Premature mortality in health regions with high Aboriginal populations

Yvon E. Allard, Russell Wilkins and Jean-Marie Berthelot

Abstract

Objectives

Potential years of life lost (PYLL) before age 75 in health regions with a relatively high proportion of Aboriginal residents is compared, by cause of death, with all other health regions.

Data sources

The findings are based on mortality data for 1995 through 1997 from the Canadian Vital Statistics Database, and on population estimates for 1995, 1996 and 1997 at the health region level.

Analytical techniques

PYLL was calculated by age and sex for two groups of health regions: the 18 with a high proportion (19% or more) of Aboriginal residents and the remaining 120, which had smaller proportions of Aboriginal residents. PYLL rate differences and rate ratios were used to compare the two groups.

Main results

The PYLL rate per 1,000 person-years at risk for all causes of death was about 50% greater in the high-Aboriginal health regions than in the other group. Almost 40% of total PYLL in high-Aboriginal health regions was attributable to injuries, notably, suicide and motor vehicles accidents.

Key words

death rate, accidents, regional health planning, rural health, databases

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Aboriginal populations worldwide have undergone major social, economic and cultural changes in the past several decades, some of which may have negatively affected their health status.[1,2] In Canada, as in other countries, Aboriginal peoples bear a disproportionate burden of disease and die younger and at higher rates than do members of the non-Aboriginal population.[2-8]

The three leading causes of death in Canada are diseases of the circulatory system, cancer and respiratory diseases; injuries rank fourth.[2,6,9,10] By contrast, for Aboriginal peoples, injuries are the leading cause of death, followed by diseases of the circulatory system and cancer.[2,4-6,9] In 1996 and 1997, compared with the total Canadian population, Aboriginal people were over six times as likely to die of injuries.[5,6,9,10]

In Canada, provincial authorities have established administrative areas known as health regions for the delivery of local health and social services. A 1999 study found that in 9 of the 12 health regions with the shortest life expectancy, at least 20% of residents were of Aboriginal origin.[11]

In such regions, therefore, the racial and ethnic composition of the population, and how that may influence the region's health status, are among the factors that policy makers may wish to consider.

Methods

Data sources

Mortality data for 1995 through 1997 are from the Canadian Vital Statistics Database, which is based on information collected on death registrations by the provincial and territorial registries of vital statistics.

Population estimates for 1995, 1996 and 1997 at the health region level[12] were adjusted for net census undercount and incomplete enumeration of some Indian reserves (see *Limitations*).

Analytical techniques

This analysis presents potential years of life lost (PYLL) before age 75 for two groups of health regions: 18 designated "high-Aboriginal" because 19% or more of residents self-identified as Aboriginal in the 1996 Census, and the other 120 designated "low-Aboriginal," with fewer than 19% of residents claiming Aboriginal identity (see *Definitions*). The 19% cut-off represents a natural gap between health regions in their percentage of Aboriginal residents. Among the 18 regions selected for this analysis, the lowest Aboriginal component was 19.3% (Appendix Table A). Overall, in the 18 high-Aboriginal regions, 35% of residents claimed Aboriginal origins; the overall figure in the other regions was 2%.

With a modified version of the methods described by Romeder and McWhinnie,[13] PYLL before age 75 was calculated, by sex and for both sexes together, by multiplying the number of deaths in each age group by the difference between 75 and the age at the mid-point of each age group, then summing that product over all age groups.[14,15] Age 75 was chosen because it is the conventional limit for premature death in Canada, and because deaths before 75 are less likely than those at older ages to have more than one contributing cause. It was also close to the average life expectancy for the 18 high-Aboriginal health regions.

For each sex and cause of death, the variance of PYLL was calculated as the sum over the 16 age groups of the quantity (C^2 x N x P x Q), where C is the number of potential years of life lost per death in the age group, N is the number of person-years at risk in the age group, P is the age-specific death rate (deaths in the age group / N), and Q is 1-P. The results were used in tests for the significance of the PYLL rate differences and PYLL rate ratios, comparing high- and low-Aboriginal health regions.

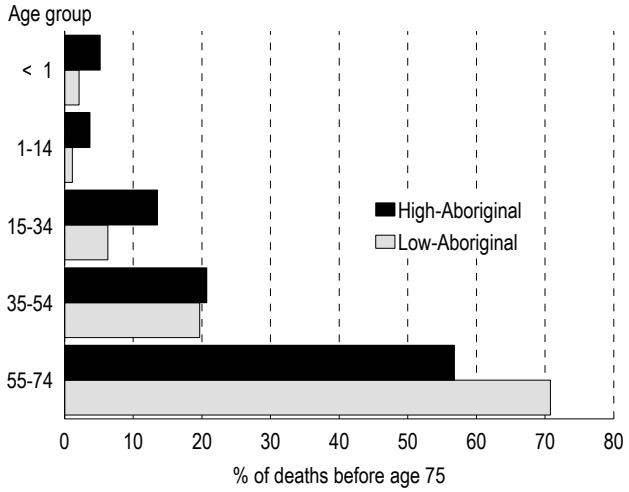
Quantifying health status has long been a concern of epidemiologists and public health authorities. While cause-deleted life expectancy and cause-specific mortality rates are useful in assessing the relative impact of clinical diseases, these measures tend to be dominated by deaths at older ages. To a considerable extent, Aboriginal peoples' life expectancy is shorter because of high mortality rates for many causes that tend to occur early in life.[1,2,4-8] This phenomenon is best revealed by another measure—potential years of life lost or PYLL—which gives more weight to deaths that occur at younger ages.

This article compares health regions with a relatively high proportion (19% or more) of Aboriginal residents with other health regions in terms of potential years of life lost. It focuses on causes of death that place residents of high-Aboriginal regions at greater risk of premature mortality (see *Methods, Definitions* and *Limitations*).

Young age distribution of deaths

Residents of high-Aboriginal health regions tend to die at a comparatively young age. Over the 1995-to-1997 period, 54% of all deaths in such regions occurred before age 75, compared with 45% of deaths in the other health regions. Moreover, in the

Chart 1
Age distribution of deaths before age 75, high- and low-Aboriginal health regions, Canada, 1995 to 1997



Data sources: *1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997*

high-Aboriginal regions, young people accounted for a much larger share of deaths before age 75 than was the case in the other group of regions (Chart 1). For instance, infants younger than age 1 made up 5% of such deaths in the high-Aboriginal regions, and 2% in the other group. Children aged 1 to 14 accounted for 4% and 1% of deaths, respectively. For 15- to 34-year-olds, the corresponding figures were 14% and 6%.

Potential years of life lost

Potential years of life lost, which highlights the loss resulting from early death, is suited to evaluating the impact of various causes of death on populations characterized by premature mortality. The PYLL rate is the number of potential years of life lost divided by the person-years at risk (see *Methods*).

For the 1995-to-1997 period, the PYLL rate in the high-Aboriginal health regions was 84 potential years of life lost per 1,000 person-years at risk, compared with 56 in the low-Aboriginal regions (Table 1). In both groups of regions, PYLL rates for males were well above those of females, but the high-/low-Aboriginal disparity persisted. For males, the respective PYLL rates were 104 versus 72; for females, 62 versus 41.

Leading causes

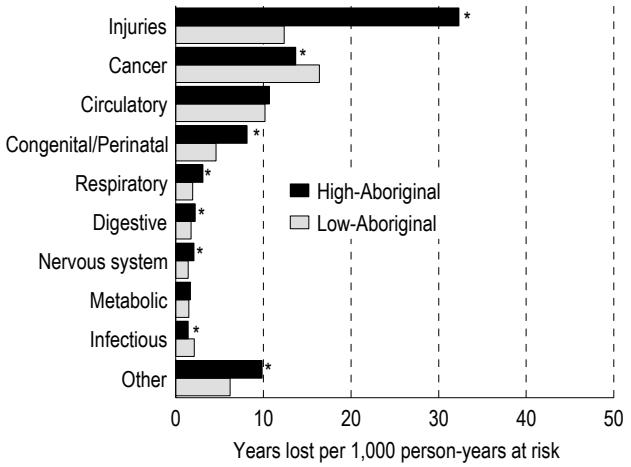
In the high-Aboriginal health regions, injuries accounted for the greatest loss of potential years of life, followed by cancer, diseases of the circulatory

Table 1
Rates of potential years of life lost (PYLL) before age 75 per 1,000 person-years at risk, by cause of death and sex, high- and low-Aboriginal health regions, Canada, 1995 to 1997

	Both sexes				Males				Females			
	PYLL rate				PYLL rate				PYLL rate			
Cause of death	High-Aboriginal regions	Low-Aboriginal regions	Rate difference	Rate ratio	High-Aboriginal regions	Low-Aboriginal regions	Rate difference	Rate ratio	High-Aboriginal regions	Low-Aboriginal regions	Rate difference	Rate ratio
All causes	**83.8**	**56.3**	**27.4***	**1.49***	**104.4**	**71.5**	**32.9***	**1.46***	**61.6**	**41.0**	**20.6***	**1.50***
Injuries	32.3	12.4	20.0*	2.61*	46.7	18.7	27.7*	2.49*	17.0	6.0	11.0*	2.84*
Suicide	9.1	4.4	4.7*	2.06*	14.3	7.0	7.3*	2.04*	3.5	1.8	1.7*	1.95*
Motor vehicle accidents	9.0	3.8	5.2*	2.35*	12.2	5.4	6.7*	2.24*	5.6	2.2	3.4*	2.54*
Drowning	2.3	0.4	1.9*	5.69*	3.3	0.7	2.7*	5.07*	1.3	0.2	1.1*	7.84*
Homicide	2.0	0.6	1.4*	3.14*	2.4	0.9	1.5*	2.75*	1.6	0.4	1.2*	3.92*
Fire	1.5	0.3	1.2*	5.72*	2.0	0.4	1.6*	5.60*	2.0	0.2	1.8*	5.78*
Other	8.5	2.9	5.6*	2.96*	12.5	4.4	8.1*	2.83*	4.1	1.3	2.9*	3.23*
Cancer	13.7	16.4	-2.7*	0.84*	14.3	17.0	-2.7*	0.84*	13.0	15.8	-2.7*	0.83*
Lung	3.5	4.1	-0.6*	0.86*	4.1	4.9	-0.8*	0.83*	3.0	3.3	-0.4	0.89
Other	10.2	12.3	-2.1*	0.83*	10.3	12.1	-1.9*	0.85*	10.1	12.5	-2.4*	0.81*
Circulatory	10.7	10.2	0.5	1.05	14.4	14.2	0.3	1.02	6.7	6.2	0.5	1.08
Ischemic heart disease	5.6	6.1	-0.5*	0.92*	8.6	9.3	-0.7	0.93	2.4	2.9	-0.5*	0.82*
Stroke	1.8	1.5	0.3*	1.19*	1.9	1.7	0.2	1.11	1.8	1.4	0.4	1.29
Other circulatory	3.3	2.6	0.7*	1.28*	4.0	3.2	0.8*	1.24*	2.6	1.9	0.6*	1.32*
Congenital/Perinatal	8.1	4.6	3.5*	1.77*	9.0	5.1	3.9*	1.76*	7.2	4.1	3.1*	1.76*
Congenital	3.8	2.1	1.7*	1.78*	3.6	2.2	1.2*	1.53*	4.0	1.9	2.1*	2.10*
Perinatal	4.4	2.5	1.9*	1.75*	5.5	2.8	2.7*	1.95*	3.2	2.2	1.0*	1.46*
Respiratory	3.1	1.9	1.2*	1.60*	3.2	2.3	0.9*	1.41*	3.0	1.6	1.4*	1.87*
Digestive	2.2	1.8	0.5*	1.26*	2.0	2.3	-0.2	0.89	2.4	1.2	1.2*	1.95*
Nervous system	2.1	1.4	0.7*	1.47*	2.2	1.6	0.6*	1.40*	2.0	1.3	0.7*	1.56*
Metabolic	1.7	1.5	0.2	1.14	1.6	1.8	-0.2	0.92	1.7	1.2	0.6*	1.49*
Infectious	1.4	2.1	-0.7*	0.66*	1.6	3.5	-1.8*	0.47*	1.1	0.8	0.4	1.47
Mental disorders	1.2	0.6	0.6*	2.13*	1.3	0.8	0.6*	1.71*	1.0	0.3	0.7*	3.06*
All other causes	7.3	3.7	3.2*	2.06*	8.0	4.4	3.6*	1.81*	6.4	2.6	3.8*	2.48*

Data sources: *1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997*
Note: *Figures shown are rounded, but calculations were based on unrounded data. For ICD codes, see* Definitions.
** $p < 0.05$*

Chart 2
Rates of potential years of life lost (PYLL) before age 75, by major causes of death,† high- and low- Aboriginal health regions, Canada, 1995 to 1997



Data sources: *1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997*
† ICD chapters
** Significantly different from low-Aboriginal (p < 0.05)*

system, and congenital and perinatal causes (Chart 2). In the low-Aboriginal regions, the four leading causes of PYLL were the same, but cancer ranked first and injuries second. The PYLL rate for injuries in the high-Aboriginal regions was 2.6 times that in the other group, and the rate for perinatal and congenital causes was 1.8 times higher. The PYLL rates for diseases of the circulatory system were about the same in the two groups of regions, and the rate for cancer was actually lower in the high-Aboriginal regions.

In the high-Aboriginal regions, males had considerably higher PYLL rates than did females for injuries except for those caused by fires. As well, PYLL rates among males in these regions surpassed rates among females for ischemic heart disease, other circulatory diseases (except stroke), perinatal conditions (but not congenital anomalies), and infectious diseases.

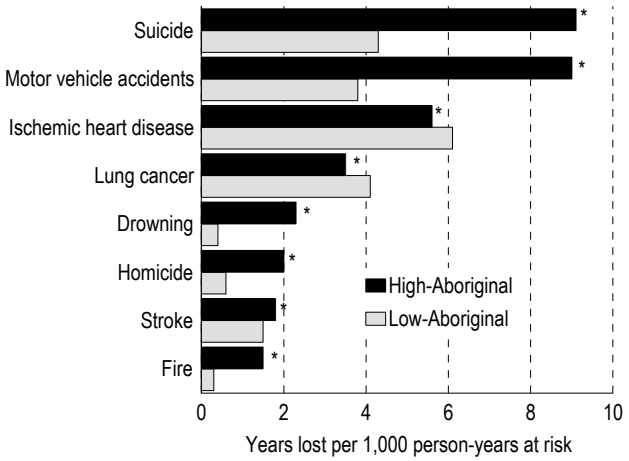
Injuries play major role

The toll in potential years of life lost due to injuries in high-Aboriginal health regions was considerable: 32 per 1,000 person-years at risk, compared with 12 in the low-Aboriginal regions. Injuries accounted for 39% of PYLL in high-Aboriginal region versus 22% in low-Aboriginal regions. In fact, nearly three-quarters (73%) of the PYLL rate difference between the two groups of regions was attributable to injuries.

Among deaths due to injuries, suicide and those involving motor vehicles were the most common causes of PYLL in the high-Aboriginal regions (Chart 3). The PYLL rates for suicide and motor vehicle accidents were each about 9 per 1,000 person-years at risk, more than twice the rates in the low-Aboriginal regions. According to a number of observers, some deaths classified as motor vehicle accidents may be intentional; that is, suicides.[5,16] Injury deaths may also be related to substance abuse, especially among young people.[17] Recent studies have found that, in the general population, short bouts of drinking to intoxication tend to be associated with violent assaults, road injuries and drownings.[17,18]

PYLL rates for drowning, fire, homicide, and other injuries in high-Aboriginal health regions far exceeded those in the other group of regions: rates for drowning and fire were more than five times higher; for homicide and other injuries, three times higher.

Chart 3
Rates of potential years of life lost (PYLL) before age 75, by specific causes of death, high- and low- Aboriginal health regions, Canada, 1995 to 1997



Data sources: *1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997*
** Significantly different from low-Aboriginal (p < 0.05)*

Cancer and circulatory system diseases

After injuries, cancer and diseases of the circulatory system, which typically occur at older ages, were the leading causes of PYLL in the high-Aboriginal health regions. However, these rates were not elevated compared with the other health regions, and in the case of cancer, the high-Aboriginal region PYLL rate was actually lower. Even the rate for lung cancer was lower in the high-Aboriginal regions, despite a much greater prevalence of smoking among Aboriginal peoples.[5,6,9]

Among diseases of the circulatory system, deaths due to ischemic heart disease predominated, especially for males. Although the PYLL rates in the high- and low-Aboriginal regions did not differ substantially, recent studies have found that Aboriginal peoples have a higher prevalence of cardiovascular diseases compared with the general population, and that rates of cardiovascular disease are increasing among Aboriginals.[2,20,21]

Definitions

Aboriginal refers to people who identified themselves as belonging to an Aboriginal group—First Nations, Inuit or Métis—on the 1996 Census (see *Limitations*). This definition includes registered First Nations individuals and those having Aboriginal identity or band membership. No distinction was made between on- and off-reserve Aboriginal people in this analysis.

Health regions are defined by provincial governments as the administrative areas of responsibility for regional health boards or areas of interest to health care authorities.

The proportion of Aboriginal residents in a health region is the number claiming Aboriginal identity divided by the region's total population. Health regions in which 19% or more of the population was Aboriginal were categorized as *"high-Aboriginal"*; those with less than 19%, *"low-Aboriginal."*

Potential years of life lost (PYLL) is a measure of premature mortality that gives greater weight to deaths at younger ages, compared with other summary indices of mortality, which are dominated by deaths of the elderly. Premature deaths are defined here as those occurring before age 75.

The following *causes of death*, coded according to the *International Classification of Diseases, Ninth Revision (ICD-9),*[19] were used for this analysis:

- Injuries (E800-E999), including suicide (E950-E959); motor vehicle accidents (traffic and non-traffic) (E810-E825); drowning (E910); homicide (E960-E978); accidents caused by fire (E890-D899); and other injuries (E816-889; E900-E909; E911-E949; E979-E999)
- Neoplasms (cancer), including lung cancer (162) and other cancers (140-161; 163-239)
- Circulatory (390-459): ischemic heart disease (410-414); cerebrovascular disease (stroke) (430-438); other circulatory (390-405; 415-429; 440-459)
- Congenital (740-759) and perinatal (excluding stillbirths) (760-779)
- Respiratory (460-519)
- Digestive (520-579)
- Nervous system (320-389)
- Metabolic (240-279)
- Infectious (001-139)
- Mental disorders (290-319)

The final category, "all other causes," groups all causes of death not listed above.

Congenital/Perinatal

Congenital and perinatal conditions were a major cause of PYLL in the high-Aboriginal health regions. The rate for congenital/perinatal causes, excluding stillbirths, in the high-Aboriginal regions was 8 potential years of life lost per 1,000 person-years at risk, compared with 5 in the low-Aboriginal regions. To some extent, this may reflect the age of the mother: births to teenage mothers have high rates of infant mortality,[22] and teen pregnancies are common among Aboriginal peoples.[5,9] Pneumonia and influenza, sudden infant death syndrome (SIDS) and fetal alcohol syndrome, which are causes of premature death in infants generally, are of particular concern in the Aboriginal community, because of their high prevalence and because they are preventable with proper health care intervention.[2,5,6,9]

Male–female differences

In both high- and low-Aboriginal health regions, PYLL rates for males exceeded rates for females. This indicates a higher risk of early death for males than for females, regardless of where they live. In the high-Aboriginal regions, the PYLL rate for males was 104 years per 1,000 person-years at risk, compared with 62 for females, or 1.7 times greater. In the low-Aboriginal health regions, although rates were lower, the male/female rate ratio was similar (1.7).

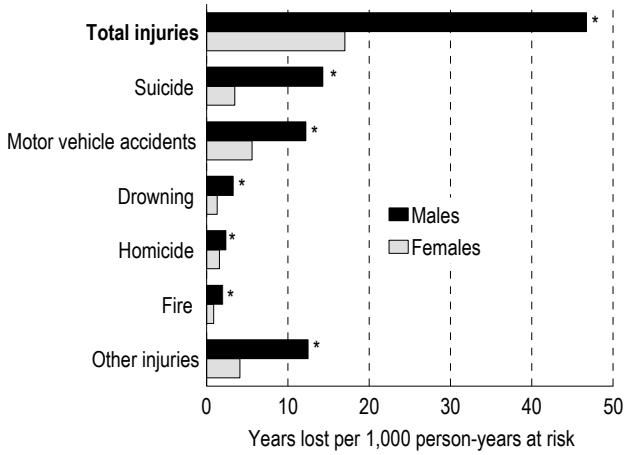
In the high-Aboriginal health regions, males had particularly elevated PYLL rates for suicides and for

Table 2
Rates of potential years of life lost (PYLL) before age 75 per 1,000 person-years at risk, all causes of death, by sex and age group, high- and low- Aboriginal health regions, Canada, 1995 to 1997

	PYLL rate			
	High-Aboriginal regions	Low-Aboriginal regions	Rate difference	Rate ratio
Both sexes	**84**	**56**	**28***	**1.49***
<1	730	410	320*	1.78*
1- 4	54	19	34*	2.77*
5- 9	22	10	12*	2.24*
10-14	27	11	16*	2.38*
15-19	71	31	41*	2.32*
20-24	85	34	51*	2.50*
25-29	75	32	43*	2.35*
30-34	62	37	25*	1.67*
35-39	64	43	21*	1.48*
40-44	64	54	9*	1.17*
45-49	84	68	16*	1.23*
50-54	115	89	26*	1.29*
55-59	142	115	27*	1.24*
60-64	159	133	25*	1.19*
65-69	161	130	31*	1.24*
70-74	71	69	3	1.04
Males	**104**	**72**	**33***	**1.46***
<1	785	449	336*	1.75*
1- 4	55	21	34*	2.63*
5- 9	25	11	14*	2.34*
10-14	35	13	22*	2.69*
15-19	97	42	55*	2.29*
20-24	131	51	81*	2.59*
25-29	107	46	61*	2.32*
30-34	86	52	34*	1.64*
35-39	79	59	21*	1.35*
40-44	79	69	10	1.14
45-49	99	83	16*	1.19*
50-54	137	112	25*	1.23*
55-59	168	143	25*	1.17*
60-64	197	172	25*	1.15*
65-69	201	171	30*	1.18*
70-74	87	92	-5	0.94
Females	**62**	**41**	**21***	**1.50***
<1	672	370	303*	1.82*
1- 4	52	18	34*	2.95*
5- 9	20	9	10*	2.13*
10-14	19	10	9*	1.95*
15-19	44	18	25*	2.38*
20-24	35	16	19*	2.12*
25-29	43	18	25*	2.41*
30-34	36	21	15*	1.70*
35-39	48	28	20*	1.71*
40-44	47	39	8	1.19
45-49	66	53	14*	1.26*
50-54	90	67	23*	1.34*
55-59	113	87	26*	1.30*
60-64	116	97	20*	1.20*
65-69	119	93	25*	1.27*
70-74	56	50	6*	1.12*

Data sources: *1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997*
Note: *Figures shown are rounded, but calculations were based on unrounded data.*
** $p < 0.05$*

Chart 4
Rates of potential years of life lost (PYLL) before age 75 from injuries in high-Aboriginal health regions, by sex, Canada, 1995 to 1997



Data sources: *1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997*
** Significantly higher than females ($p < 0.05$)*

deaths resulting from motor vehicle accidents (Chart 4). For suicide, the PYLL rate among males was 14 per 1,000 person-years at risk, compared with 4 for females; rates for motor vehicle accidents were 12 and 6, respectively.

However, PYLL rates among females in the high-Aboriginal group of health regions often matched or exceeded those of males in the low-Aboriginal group. This was true for deaths attributed to motor vehicle accidents, drowning, homicide, fire, stroke, congenital/perinatal diseases, diseases of the respiratory system, diseases of the digestive system, diseases of the nervous system, and mental disorders.

Importance of age structure

In contrast to typical mortality statistics, which are dominated by deaths of the elderly, potential years of life lost emphasizes deaths of younger people. In any population, deaths of children, teenagers and young adults will mean more potential years of life lost than deaths of older people. And in the high-Aboriginal regions, young people make up a larger share of the population than is the case in the other group of health regions. Consequently, to some degree, the elevated PYLL rates in the high-

Limitations

Although the population estimates for 1995, 1996 and 1997 were adjusted for net census undercount, 1996 Census undercoverage was greater among Aboriginal peoples than among other segments of the population. Enumeration was not permitted, or was interrupted before it could be completed, on 77 Indian reserves and settlements, representing an estimated 44,000 individuals.[23] As well, counts of Aboriginal peoples have varied from one census to the next, thus affecting estimates of the Aboriginal population.[5,23] There may also be deficiencies in the quality of data on Aboriginal births, deaths and migration, all of which are needed for accurate population estimates.

The registration of cause of death is subject to misclassification; therefore, data quality problems may affect PYLL values for certain causes. But such misclassification should not be more common in one group of health regions than in another.

Analyses based on a single underlying cause of death may underestimate the importance of other causes that contributed to the death. For example, Type II diabetes, which is prevalent among Aboriginal peoples,[5,6] is a frequent contributor to subsequent death due to circulatory diseases or renal failure. The potential impacts of such "competing" causes should be considered when interpreting the results of this analysis.

While it is possible that deaths in outlying areas may be somewhat underreported, the extent of such underreporting is thought to be small.

The high-/low-Aboriginal dichotomy used to characterize health regions does not permit discussion of PYLL specifically among Aboriginal populations. Overall, in the high-Aboriginal group, only 35% of the population was Aboriginal, so potential years of life lost in these regions is not synonymous with PYLL among Aboriginal peoples. Unlike countries such as Australia and the United States, Canada does not include Aboriginal identity on death registrations,[7,24,25] although in British Columbia[26] and Manitoba,[27] vital statistics data are linked to status verification files of Indian and Northern Affairs Canada. However, there is no way of determining Aboriginal identity for Canada as a whole from Statistics Canada's Vital Statistics Database.

PYLL is a descriptive indicator of population health that places more "weight" on deaths of young people. It may be argued that the loss of an elder (which contributes less to PYLL) is of equal importance, in that it represents shrinkage of a community's cultural repository. However, the value of PYLL is that it highlights the causes of premature, and therefore often preventable, deaths, whereas deaths among the elderly are a normal part of the life course.

Aboriginal regions reflect the young age structure of their populations.

Yet even when calculated for each age group, PYLL rates were much higher in the high-Aboriginal regions than in the others (Table 2). The PYLL rate for infants younger than age 1 in the high-Aboriginal regions was 730 years per 1,000 person-years at risk, compared with 410 in the low-Aboriginal regions. PYLL rates for children aged 1 to 14 and young adults aged 15 to 29 in the high-Aboriginal regions were well over twice those in the other group of regions. Although the disparity in PYLL rates between high- and low-Aboriginal regions diminished somewhat with advancing age, it persisted for almost all age/sex groups.

Concluding remarks

In this analysis, potential years of life lost was used to quantify premature mortality—by age, sex and cause of death—in two sets of health regions. The results underscore the preventable nature of much loss of life in regions with a high proportion of Aboriginal residents.

Overall, the PYLL rate was about 50% higher in the high-Aboriginal regions, compared with the low-Aboriginal regions. And particularly for injuries (notably, suicides and motor vehicles accidents), high-Aboriginal health regions had elevated PYLL rates, especially among males.

The second- and third-ranking PYLL rates in the high-Aboriginal regions were for cancer and diseases of the circulatory system. This reflects a decrease among Aboriginal peoples in the proportion of deaths from most infectious diseases (such as tuberculosis) and an increase in the proportion from chronic diseases over the last 50 years.[2,5,6,8]

However, the Aboriginal component of the population is not the only factor that might have had a bearing on PYLL. Links between premature mortality, population health and health determinants

such as socio-economic status cannot be discounted. The majority of the 18 health regions in the high-Aboriginal group were identified in three recent reports as having Canada's lowest life expectancies and/or lowest disability-free life expectancies.[11,28,29] Not only do these regions have substantial proportions of Aboriginal residents, but they are also sparsely populated, far from major metropolitan areas, and are characterized by high unemployment, low educational attainment, low household income, and above-average reliance on government transfer payments. Thus, the elevated PYLL rates in high-Aboriginal health regions may not be due solely to higher mortality among the Aboriginal component of the population. The other factors at work in these regions—remoteness, rurality and low socio-economic status—could contribute to premature mortality and would be expected to affect both Aboriginal and non-Aboriginal residents alike.

However, a 2001 Australian study,[30] which accounted for remoteness and socio-economic deprivation in that country's statistical divisions, showed that while both were correlated with mortality rates, the strongest correlation was with the proportion of residents who self-identified as Indigenous. Therefore, although geographic and socio-economic factors (unmeasured in this analysis) probably contributed to the disparity in PYLL rates between the two groups of health regions, some part of it was almost certainly due to the difference in Aboriginal composition. Further study is needed to determine if a shorter life with more years lived in poor health is a defining attribute of Aboriginal peoples, or whether this applies to everyone, regardless of ethnicity, who lives in a health region with a high proportion of Aboriginal residents. Record linkage[31] is one of the methods that is technically feasible and could provide valuable information on the relationship between health status, mortality and being Aboriginal.[2,30] However, databases that include Aboriginal identity are currently not linked to the Canadian Vital Statistics Database.

In Canada, health regions are increasingly assuming responsibility for health and social services.[32] An analysis of the causes of potential years of life lost at the health region level has implications for the delivery of those services. This examination of premature death demonstrates the toll taken by injuries in high-Aboriginal health regions, and reinforces an observation made in a 2003 Health Canada report that "even a partial reduction in injury death rates would have a profound effect on premature death rates and the health of the population in general."[2] This is especially the case in northern, remote and isolated communities that have high Aboriginal populations where the the societal burden[1,2] imposed by premature—and mostly preventable—death seems to suggest that effective public health or other strategies might reduce the harm associated with injury. ●

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Appendix

Table A

Population and life expectancy, health regions with a high proportion (≥ 19%) of Aboriginal† residents, Canada, 1995 to 1997

Health region			1996 population		Life expectancy (years)
Number	Name	Province/ Territory	Number	Proportion Aboriginal†	
				%	
1006	Health Labrador Corporation‡	Newfoundland	25,693	28.7	74.9
2417	Nunavik‡	Québec	8,905	87.6	65.4
2418	Terres-Cries-de-la-Baie-James‡	Québec	11,597	92.1	73.9
3549	Northwestern‡	Ontario	84,450	22.2	74.3
4620	North Eastman‡	Manitoba	38,182	19.7	77.6
4660	Parkland‡	Manitoba	43,558	21.1	77.4
4670	Norman‡	Manitoba	23,621	36.9	74.6
4680	Burntwood‡§	Manitoba	45,167	65.0	72.9
4690	Churchill‡§	Manitoba	1,111	45.0	72.9
4709	Prince Albert (Region I)	Saskatchewan	75,632	24.9	78.4
4710	North Battleford (Region J)‡	Saskatchewan	67,728	23.4	77.3
4711	Northern Health Services‡	Saskatchewan	32,172	78.1	73.3
4815	Keeweetinok Lakes‡	Alberta	23,563	45.5	74.8
4817	Northwestern	Alberta	17,639	35.1	80.0
5913	North West‡	British Columbia	90,212	21.5	77.9
6001	Yukon‡	Yukon	31,938	19.3	75.7
6101	Northwest Territories‡	Northwest Territories	41,829	45.4	76.8
6201	Nunavut‡	Nunavut	25,947	80.4	69.8
	Total health regions with ≥ 19% Aboriginal residents		688,944	35.1	75.9
	Other health regions		28,982,948	2.1	78.4
Total	**Canada**		**29,671,892**	**2.9**	**78.3**

Data sources: *References 10 and 12*
† Self-identified on 1996 Census
‡ Among health regions where life expectancy and disability-free life expectancy are lowest (Reference 25)
§ Life expectancies for Burntwood and Churchill are combined.