 Carr W, Szapiro N, Heisler T, et al. Sentinel health events as indicators of unmet needs. *Social Science and Medicine* 1989; 29(6): 705-14.

30 Fiscella K, Franks P, Clancy CM. Skepticism towards medical care and health care utilization. *Medical Care* 1998; 36(2): 180-9.

31 Ross CE, Duff RS. Returning to the doctors: the effect of client characteristics, type of practice, and experience with care. *Journal of Health and Social Behaviour* 1982; 23: 119-31.

Appendix

Table A
Distribution of selected characteristics, household population aged 18 or older, Canada excluding territories, 1998/99

	Sample size	Estimated population '000	Estimated population %
Total	**14,143**	**22,548**	**100**
Sex			
Men	6,444	11,024	48.9
Women	7,699	11,524	51.1
Age group			
18-34	4,081	6,969	30.9
35-44	3,117	5,422	24.0
45-64	4,096	6,673	29.6
65+	2,849	3,484	15.5
Marital status			
Married/Common-law	8,208	14,130	62.7
Never married	3,080	5,098	22.6
Widowed/Divorced/Separated	2,855	3,320	14.7
Household income			
Lowest	2,289	2,848	12.6
Lower-middle	3,777	5,564	24.7
Upper-middle/High	7,201	12,587	55.8
Missing	876	1,549	6.9
Education			
Less than high school graduation	3,612	5,094	22.6
High school graduation or more	10,520	17,434	77.3
Missing	11	19	0.1
Employment status			
Currently working	8,354	14,296	63.4
Other	5,789	8,251	36.6
Residence			
Urban	10,880	18,396	81.6
Rural	3,263	4,152	18.4
Aboriginal status			
Yes	382	498	2.2
No	13,761	22,050	97.8
Immigrant status			
Immigrant	2,278	4,877	21.6
Canadian-born	11,855	17,647	78.3
Missing	10	23	0.1
Self-perceived health			
Poor/Fair	1,613	2,255	10.0
Good/Very good/Excellent	12,530	20,293	90.0
Chronic condition			
Yes	9,045	13,899	61.6
No	5,098	8,649	38.4
Chronic pain			
Yes	2,249	3,350	14.9
No	11,888	19,189	85.1
Missing	6	9	0.0
Distress			
Yes	1,586	2,572	11.4
No	12,557	19,976	88.6
GP consultation in past year			
Yes	11,396	17,805	79.0
No	2,747	4,743	21.0
Specialist consultation in past year			
Yes	3,690	5,950	26.4
No	10,453	16,598	73.6
Doctors' authority score			
High	2,772	4,478	19.9
Middle	9,831	15,642	69.4
Low	1,540	2,428	10.8
Self-care score			
High	3,770	5,817	25.8
Middle	5,925	9,789	43.4
Low	4,448	6,942	30.8

Data source: *1998/99 National Population Health Survey, cross-sectional sample, Health file*
Note: *Because of rounding, detail may not add to totals.*

Revascularization and heart attack outcomes

Helen Johansen, Cyril Nair, Luling Mao and Michael Wolfson

Abstract

Objectives

This article focuses on rates of revascularization and mortality among people admitted to hospital after an acute myocardial infarction (AMI).

Data source

The hospital data are from the Person-oriented Information Database. Information on deaths is from the Canadian Mortality Database.

Analytical techniques

Hospital records for Nova Scotia, Saskatchewan, Alberta and British Columbia were linked to identify AMI patients admitted between April 1, 1995 and March 31, 1996. Patients with no admission for AMI in the previous 12 months were followed for one year to determine what percentage underwent percutaneous transluminal coronary angioplasty and/or coronary artery bypass graft surgery. The risk of being revascularized and the risk of dying were estimated.

Main results

In the year after hospitalization, 25% of AMI patients were revascularized. Rates of revascularization were relatively low for women, very elderly people, and individuals with other health problems. Revascularization was significantly associated with a lower risk of dying for male, but not female, AMI patients.

Key words

acute myocardial infarction, percutaneous transluminal coronary angioplasty, coronary artery bypass graft, medical record linkage, mortality

Authors

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Heart attack (acute myocardial infarction or AMI) is a leading cause of hospitalization and death in Canada.[1,2] A heart attack usually occurs when a blockage (most often a blood clot) in a coronary artery severely restricts or cuts off the blood supply to a region of the heart. If this happens for more than a few minutes, heart tissue dies. The heart's ability to keep pumping is directly related to the extent and site of the damaged tissue (infarction).[3] In 1995/96, close to 59,000 hospital admissions were attributable to AMI, accounting for 11% of male deaths and 10% of female deaths.

Percutaneous transluminal coronary angioplasty (PCTA) and coronary artery bypass graft surgery (CABG) are revascularization methods that are commonly used to improve blood flow to the heart among people with coronary heart disease. Because the risks associated with surgery are higher for people whose heart muscle was damaged by a heart attack, not all AMI patients are good candidates for these procedures. However, revascularization may be performed on AMI patients for whom other therapies are not suitable.[3]

Methods

Data sources

Hospital morbidity data are from the Canadian Institute for Health Information, which provides morbidity files annually to Statistics Canada. Each record contains information from an inpatient's hospital chart and pertains to one hospital separation. The data in this analysis are from the Person-oriented Information Database, which Statistics Canada builds from these hospital morbidity files. Mortality data are from the Canadian Mortality Database.

The Postal Code Conversion file was used to determine Census Enumeration Areas from the patient's residential postal code. Health region (as of 1999) was based on the Census Enumeration Area.

Analytical techniques

To identify heart attack patients, hospital records for Nova Scotia, Saskatchewan, Alberta and British Columbia were linked using patient identification numbers. Patients discharged with an acute myocardial infarction (AMI) between April 1, 1995 and March 31, 1996 in Nova Scotia, Saskatchewan, Alberta and British Columbia were followed for the succeeding year to determine revascularization and mortality (all causes). These provinces were chosen because patients could be traced for out-of-hospital deaths.

An AMI patient was defined as someone who had one or more hospital stays for AMI during the year. The diagnostic code 410 in the *International Classification of Diseases, Ninth Revision* (ICD-9)[4] was used to identify AMI patients. They were followed for one year to determine if they had percutaneous transluminal coronary angioplasty (PTCA) and/or coronary artery bypass graft surgery (CABG) surgery. The *Canadian Classification of Procedures* (CCP)[5] was used to identify PTCA (48.00-48.08, 51.59) and CABG (48.11-48.19).

The first primary diagnosis of AMI during the 1995/96 fiscal year was considered the "index event." An index event makes it possible to calculate time from AMI to revascularization without depending on referral time for angiography.

Calculations are based on patients who had an AMI in the 1995/96 fiscal year and who had *not* been hospitalized for AMI in the preceding year. They are referred to as having a one-year "wash-out" period. Patients who had had an AMI during the previous year and were waiting for revascularization when they had the attack that caused their admission to hospital in 1995/96 were excluded because the second AMI may have given them a higher priority on a waiting list, and thus, a relatively short time would elapse before PTCA or CABG. A total of 12,648 patients were hospitalized for AMI in the four provinces in 1995/96; the wash-out eliminated 308.

Some patients are admitted to hospital for tests to rule out a heart attack. To reduce false-positive diagnoses, patients who were admitted for suspected AMI, but who were discharged alive within two days and who had neither a PTCA nor a CABG in the subsequent year were also excluded. These exclusions represented another 69 patients, leaving 12,271 patients in the study.

Time-to-procedure was estimated by subtracting the admission date of the index event from the admission date of the first hospital stay during which revascularization occurred and adding half the length of stay of the revascularization visit. This definition encompasses variations in waiting time to see a specialist and placement on a waiting list for hospitalization. If the procedure occurred during the index visit, time-to-procedure was considered half the length of stay. This was necessary because not all jurisdictions report the date when each procedure was performed.

For all four provinces, in-hospital deaths were determined from hospital records. For out-of-hospital deaths, provincial health insurance numbers were used to link death certificates to hospital records for Saskatchewan, Alberta, and British Columbia. Because health insurance numbers are not available on all death certificates, birth date, sex and postal code were used to refine the linkage. In Nova Scotia, health insurance registration data were used to determine mortality of AMI patients.

Cox proportional hazards regression was used to adjust revascularization for co-morbidity and age. Separate analyses were done for men and women. The Charlson Index was used to adjust for co-morbidity (see *Charlson Index*). Individual health regions in the models had populations of at least 100,000; less populous regions were included in the models as "other" Saskatchewan, "other" Alberta, and "other" British Columbia. The revascularization variables in the mortality models are time-dependent covariates; that is, the effect of revascularization on death is not considered until after the revascularization is performed.

Two models (one for 30-day and one for one-year mortality) created by the Institute for Clinical Evaluative Sciences (ICES)—the Tu method—to adjust mortality rates for differences in age, sex and co-morbidity were also used. The observed number of deaths was summed in each health region and divided by the predicted number of deaths found by summing the probabilities of death given by the model. The resulting mortality ratio was then multiplied by the overall cohort mortality rate to yield the risk-adjusted mortality rate for the region. An estimate of the variance obtained from the logistic model was used to calculate 95% confidence intervals. These results can be interpreted as the mortality rate a region would have if it were similar to the average case mix in Ontario for the same inception cohort used in the model development (1994/95-1996/97).

The Cox proportional hazard regression with the Charlson Index and the Tu model gave similar results for one-year heart attack mortality. Because the regression model allowed revascularization to be included, only the Cox regression results are reported in this article.

With data from four provinces—Nova Scotia, Saskatchewan, Alberta and British Columbia—this analysis examines revascularization and mortality among heart attack patients during the year after their admission to hospital for AMI (see *Methods* and *Limitations*). These provinces were chosen because patients could be traced for out-of-hospital deaths. Rates of revascularization and mortality are presented by sex, age and health region. The aim is to determine the factors associated with revascularization, and then, controlling for the other factors, to determine if revascularization is associated with survival.

Health region data are used to partially account for variables that are not available in hospital and mortality statistics, but that could differ geographically: physician factors, health care facilities, and patient characteristics, for example.

Hospital admissions

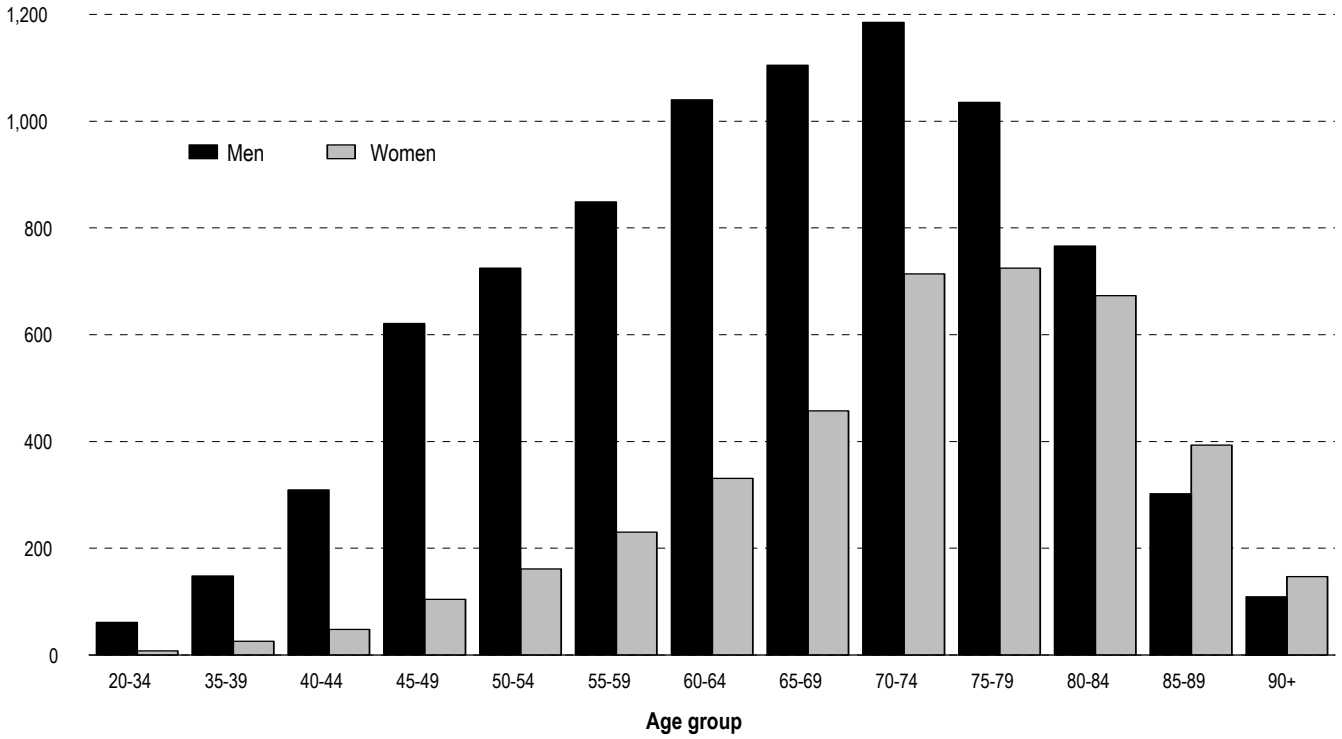
In 1995/96, 12,271 people aged 20 or older in Nova Scotia, Saskatchewan, Alberta and British Columbia were admitted to hospital with a primary diagnosis of AMI and no previous AMI hospitalization in the past year: 8,255 men and 4,016 women.

These AMI patients were relatively old: 62% were 65 or older. In each age group up to and including 80-to-84, male patients exceeded female patients (Chart 1). Among the very old, women outnumbered men, in part a reflection of women's generally greater longevity.

In the year after their heart attack, 17% of the patients underwent PTCA, and 9% had CABG surgery (see *Cardiac procedures*). Overall, 25% were revascularized, slightly less than the sum of those who had a PTCA and those who had CABG surgery, because some patients (1%) had both procedures (Table 1).[6,7]

Most revascularization of AMI patients occurred within a month of their heart attack (Chart 2). In fact, a substantial proportion was performed in the first two weeks. All AMI patients, however, were not equally likely (or unlikely) to be revascularized.

Chart 1
Number of heart attack patients hospitalized between April 1, 1995 and March 31, 1996, by age group and sex, four provinces†



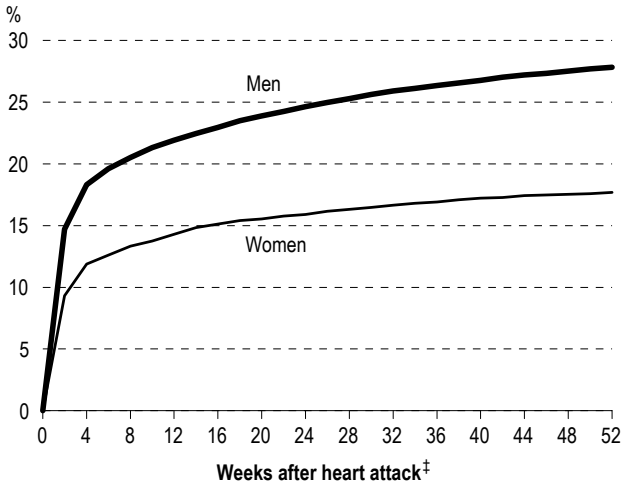
Data source: *Person-oriented Information Database*
† Nova Scotia, Saskatchewan, Alberta, British Columbia

Table 1
Percentage of heart attack patients hospitalized between April 1, 1995 and March 31, 1996 who were revascularized within one year, by sex, four provinces†

	Total	Men	Women
	%	%	%
Total‡	**25.2**	**28.6**	**18.1**
Percutaneous transluminal coronary angioplasty (PTCA) only	16.1	18.0	12.1
Coronary artery bypass graft surgery (CABG) only	8.3	9.7	5.6
Both PTCA and CABG	0.8	0.9	0.5

Data source: *Person-oriented Information Database*
Note: *Because of rounding, detail may not add to totals.*
† Nova Scotia, Saskatchewan, Alberta, British Columbia
‡ May be less than sum of PTCA and CABG, as some patients had both.

Chart 2
Cumulative rate of revascularization among heart attack patients hospitalized between April 1, 1995 and March 31, 1996, by sex, four provinces†



Data source: *Person-oriented Information Data Base*
† Nova Scotia, Saskatchewan, Alberta, British Columbia
‡ First primary diagnosis of acute myocardial infarction

Revascularization rates differ

In 1995/96, a higher percentage of male than female heart attack patients in the four provinces underwent PCTA and CABG. Other research, too, has shown female AMI patients to be less likely than male patients to have invasive cardiac procedures.[8,9] An Ontario study found rates of both PTCA and CABG to be lower among women.[10] And in the United States, sex differences remained even after matching hospital of admission and controlling for other factors that can influence procedure rates.[11] To some degree, women's lower rate may be influenced by their longer life expectancy, which results in a higher proportion of women with AMIs in the oldest age groups—the least likely to undergo revascularization.[12-14]

For both sexes, PCTA rates were highest among heart attack patients in their forties and early fifties, then generally declined at older ages (Chart 3). In most age groups, rates were higher among men than women.

CABG surgery was less common than PCTA among heart attack patients. CABG rates were

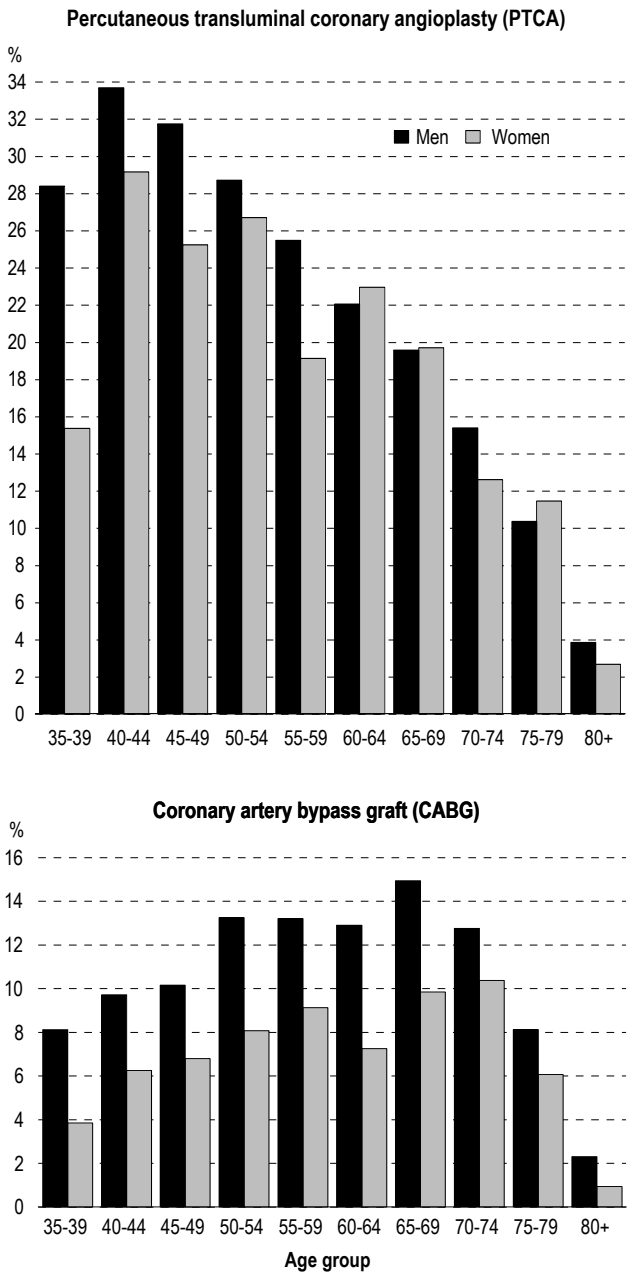
Cardiac procedures

Percutaneous transluminal coronary angioplasty (PCTA) and coronary artery bypass graft (CABG) are revascularization methods that improve the flow of blood to the heart.[3] They are used most often to treat coronary artery disease, a condition in which fatty deposits accumulate in the cells lining the artery wall and obstruct blood flow.

For PTCA, a large peripheral artery (usually the femoral artery in the leg) is punctured with a needle and a guide wire is threaded through the needle into the arterial system, through the aorta and into the obstructed coronary artery. A catheter with a balloon attached to the tip is threaded over the guide wire and into the diseased coronary artery to the obstructed area. The balloon is inflated for several seconds. It may be inflated and deflated a number of times, thereby reducing the obstruction. To keep the artery open after angioplasty, a device made of wire mesh (a stent) may be inserted into the artery.

CABG involves grafting veins (usually from the leg) or arteries (usually from beneath the breastbone) from the aorta to the coronary artery, thus bypassing the obstructed area. Bypass surgery is highly effective in people who have angina and coronary heart disease that is not widespread. It can improve exercise tolerance, reduce symptoms, and decrease the number or dose of drugs needed. Patients most likely to have bypass surgery are those with severe angina that has not improved with drug therapy and no other conditions that would make surgery hazardous.

Chart 3
Percentage of heart attack patients hospitalized between April 1, 1995 and March 31, 1996 who were revascularized within one year, by age and sex, four provinces†



Data source: *Person-oriented Information Data Base*
† Nova Scotia, Saskatchewan, Alberta, British Columbia

highest for people in their late sixties and early seventies, and in every age group, men had a higher rate than did women. Rates among men fell from age 70 on, and among women, from age 75 on.

Table 2
Percentage of heart attack patients hospitalized between April 1, 1995 and March 31, 1996 who were revascularized within one year, by health region, four provinces

Health region	%
Nova Scotia	
Western	17.1
Central	19.3
Northern	20.1
Eastern	14.8
Saskatchewan	
Regina	26.8
Saskatoon	26.2
Others†	19.9
Alberta	
Chinook Regional Health Authority	29.9
Calgary Regional Health Authority	43.1
David Thompson Regional Health Authority	25.2
East Central Regional Health Authority	18.5
Capital Health Authority	33.0
Lakeland Regional Health Authority	24.7
Others†	26.0
British Columbia	
North Okanagan	23.4
South Okanagan/Similkameen	23.3
Thompson	14.1
Fraser Valley	21.3
South Fraser Valley	25.3
Simon Fraser	29.6
Central Vancouver Island	29.8
Upper Island/Central Coast	31.3
Northern Interior	25.5
Vancouver	22.5
Burnaby	23.5
North Shore	15.8
Richmond	26.1
Capital	32.8
Others†	15.6

Data source: *Person-oriented Information Database*
† Less than 100,000 population

The percentage of heart attack patients who were revascularized within one year varied among large health regions (population over 100,000). For example, in Alberta, the range was from 19% to 43%, and in British Columbia, from 14% to 33% (Table 2). Wide differences among health regions have also been documented in Manitoba and Ontario.[15,16]

Factors related to revascularization

Although female heart attack patients were more likely than male patients to be very elderly and to have more illnesses (see *Charlson Index*), even when these factors were taken into account, women were still less likely to be revascularized, particularly with CABG surgery (data not shown).

When co-morbidity and health region were taken into account, the likelihood of being revascularized declined at older ages for AMI patients of both sexes (Table 3). Among men, each additional year meant a 2% reduction in the chance of revascularization; among women, the comparable figure was 3%.

Table 3
Hazard ratios for revascularization within one year, male and female heart attack patients hospitalized between April 1, 1995 and March 31, 1996, four provinces

	Men		Women	
	Hazard ratio	95% confidence interval	Hazard ratio	95% confidence interval
Age	0.98*	0.97, 0.98	0.97*	0.96, 0.97
Charlson Index	0.90*	0.86, 0.94	0.92*	0.86, 0.98
Nova Scotia				
Western	0.34*	0.26, 0.45	0.38*	0.24, 0.60
Central	0.37*	0.28, 0.49	0.42*	0.27, 0.65
Northern	0.35*	0.25, 0.49	0.58*	0.35, 0.95
Eastern	0.30*	0.22, 0.41	0.27*	0.15, 0.46
Saskatchewan				
Regina	0.66*	0.52, 0.84	0.48*	0.30, 0.78
Saskatoon	0.66*	0.50, 0.85	0.59*	0.35, 0.97
Others†	0.45*	0.37, 0.55	0.49*	0.34, 0.71
Alberta				
Chinook Regional Health Authority	0.74*	0.55, 0.98	0.74	0.43, 1.28
David Thompson Regional Health Authority	0.49*	0.36, 0.68	0.63	0.35, 1.11
East Central Regional Health Authority	0.49*	0.32, 0.75	0.27*	0.10, 0.73
Capital Health Authority	0.71*	0.60, 0.85	0.86	0.62, 1.18
Lakeland Regional Health Authority	0.50*	0.34, 0.73	0.60	0.31, 1.16
Others†	0.59*	0.49, 0.70	0.68*	0.49, 0.95
British Columbia				
North Okanagan	0.55*	0.38, 0.78	0.68	0.39, 1.18
South Okanagan/ Similkameen	0.60*	0.45, 0.78	0.55*	0.33, 0.91
Thompson	0.34*	0.22, 0.52	0.14*	0.03, 0.55
Fraser Valley	0.49*	0.38, 0.64	0.51*	0.32, 0.83
South Fraser Valley	0.58*	0.47, 0.71	0.65*	0.45, 0.93
Simon Fraser	0.72*	0.55, 0.93	0.71	0.45, 1.11
Central Vancouver Island	0.75*	0.59, 0.95	0.77	0.50, 1.19
Upper Island/Central Coast	0.86	0.62, 1.21	0.68	0.36, 1.28
Northern Interior	0.41*	0.28, 0.61	0.45*	0.22, 0.93
Vancouver	0.61*	0.48, 0.77	0.55*	0.35, 0.87
Burnaby	0.53*	0.37, 0.75	0.78	0.46, 1.31
North Shore	0.40*	0.28, 0.58	0.34*	0.15, 0.77
Richmond	0.62*	0.43, 0.89	0.54	0.25, 1.18
Capital	0.97	0.77, 1.21	1.13	0.78, 1.64
Others†	0.41*	0.34, 0.51	0.33*	0.21, 0.51

Data source: *Person-oriented Information Database*
Note: *Reference group is Calgary Regional Health Authority.*
† Less than 100,000 population
** $p < 0.05$*

The more illnesses heart attack patients had, the less likely they were to undergo revascularization. With each point-increase in their Charlson Index score, men were 10% less likely to be revascularized; for women, the reduction was 8%.

Many other variables that could affect revascularization rates, such as hospital and physician factors and socio-economic characteristics of patients, are not available from hospital records. To partially account for these potential influences, health region was considered in the model. The Calgary Regional Health Authority (RHA), where revascularization rates were highest for both sexes, was used as the reference group.

Compared with male heart attack patients in the Calgary RHA, the hazard ratios for revascularization were significantly low for male patients in every other large health region in the four provinces, except for two in British Columbia.

Female heart attack patients in each Nova Scotia and Saskatchewan health region also had significantly low hazard ratios for revascularization, compared with the Calgary RHA. However, in British Columbia, ratios were significantly low in just half of the 14 regions. And in Alberta, the hazard ratio was significantly low in just one health region.

Charlson Index

Studies that use administrative data bases to examine the outcomes of medical care must account for disease severity and co-morbid conditions. The Charlson Index is a common measure of clinical co-morbidity designed for use with medical records.[17-20] Weights for each co-morbidity reported for a patient are summed to give an index value. More severe conditions have higher weights (Appendix).

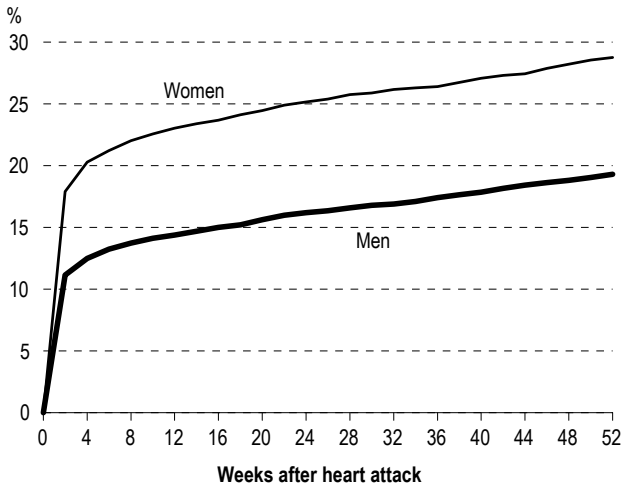
The Charlson Index[17] showed less co-morbidity among male than female heart attack patients in the four provinces. Whereas 61% of the men had a Charlson Index in the 0-to-1 range, this was the case for 50% of the women. On the other hand, for 25% of the women, the Index was at least 3, compared with 19% of the men.

Most mortality in early weeks

The majority of people admitted to hospital after a heart attack survive, and deaths that do occur usually happen in the early weeks (Chart 4). Within a month of the event, 15% of AMI patients in the four provinces had died; by the end of a year, the death toll had risen to 22% (Table 4).

As might be expected, elderly AMI patients had less favourable outcomes than younger patients. The one-month mortality rate was 31% at age 80 or older, compared with about 2% at ages 20 to 44. After a year, 47% of patients aged 80 or older had died, compared with 3% of the 20- to 44-year-olds.

Chart 4
Cumulative rate of death among heart attack patients hospitalized between April 1, 1995 and March 31, 1996, by sex, four provinces†



Data source: *Person-oriented Information Database*
† Nova Scotia, Saskatchewan, Alberta, British Columbia

Table 4
Percentage of heart attack patients hospitalized between April 1, 1995 and March 31, 1996 who died within 30 days and within one year, by age and sex, four provinces†

	Died within 30 days			Died within one year		
	Total	Men	Women	Total	Men	Women
		%			%	
Total	**15.2**	**12.6**	**20.4**	**22.4**	**19.3**	**28.8**
20-44	2.2	1.9	3.7	3.0	2.9	3.7
45-64	5.9	5.6	7.1	8.5	7.8	11.0
65-79	16.6	15.2	19.0	24.2	23.4	25.7
80+	30.9	29.2	32.5	46.7	46.2	47.2

Data source: *Person-oriented Information Database, Mortality Database*
† Nova Scotia, Saskatchewan, Alberta, British Columbia

Mortality rates were higher for women than men: a year after having suffered a heart attack, 29% of women had died, compared with 19% of men. Even when age and co-morbidity were considered, the likelihood of dying was significantly higher for female than male heart attack patients (data not shown).

Regional variations

One-year mortality among heart attack patients varied considerably by health region (Table 5). In the large Alberta regions, the percentage who died within a year ranged from 15% to 31%. In British Columbia, the range was from 14% to 29%, although the relatively high percentages in some

Table 5
Percentage of heart attack patients hospitalized between April 1, 1995 and March 31, 1996 who died within one year, by health region, four provinces

Health region	%
Nova Scotia	
Western	21.2
Central	19.8
Northern	18.3
Eastern	22.0
Saskatchewan	
Regina	22.8
Saskatoon	24.1
Others†	23.7
Alberta	
Chinook Regional Health Authority	20.5
Calgary Regional Health Authority	14.7
David Thompson Regional Health Authority	18.7
East Central Regional Health Authority	30.8
Capital Health Authority	18.6
Lakeland Regional Health Authority	21.0
Others†	18.0
British Columbia	
North Okanagan	24.4
South Okanagan/Similkameen	27.1
Thompson	28.8
Fraser Valley	22.8
South Fraser Valley	21.0
Simon Fraser	26.0
Central Vancouver Island	23.6
Upper Island/Central Coast	28.8
Northern Interior	13.9
Vancouver	29.4
Burnaby	27.2
North Shore	26.1
Richmond	22.2
Capital	24.9
Others†	21.2

Data source: *Person-oriented Information Database, Mortality Database*
† Less than 100,000 population

regions may be related to the province's hospital admission policy (see *Limitations*). In British Columbia, people who die in the emergency ward within six hours of arrival may be deemed inpatients.

There was much less difference in mortality rates among health regions in Nova Scotia, where percentages varied from 18% to 22%, and in Saskatchewan, where the range was from 23% and 24%.

Revascularization and mortality

The mortality rate of heart attack patients who had been revascularized was lower than the rate among those who had not been revascularized. Just over 5% of men who had undergone revascularization died within the year, compared with 25% who had not been revascularized. For female AMI patients, the corresponding figures were 9% and 33%. But patients who were revascularized tended to be both younger and healthier than those who were not. Thus, to assess the independent association of each variable with post-heart attack mortality, it is necessary to account for these interrelationships. This was done by adjusting for age, co-morbidity, health region and revascularization.

Not surprisingly, hazard ratios of dying within the year rose with age and with the number of co-morbidities (Table 6). Each additional year of age increased the risk of dying by 7% among men and by 6% among women. For both sexes, a 1-point increment in their score on the Charlson Index was associated with a 21% increase in their risk of dying.

In health regions where the rate of revascularization was relatively high, the percentage of heart attack patients who died tended to be lower (Chart 5). Still, health regions differ in factors other than rates of revascularization that might affect death rates. These include age, sex and co-morbidity of patients.

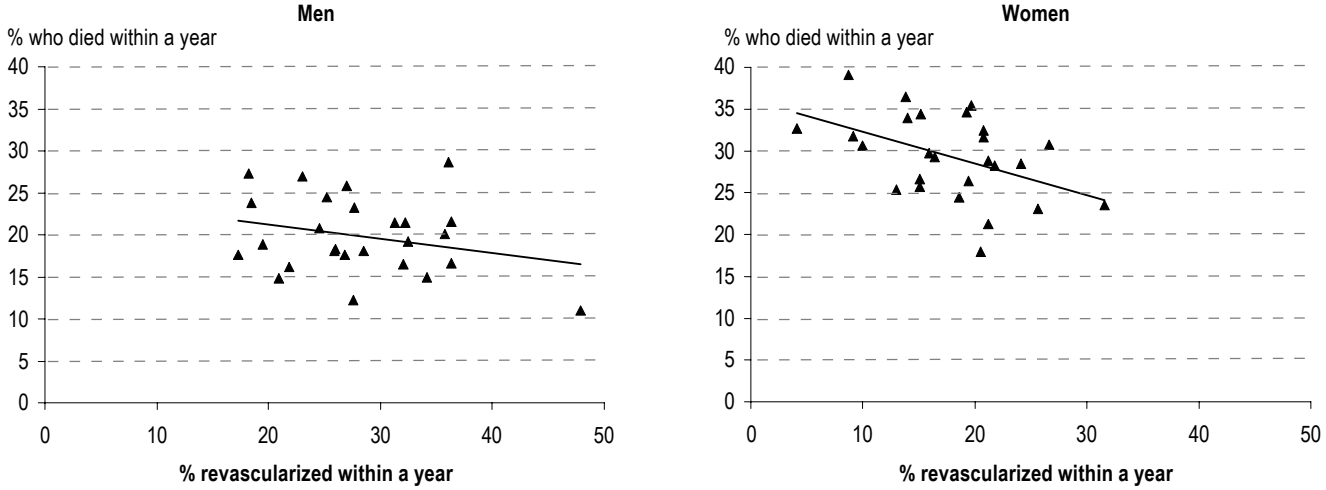
When the effects of age and co-morbidity, as well as revascularization, were taken into account, among male heart attack patients, the hazard ratios for dying within a year did not differ significantly from the Calgary RHA in any of the Nova Scotia health regions, and the ratio was significantly high (based on a 95% confidence interval) in only one Alberta health region. However, compared with their Calgary RHA counterparts, male AMI patients in the Saskatchewan health regions had an increased risk of dying, as did those in five British Columbia

Table 6
Hazard ratios for death within one year, male and female heart attack patients hospitalized between April 1, 1995 and March 31, 1996, four provinces

	Men		Women	
	Hazard ratio	95% confidence interval	Hazard ratio	95% confidence interval
Age	1.07*	1.06, 1.07	1.06*	1.05, 1.07
Charlson Index	1.21*	1.18, 1.25	1.21*	1.16, 1.27
Revascularization				
Within 0-14 days	0.73*	0.57, 0.94	0.87	0.63, 1.22
Within 15-365 days	0.66*	0.47, 0.91	1.05	0.69, 1.61
Nova Scotia				
Western	1.25	0.89, 1.76	0.93	0.64, 1.35
Central	1.07	0.74, 1.54	0.97	0.67, 1.41
Northern	1.10	0.71, 1.71	0.92	0.58, 1.46
Eastern	1.20	0.84, 1.71	1.23	0.85, 1.79
Saskatchewan				
Regina	1.51*	1.06, 2.16	1.12	0.76, 1.65
Saskatoon	1.55*	1.07, 2.23	1.12	0.74, 1.69
Others†	1.43*	1.08, 1.90	1.18	0.86, 1.61
Alberta				
Chinook Regional Health Authority	0.91	0.58, 1.43	1.12	0.71, 1.77
David Thompson Regional Health Authority	1.34	0.87, 2.06	0.83	0.47, 1.47
East Central Regional Health Authority	1.81*	1.16, 2.82	1.66	0.99, 2.79
Capital Health Authority	1.35	0.99, 1.82	0.88	0.63, 1.24
Lakeland Regional Health Authority	1.24	0.76, 2.02	1.01	0.56, 1.83
Others†	1.31	0.98, 1.75	0.95	0.68, 1.34
British Columbia				
North Okanagan	1.16	0.73, 1.85	1.59*	1.02, 2.49
South Okanagan/ Similkameen	1.53*	1.07, 2.19	1.22	0.83, 1.80
Thompson	2.35*	1.56, 3.56	1.42	0.82, 2.44
Fraser Valley	1.40	0.99, 1.99	0.92	0.62, 1.37
South Fraser Valley	1.23	0.89, 1.70	0.97	0.69, 1.37
Simon Fraser	1.87*	1.27, 2.74	1.43	0.98, 2.08
Central Vancouver Island	1.39	0.99, 1.97	1.21	0.80, 1.83
Upper Island/Central Coast	2.30*	1.51, 3.51	1.21	0.69, 2.12
Northern Interior	1.30	0.71, 2.40	1.03	0.47, 2.25
Vancouver	1.59*	1.16, 2.16	1.30	0.93, 1.82
Burnaby	1.47	0.97, 2.22	1.17	0.75, 1.84
North Shore	1.17	0.79, 1.72	1.19	0.73, 1.94
Richmond	1.05	0.62, 1.78	1.21	0.71, 2.05
Capital	1.33	0.95, 1.86	1.08	0.75, 1.54
Others†	1.67*	1.25, 2.23	1.22	0.90, 1.67

Data source: *Person-oriented Information Database*
Note: *Reference group is Calgary Regional Health Authority.*
† Less than 100,000 population
** $p < 0.05$*

Chart 5
Percentage of male and female heart attack patients hospitalized between April 1, 1995 and March 31, 1996 who died within a year, by percentage who were revascularized, health regions,† four provinces‡



Data source: *Person-oriented Information Database*
† 100,000 population or more
‡ Nova Scotia, Saskatchewan, Alberta, British Columbia

Limitations

The one-year period during which patients were tracked is too short to identify everyone who eventually undergoes revascularization. Since the analysis is based on a one-year cohort, 1995/96, it is not possible to generalize the results beyond this period. As well, results for four provinces cannot be used to infer the national situation.

Record linkage in the Person-oriented Information Database was done separately for each province. Thus, a patient with heart attack-related hospital admissions in two different provinces during the same fiscal year would be counted more than once.[21] However, the overall effect of such events is considered small. In fact, because procedures performed outside a patient's province of residence do not always have the health insurance number on the morbidity file, it is more likely that out-of-province procedures could result in an underestimation of the number of residents of a particular province undergoing revascularization.

While adjustments were made to account for co-morbidity, the only data available were those in an administrative data base. Clinical factors such as the site and severity of the AMI and blood pressure and heart rate at admission could not be taken into account. As well, some hospitals may not have coded all co-existing conditions in the discharge abstracts that are the basis for this analysis. On the other hand, it is unlikely that undercoding of co-morbid disease would dramatically alter a hospital's risk-adjusted mortality rate, as demonstrated in a California AMI validation study.[22]

A major limitation of this analysis is the lack of data on risk factors, disease severity, medications and specific treatments, and follow-up information on functional status and morbidity.

The hospital morbidity database does not include people who were revascularized as outpatients. However, other reports have shown that this is a relatively rare occurrence: 92% of PTCAs in the United States[23] and almost all PTCAs in Alberta[24] were performed on inpatients, as were all CABGs in both places.

Revascularization rates in this analysis are not completely accurate representations of the extent of revascularization performed on AMI patients by hospitals in any specific health region. The data are based on the patient's postal code and do not necessarily coincide with the location of the facility where the procedure was performed.

Health regions were identified based on residential postal codes provided by patients on admission and are subject to error. Patients may be unable to provide their postal code or have no fixed address. Such cases are not treated in the same way by all institutions. Some hospitals use the facility's postal code; others use a special value.

The association between revascularization and deaths may be diluted because the mortality figures include all causes of death. Revascularization rates were low among AMI patients with other health problems. However, the co-morbidities may have placed those patients at increased risk of dying from a non-heart health problem within the year.

Except for British Columbia, this analysis is limited to patients who were registered as inpatients, and so does not reflect all AMI deaths. Admissions in British Columbia are based on presentation; that is, when the person first arrives at the facility. British Columbia patients who die in the emergency room (not yet registered as inpatients, but present at the facility) within six hours may be deemed inpatients. This practice varies by facility. The robustness of the models was tested by removing deaths that occurred in less than one day in all four provinces and comparing the results with those reported here. The conclusions that can be drawn from both analyses are similar.

health regions. On the other hand, for female heart attack patients, the risk of dying was significantly high, compared with Calgary, in only one large British Columbia health region.

Allowing for the effects of age, sex, co-morbidity and region, the hazard ratio for dying was low among male patients who had been revascularized. The risk of dying was 27% lower among men who had had a procedure within two weeks than among those who had not been revascularized. For those revascularized at a later date that year, the risk of dying was 34% lower. The difference between these two figures could indicate that patients who are revascularized sooner may have been more urgent cases, and at the same time more seriously ill, in ways that are not well measured by the Charlson Index. Among female heart attack patients, neither early nor later revascularization was associated with the risk of dying.

Concluding remarks

Revascularization is an important treatment option following a heart attack, but not all patients are appropriate candidates. The first consideration is the nature of the blockage and whether it is suitable for angioplasty or coronary artery bypass graft surgery. The second consideration is the patient's age and the presence of co-morbidities that would contraindicate an invasive procedure.

In fact, according to this analysis, most AMI patients are not revascularized. A year after their heart attack, three-quarters of the 12,271 patients admitted to hospital in 1995/96 in Nova Scotia, Saskatchewan, Alberta and British Columbia had not been revascularized. Revascularization tended to be performed less frequently on those who were elderly or who had other conditions, and was more common among men than women.

A key measure of the effectiveness of any procedure is how long patients survive. When age, co-morbidity and health region were taken into consideration, male heart attack patients who had been revascularized were at less risk of dying than were those who had not had such a procedure. Revascularization was not significantly associated with women's chances of survival, possibly a reflection of the smaller number of women in this analysis.

There was substantial, unexplained variation in rates of revascularization and death among the large health regions of the four provinces. To some extent, this may be associated with factors that vary geographically, but are not available in hospital morbidity or mortality data. Geographical differences in any surgical procedure may reflect the relative importance of professional discretion in the decision to use it; diagnostic and practice styles; and physicians' training, experience and belief in the efficacy of the procedure. Hospital policies, practices and facilities may vary from region to region, as may the severity of heart attack cases. Clinical variables such as arrival time in hospital, use of secondary preventive medications,[25,26] cardiac rehabilitation services, and outpatient care after discharge may also differ by region.[27] In addition, patient characteristics such as smoking and obesity, and whether the individuals subsequently reduced their risk exposure may be influential. Socio-economic status, the availability of social support, and the individual's work environment are well-established health determinants[28-30] that could not be directly examined, but that might be associated with health region.

Geographic variations in revascularization rates within Canadian provinces[31-35] and between Canada and the United States[36-38] are not new and have sparked a debate on the appropriate rate of use of these procedures and raised questions about waiting times.[39-43]

There is no consensus on the optimal rate of revascularization after a heart attack. The greater use of revascularization in the United States does not consistently improve mortality rates,[36,37] although a recent study concluded that American patients experienced a better quality of life than Canadian patients, which might be attributable to more aggressive management based on early coronary angiography and PTCA.[44] As well, a significant excess of angina pectoris with resultant diminished quality of life has been reported for the lower Canadian surgery levels, compared with the United States.[37,38]

The results of this analysis are suggestive, but not definitive. As noted, the data do not contain clinical details on the severity of the AMI or other medical treatments that may have been administered when patients arrived at hospital, information about the facilities or the physicians in those facilities who would make treatment decisions, or information about patient characteristics that would influence those decisions and affect one-year survival. Therefore, this analysis cannot assess whether revascularization rates are too low or too high. ●

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References

1 Heart and Stroke Foundation of Canada. *The Changing Face of Heart Disease and Stroke in Canada, 2000.* Ottawa: Heart and Stroke Foundation of Canada, 1999.

2 Heart and Stroke Foundation of Canada. *Heart Disease and Stroke in Canada.* Ottawa: Heart and Stroke Foundation of Canada, 1995.

3 Berkow R, Beers MH, Fletcher AJ, eds. *The Merck Manual of Medical Information.* Whitehouse Station, New Jersey: Merck & Co., Inc., 1997.

4 World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries and Death.* Based on the recommendations of the Ninth Revision Conference, 1975. Geneva: World Health Organization, 1977.

5 Statistics Canada. *Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures.* Ottawa: Statistics Canada, Health Division, 1968.

6 Weintraub WS, Jones EL, Craver JM, et al. Frequency of repeat coronary bypass or coronary angioplasty after coronary artery bypass surgery using saphenous venous grafts. *American Journal of Cardiology* 1994; 73(2): 103-12.

7 King SB III, Lembo NJ, Weintraub WS, et al. A randomized trial comparing coronary angioplasty with coronary bypass surgery. Emory Angioplasty versus Surgery Trial. *The New England Journal of Medicine* 1994; 331(16): 1044-50.

8 Kostis JB, Wilson AC, O'Dowd K, et al. Sex differences in the management and long-term outcome of acute myocardial infarction. A statewide study. MIDAS Study Group. Myocardial Infarction Data Acquisition System. *Circulation* 1994; 90(4): 1715-30.

9 Majeed FA, Cook DG. Age and sex differences in the management of ischemic heart disease. *Public Health* 1996; 110(1): 7-12.

10 Jagal SB, Goel V, Naylor CD. Sex differences in the use of invasive coronary procedures in Ontario. *Canadian Journal of Cardiology* 1994; 10(2): 239-44.

11 Giles WH, Anda RF, Casper ML, et al. Race and sex differences in rates of invasive cardiac procedures in US hospitals. Data from the National Hospital Discharge Survey. *Archives of Internal Medicine* 1995; 155(3): 318-24.

12 Salley RK, Robinson MC. Ischemic heart disease in the elderly: The role of coronary angioplasty and coronary artery bypass grafting. *Southern Medical Journal* 1993; 86(10): 2S15-22.

13 Hannan EL, Burke J. Effect of age on mortality in coronary artery bypass surgery in New York, 1991-1992. *American Heart Journal* 1994; 128(6 Pt 1): 1184-91.

14 McDonald P, Shortt H, Sanmartin C, et al. *Waiting Lists and Waiting Times for Health Care in Canada: More Management. More Money.* Ottawa: Health Canada, 1998.

15 Hartford K, Ross LL, Walld R. Regional variation in angiography, coronary artery bypass surgery, and percutaneous transluminal coronary angioplasty in Manitoba, 1987 to 1992: the funnel effect. *Medical Care* 1998; 36(7): 1022-32.

16 Slaughter PM, Young W, DeBoer DP, et al. Patterns of revascularization. In: Naylor CD, Slaughter PM, eds. *Cardiovascular Health and Services in Ontario: An ICES Atlas.* Toronto: Institute for Clinical Evaluative Sciences, 1999: 165-87.

17 D'Hoore W, Sicotte C, Tilquin C. Risk adjustment in outcome assessment: the Charlson Comorbidity Index. *Methods of Information in Medicine* 1993; 32: 382-7.

18 Librero J, Peiro S, Ordinana R. Chronic comorbidity and outcomes of hospital care: length of stay, mortality, and readmission at 30 and 365 days. *Journal of Clinical Epidemiology* 1999; 52(3): 171-91.

19 Ghali WA, Hall RE, Rosen AK, et al. Searching for an improved clinical comorbidity index for use with ICD-9-CM administrative data. *Journal of Clinical Epidemiology* 1996; 49(3): 273-8

20 Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *Journal of Clinical Epidemiology* 1992; 45(6): 613-9.

21 Burr KF, McKee B, Foster LT, et al. Interprovincial data requirements for local health indicators: The British Columbia experience. *Health Reports* (Statistics Canada, Catalogue 82-003) 1995; 7(2): 17-24.

22 Lee KL, Woodlief LH, Topol EJ, et al. Predictors of 30-day mortality in the era of reperfusion for acute myocardial infarction. Results from an international trial of 41,021 patients. GUSTO I Investigators. *Circulation* 1995; 91: 1659-68.

23 Centers for Disease Control and Prevention, National Center for Health Statistics. *Ambulatory and Inpatient Procedures in the United States, 1996*. Vital and Health Statistics (Series 13, Number 139) Hyattsville, Maryland: US Department of Health and Human Services, November, 1998.

24 Private communication, Dr. Merril Knudtson, Foothills Hospital, Alberta.

25 Long-term effects of intravenous thrombolysis in acute myocardial infarction: final report of the GISSI study. Gruppo Italiano per lo Studio della Streptochi-nasinell: Infarto Miocardico (GISSI). *Lancet* 1987; 2(8564): 871-4.

26 Wilkes NP, Jones MP, O'Rourke MF, et al. Determinants of recurrent ischaemia and revascularisation procedures after thrombolysis with recombinant tissue plasminogen activator in primary coronary occlusion. *International Journal of Cardiology* 1991; 30(1): 69-76.

27 Mant J, Hicks N. Detecting differences in quality of care: The sensitivity of measures of process and outcome in treating acute myocardial infarction. *British Medical Journal* 1995; 311: 793-6.

28 Marmot MG, Bosma H, Hemingway H, et al. Contribution of job control and other risk factors to social variations in coronary heart disease incidence. *Lancet* 1997; 350(9073): 235-9.

29 Hemingway H, Shipley M, Macfarlane P, et al. Impact of socioeconomic status on coronary mortality in people with symptoms, electrocardiographic abnormalities, both or neither: the original Whitehall study 25-year follow-up. *Journal of Epidemiology and Community Health* 2000; 54(7): 510-6.

30 Marmot MG, Shipley MJ, Rose G. Inequalities in death—specific explanations of a general pattern? *Lancet* 1984; 1(8384): 1003-6.

31 Johansen H, Nargundkar M, Nair C, et al. At risk of first or recurring heart disease. *Health Reports* (Statistics Canada, Catalogue 82-003) 1998; 9(4): 19-29.

32 Roos LL, Sharp SM. Innovation, centralization, and growth: coronary artery bypass graft surgery in Manitoba. *Medical Care* 1989; 27: 441-52.

33 Platt GH, Svenson LW, Woodhead SE. Coronary artery bypass grafting in Alberta from 1984 to 1989. *Canadian Journal of Cardiology* 1993; 9: 621-4.

34 Ugnat AM, Naylor CD. Regionalized delivery and variable utilization: coronary surgery in Ontario, 1981-1991. *Canadian Medical Association Journal* 1994; 151: 575-80.

35 Naylor CD, Jaglal SB. Regional revascularization patterns after myocardial infarction in Ontario. *Canadian Journal of Cardiology* 1995; 11(8): 670-4.

36 Rouleau JL, Moye LA, Pfeffer MA, et al. A comparison of management patterns after acute myocardial infarction in Canada and the United States. *The New England Journal of Medicine* 1993; 328: 779-84.

37 Mark DB, Naylor CD, Hlatky MA, et al. Use of medical resources and quality of life after acute myocardial infarction in Canada and the United States. *The New England Journal of Medicine* 1994; 331: 130-5.

38 Tu JV, Pashos CL, Naylor CD, et al. Use of cardiac procedures and outcomes in elderly patients with myocardial infarction in the United States and Canada. *The New England Journal of Medicine* 1997; 336(21): 1500-5.

39 Naylor CD, Sykora K, Jefferson S, Steering Committee of the Adult Cardiac Care Network of Ontario. Waiting for coronary artery bypass surgery: population-based study of 8,517 consecutive patients in Ontario, Canada. *Lancet* 1995; 346: 1605-9.

40 Hux JE, Naylor CD. Are the marginal returns of coronary artery surgery smaller in high-rate areas? The Steering Committee of the Provincial Adult Cardiac Care Network of Ontario. *Lancet* 1996; 348: 1202-7.

41 Underwood MJ, Firmin RK, Jehu D. Aspects of psychological and social morbidity in patients awaiting coronary artery bypass grafting. *British Heart Journal* 1993; 69(5): 382-4.

42 Mulgan R, Logan RL. The coronary bypass waiting list: a social evaluation. *New Zealand Medical Journal* 1990; 103(895): 371-2.

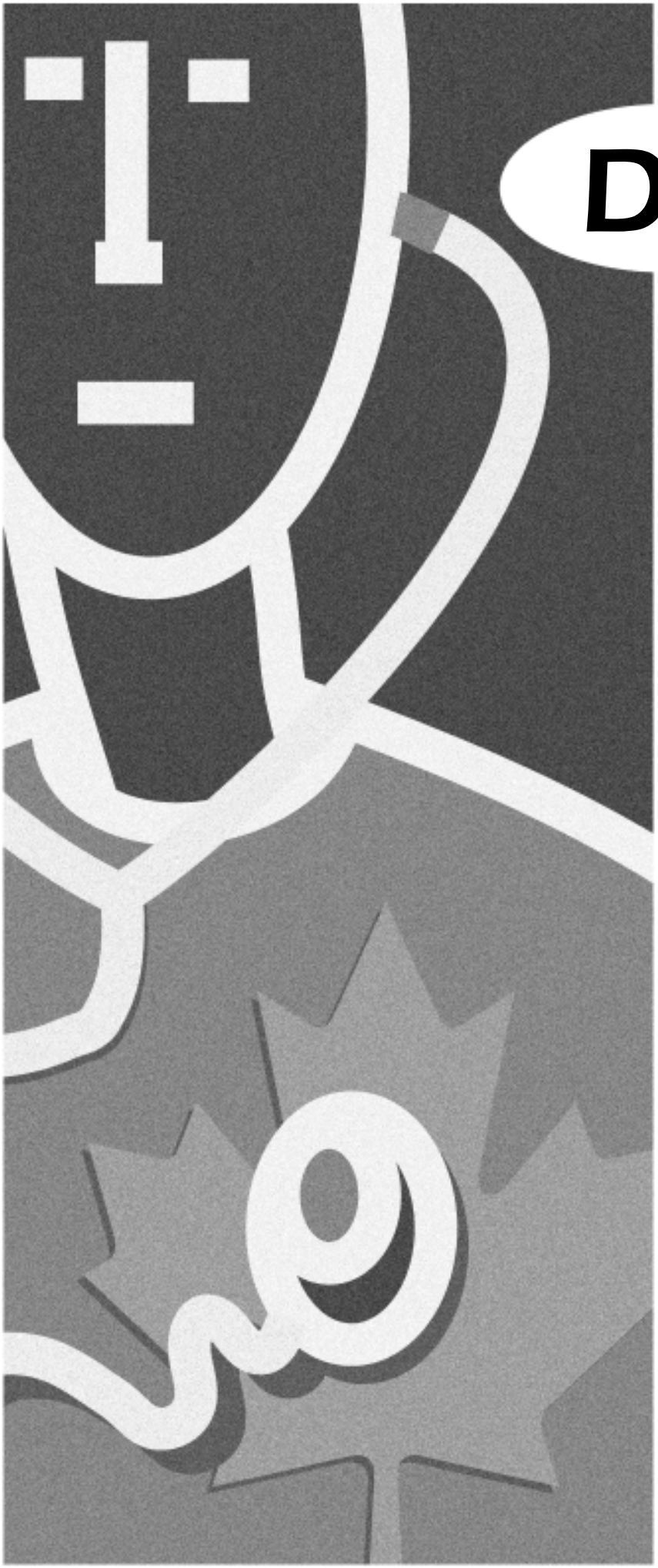
43 Doogue M, Brett C, Elliott JM. Life and death on the waiting list for coronary bypass surgery. *New Zealand Medical Journal* 1997; 110(1037): 26-30.

44 Langer A, Fisher M, Califf RM, et al. Higher rates of coronary angiography and revascularization following myocardial infarction may be associated with greater survival in the United States than in Canada. The CARS Investigators. *Canadian Journal of Cardiology* 1999; 15(10): 1095-102.

Appendix

Conditions used for Charlson Index

Weight	Condition	ICD-9 code
1	Myocardial infarction	410, 411
	Congestive heart failure	398, 402, 428
	Peripheral vascular disease	440-447
	Dementia	290, 291, 294
	Cerebrovascular disease	430-433, 435
	Chronic pulmonary disease	491-493
	Connective tissue disease	710, 714, 725
	Ulcer disease	531-534
	Mild liver disease	571, 573
2	Hemiplegia	342, 434, 436,437
	Moderate or severe renal disease	403, 404, 580-586
	Diabetes	250
	Any tumor	140-195
	Leukemia	204-208
	Lymphoma	200, 202, 203
3	Moderate or severe liver disease	570, 572
6	Metastatic solid tumor	196-199



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The proportion of first-time mothers aged 30 or older more than doubled between 1983 and 1999, from 14% to 32%. The pattern was similar for fathers of babies born to first-time mothers. In 1999, men aged 30 or older fathered 51% of such babies, up from 32% in 1983.

In total, 337,429 babies were born in 1999, down 1.5% from the previous year. This was the ninth year of decline, although this most recent drop fell well short of 1997's record decrease of 4.8%. While the number of live births was down in most provinces and territories, Newfoundland, Prince Edward Island and Alberta recorded increases.

The fertility rate, which estimates the average number of children a woman will have in her lifetime, continued its nine-year fall to a new low of 1,528 births per 1,000 women aged 15 to 49.

Twins, triplets and other multiple births accounted for 2.7% of all births in 1999. Since 1979, the number of multiple-birth babies has risen 25%, while the total number of births has decreased by almost 8%. This trend accelerated in recent years: between 1993 and 1999, the number of multiple-birth babies increased 12.5%, while the total number of births declined 13.2%. Women aged 30 or older accounted for over half of multiple-birth babies (55%) in 1999.

Babies in multiple births are much more likely to be premature. In 1999, 53% of multiple-birth babies were born before 37 weeks' gestation, compared with 7% of babies in single births.

The proportion of babies with low birth weight (less than 2,500 grams) continued to fall in 1999, to 5.6% of all live births. Excluding multiple births, only 4.4% of babies born in 1999 had a low birth weight.

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A total of 152,821 couples married in 1998, virtually unchanged from the previous year. The crude marriage rate was 5.1 for every 1,000 population, well below the 1988 and 1989 peaks of 7.0 that partly reflected a surge in remarriages after changes to the Divorce Act. Prince Edward Island had the highest marriage rate in 1998 (6.4 per 1,000 population), followed by Alberta. Québec, which had the lowest rate (3.1 per 100,000), also recorded the greatest decrease in marriages between 1997 and 1998 (-4.2%). The declines, especially those in Québec, may partly reflect the popularity of common-law relationships.

Three-quarters of both brides and grooms were married for the first time in 1998. One-fifth (22%) remarried following divorce, and 3% had been widowed. On average, the age difference between brides and grooms was 5.2 years when the groom was the older partner, and 3.7 years when the groom was younger.

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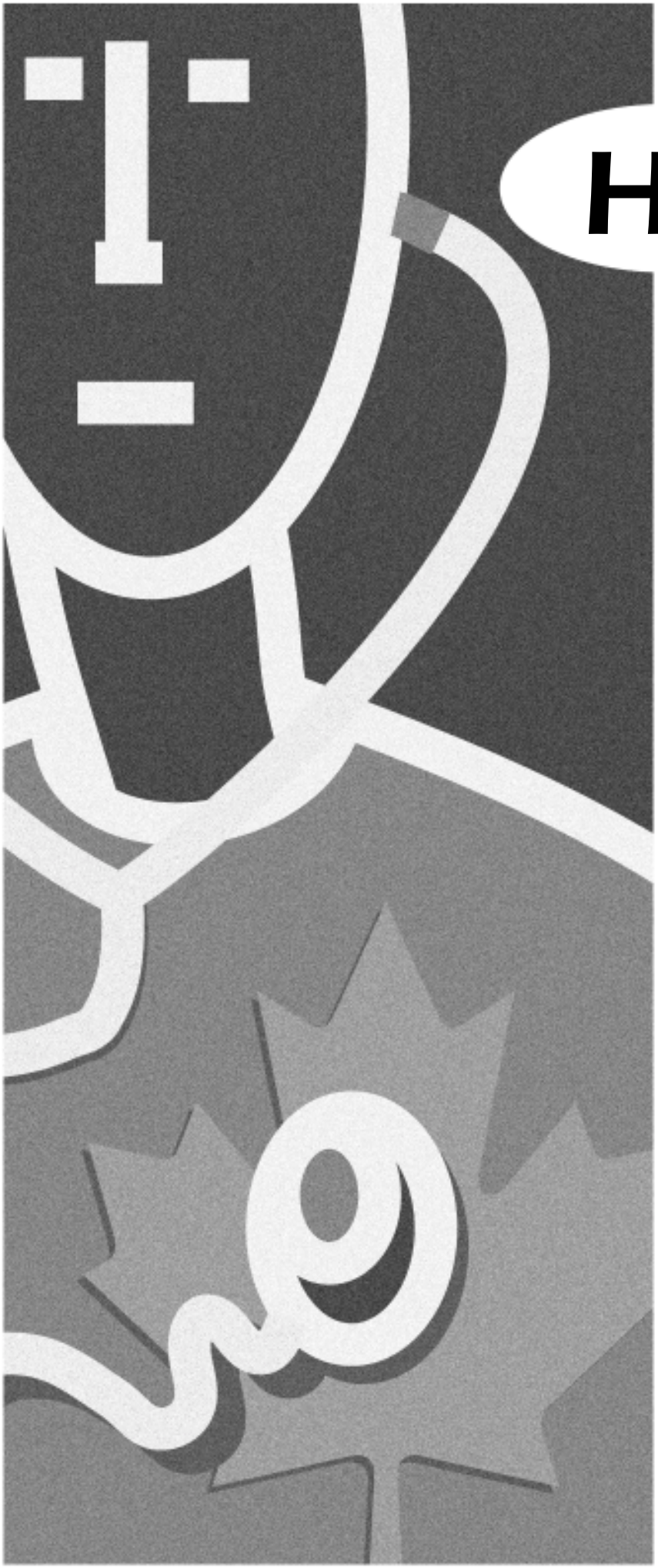

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