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Cardiovascular and cancer mortality among Canadians of European, south Asian and Chinese origin from 1979 to 1993: an analysis of 1.2 million deaths

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Abstract

Background: Cardiovascular disease and cancer are important health problems worldwide, yet our knowledge of these conditions is derived principally from populations of European descent. To investigate ethnic variations in major causes of death in Canada, the authors examined total and cause-specific mortality among European, south Asian, and Chinese Canadians.

Methods: Canadians of European, south Asian and Chinese origin were identified in the Canadian Mortality Database by last name and country of birth and in the population census by self-reported ethnicity. Age-standardized death rates by cause, per 100 000 population, were calculated for ages 35 to 74 years from 1979 to 1993 and in 5-year intervals grouped around census years (1979/83, 1984/88 and 1989/93).

Results: Rates of death from ischemic heart disease were highest among Canadians of south Asian origin (men 320.2, women 144.5) and European origin (men 319.6, women 109.9) and were markedly lower among Canadians of Chinese origin (men 107.0, women 40.0); the rates declined significantly in all 3 groups over the study period. Rates of death from cerebrovascular disease were relatively low and showed less ethnic variation (Canadian men of European, south Asian and Chinese origin 49.5, 47.0 and 45.8 respectively; Canadian women of European, south Asian and Chinese origin 34.8, 39.0 and 42.2 respectively) and declined similarly in all groups over time. Rates of death from cancer were highest among Canadians of European origin (men 343.6, women 236.2), intermediate among those of Chinese origin (men 258.1, women 161.6) and lowest among those of south Asian origin (men 122.3, women 131.3). Over time, cancer mortality increased in Canadians of European origin but remained constant or declined in those of south Asian and Chinese origin.

Interpretation: Substantial differences exist in rates of death from ischemic heart disease and cancer among European, south Asian and Chinese Canadians.

The global burden of cardiovascular disease and cancer is rising among non-European populations as countries in Asia and Latin America undergo epidemiologic transition. Already, the number of deaths from cardiovascular disease in China and India, the world's 2 most populous countries, is the same as the number of deaths from cardiovascular disease in all developed countries.[1] Despite the increasing importance of chronic diseases as causes of death and disability worldwide, our knowledge of the epidemiology of these conditions is derived principally from populations of European origin. The foundation of knowledge required for effective global disease prevention is yet to be laid.

In Canada, the proportion of the population accounted for by non-European ethnic groups is significant and is increasing. Chinese and south Asians (people from the Indian subcontinent) are among the largest ethnic groups in Canada, numbering 558 600 and 420 300 respectively in 1991.[2] The members of these eth-

nic groups may be defined by their shared ancestral origins in a given geographic region. They may have in common genetic characteristics or lifestyle practices that influence disease rates. In studying disease patterns among ethnic groups resident in the same country, differences in access to health care and in quality of health statistics, which may confound international comparisons, are generally controlled for. An understanding of disease patterns among ethnic Chinese and south Asians in Canada would be of value in targetting public health efforts and in health service planning.

The primary objective of this study was to examine the main causes of death among people of European, south Asian and Chinese origin in Canada from 1979 to 1993. The secondary objective was to document trends within each ethnic group over this period for the 3 leading causes of death in Canada: ischemic heart disease (IHD), cerebrovascular disease (CBVD) and lung cancer.

Methods

Canadians of south Asian origin were defined as those born in India, Pakistan, Bangladesh or Sri Lanka, and Canadians of Chinese origin as those born in China (including Hong Kong) or Taiwan. The method used to determine ethnic origin has previously been reported in detail.[3] Briefly, 1.2 million deaths were identified from 1979 to 1993 in the Canadian Mortality Database maintained by Statistics Canada. South Asian and Chinese ethnicity was determined in the mortality files using the last name of the dead person and his or her country of birth (note that death certificates do not specifically record ethnicity). European ethnicity was assigned to dead people who had been born in Canada, since in the 1991 census 98% of all Canadians aged 35 to 74 years who were born in Canada were of European descent (Statistics Canada: unpublished data, 1996). Population estimates of Canadians of south Asian and Chinese origin were based on self-reported ethnicity in the Canadian census[4] of 1981, 1986 and 1991. The Canadian-born portion of the Canadian population aged 35 to 74 years was taken as the denominator for European origin. Canadians not born in Canada who were not Chinese or south Asian were considered as a fourth category (labelled "other immigrants"). This predominantly European group isolated any possible effect of immigration itself on death rates for Canadians.

The cause of death was coded in the Canadian Mortality Database according to the International Classification of Diseases, ninth revision.[5] Causes examined were cardiovascular disease (codes 390–459) (including IHD [410–414], CBVD [430–438], congestive heart failure [428] and other cardiovascular diseases [rest of 390–459]), all cancers (140–208) (including cancer of the colorectum [153, 154], lung [162], breast [174], prostate [185], nasopharynx [147], esophagus [150], stomach [151], liver [155], pancreas [157], uterus [180] and ovary [183] and other cancers [rest of 140–208]), chronic obstructive pulmonary disease (COPD) (490–496), diabetes mellitus (250), kidney disease (580–589) and liver cirrhosis and related disease (571).

Analysis

We calculated all-cause and cause-specific death rates for the entire 15-year period with the mean of the census population in 1981, 1986 and 1991 as the denominator. Analysis was restricted to the age group 35 to 74 years (as classification of cause of death in elderly people may be less reliable), and rates were expressed per 100 000 population. We compared the various ethnic groups using relative risks (RRs) with European origin as the reference category. Age standardization was performed by the direct method to the Canadian population in 1986[6] using 10-year age strata (35–44 years, 45–54 years, 55–64 years and 65–74 years) for each sex and ethnic group. We cal-

Table 1: Numbers of deaths and age-standardized death rates* per 100 000 for all causes and for cardiovascular disease among adults aged 35 to 74 years in Canada in 1979–93, by ethnicity and sex

	Ethnic group											
	European origin			South Asian origin			Chinese origin			Other immigrants		
Sex; cause	No. of deaths	Death rate	(and 95% CI)	No. of deaths	Death rate	(and 95% CI)	No. of deaths	Death rate	(and 95% CI)	No. of deaths	Death rate	(and 95% CI)
Men												
All causes	587 969	1093.3	(1090.7,1095.9)	4 023	758.3	(734.5,782.2)	5 531	599.2	(583.8,614.6)	182 043	1068.2	(1063.4,1073.0)
Cardiovascular disease	239 914	448.8	(447.0,450.5)	2 066	417.9	(399.5,436.3)	1 681	189.6	(180.6,198.6)	75 025	440.1	(436.9,443.3)
Ischemic heart disease	171 139	319.6	(318.1,321.0)	1 588	320.2	(304.0,336.3)	948	107.0	(100.2,113.8)	53 568	313.6	(310.9,316.4)
Cerebrovascular disease	26 471	49.5	(48.9,50.1)	222	47.0	(40.5,53.5)	406	45.8	(41.4,50.3)	8 826	52.1	(51.0,53.3)
Congestive heart failure	4 791	9.4	(9.1,9.7)	18	4.3	(2.2,6.3)	25	2.9	(1.7,4.0)	1 179	7.0	(6.6,7.4)
Other cardiovascular disease	37 513	70.3	(69.6,71.0)	238	46.4	(40.2,52.6)	302	33.9	(30.1,37.7)	11 452	67.4	(66.1,68.6)
Women												
All causes	348 421	567.5	(565.6,569.3)	2 525	494.0	(475.0,513.1)	3 915	359.7	(348.6,370.7)	105 960	576.3	(572.8,579.9)
Cardiovascular disease	114 056	184.2	(183.1,185.2)	1 046	222.7	(209.3,236.0)	1 115	104.3	(98.2,110.3)	34 981	187.3	(185.2,189.3)
Ischemic heart disease	68 049	109.9	(109.1,110.7)	668	144.5	(133.6,155.3)	425	40.0	(36.2,43.8)	20 329	108.4	(106.8,109.9)
Cerebrovascular disease	21 585	34.8	(34.4,35.3)	187	39.0	(33.4,44.7)	452	42.2	(38.3,46.1)	7 051	38.0	(37.1,38.9)
Congestive heart failure	3 094	5.0	(4.9,5.2)	24	5.4	(3.2,7.5)	16	1.5	(0.8,2.2)	896	4.8	(4.4,5.1)
Other cardiovascular disease	21 328	34.4	(34.0,34.9)	167	33.9	(28.7,39.0)	222	20.6	(17.9,23.3)	6 705	36.1	(35.2,37.1)

Note: CI = confidence interval.
*Standardized to 1986 Canadian census.

culated 95% confidence intervals for each death rate.[7] We also calculated age-specific death rates for ages 35–54 and 55–74 years to detect any important differences not revealed in age-standardized data.

We examined secular trends over the 15 years using 3 periods of 5 years each (1979/83, 1984/88 and 1989/93). Annual rates were not used for time trend analysis because attempts to estimate the populations of south Asian and Chinese origin in noncensus years would have been imprecise owing to rapid changes in these populations in Canada. In addition, the number of deaths by cause among Canadians of south Asian and Chinese origin in individual years was small and would have further increased uncertainty in annual estimates. We used the percent change in the age-standardized death rate from 1979/83 to 1989/93 to quantify the secular trend.

Results

Among Canadians of European, south Asian and Chinese origin and other immigrants aged 35 to 74 years, 1.2 million deaths were identified in 1979/93.

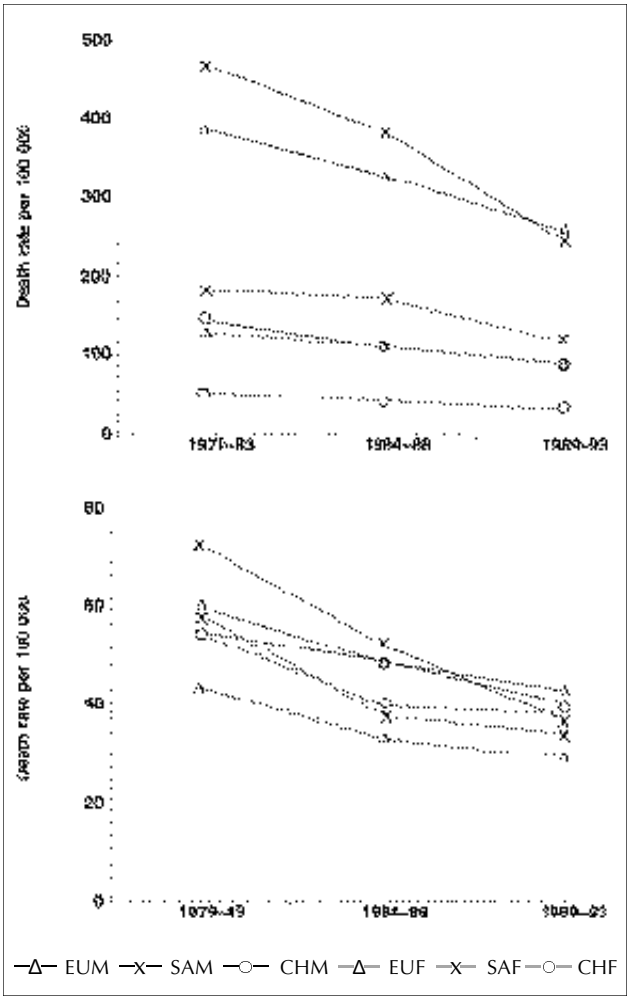

Fig. 1: Changes in age-standardized death rates per 100 000 for ischemic heart disease (top) and cerebrovascular disease (bottom) from 1979/83 to 1989/93 among Canadian men (M) and women (F) of European (EU), south Asian (SA) and Chinese (CH) origin.

All causes

The numbers of deaths and the age-standardized mortality rate among the 4 groups are presented in Table 1. All-cause death rates for men were highest among Canadians of European origin (RR 1.00), intermediate among those of south Asian origin (RR 0.69) and lowest among those of Chinese origin (RR 0.55). Women showed a similar ethnic distribution, with death rates highest among Canadians of European origin (RR 1.00), intermediate among those of south Asian origin (RR 0.87) and lowest among those of Chinese origin (RR 0.63) (Table 1). Age-specific rates for ages 35–54 and 55–74 years were essentially identical to the overall results (data not shown). Lower all-cause death rates among Canadians of south Asian origin were due to lower rates of death from cancer, whereas among Canadians of Chinese origin, fewer deaths from IHD accounted for much of the difference.

Cardiovascular disease

Major causes of death from cardiovascular disease were IHD and CBVD. Rates of death from IHD were high among Canadian men of south Asian (RR 1.00) and European (RR 1.00) origin, whereas men of Chinese origin had a substantially lower rate (RR 0.33). Among women, rates of death from IHD were significantly higher among Canadians of south Asian (RR 1.31) than European or Chinese origin (RR 0.36) (Table 1). There were also striking differences in the proportional mortality from IHD (i.e., mortality from IHD as a proportion of all-cause mortality) between these ethnic groups. The proportional mortality from IHD was very high in Canadian men (42%) and women (29%) of south Asian origin and compared with men (29%) and women (19%) of European origin and men (18%) and women (11%) of Chinese origin. Rapid declines in IHD mortality from 1979/83 to 1989/93 were observed in all groups: the percent change for Canadian men and women of south Asian origin was –47% and –35% respectively, for Canadian men and women of European origin –33% and –31% respectively, and for Canadian men and women of Chinese origin –38% and –40% respectively (Fig. 1).

There was less interethnic variation in CBVD mortality than in IHD mortality. Overall rates of death from CBVD were similar among Canadian men of European, south Asian (RR 0.95) and Chinese (RR 0.93) origin. In Canadian women, slightly greater disparity was seen: mortality was highest among women of Chinese origin (RR 1.21), intermediate among those of south Asian origin (RR 1.12) and lowest among those of European origin (Table 1). Substantial declines in rates of death from stroke were seen in all ethnic groups over time: the percent change among women and men of south Asian origin was –41% and –48% respec-

tively, among women and men of European origin –32% and –28% respectively, and among women and men of Chinese origin –30% and –27% respectively (Fig. 1).

Cancer

Rates of death from cancer among men were highest among Canadians of European origin, intermediate among those of Chinese origin (RR 0.75) and lowest among those of south Asian origin (RR 0.36). Cancer death rates were also high among Canadian women of European origin and lower among those of Chinese (RR 0.68) and south Asian (RR 0.56) origin (Table 2). Important cancer sites in Canadians of European origin were the lung, colorectum, breast and prostate, whereas Canadians of Chinese origin were at increased risk of lung, colorectal, liver, nasopharyngeal and stomach cancer. Canadians of Chinese origin were the only group in whom cancer was the leading cause of death for both men and women. The proportional mortality from cancer was highest in men (43%) and women (45%) of Chinese origin, intermediate in men (32%) and women (42%) of European origin, and lowest in men (16%) and women (27%) of south Asian origin. Cancer mortality increased over time in people of European origin (percent change +11% for women and +10% for men). In contrast, cancer mortality declined in people of south Asian origin (percent change –26% for women and –18% for men) and Chinese origin (–9% and –7% respectively) (Fig. 2).

Lung cancer was the most common cause of death from cancer in men of all ethnic groups. Rates of death from lung cancer were highest among Canadian men of European origin, intermediate among men of Chinese origin (RR 0.57) and extremely low among men of south Asian origin (RR 0.17). For women, lung cancer mortality was highest among those of European origin, next highest among those of Chinese origin (RR 0.67) and lowest among those of south Asian origin (RR 0.20). Lung cancer was the leading cause of death from cancer in women of Chinese origin and the second leading cause in women of European and south Asian origin, among whom breast cancer was the leading cause of cancer death. Over time, rates of death from lung cancer showed an increasing trend among men of all ethnic groups (percent change +13% for those of European origin, +11% for those of south Asian origin and +4% for those of Chinese origin). Among women, lung cancer mortality increased markedly in those of European origin (percent change +47%) but decreased in those of Chinese origin (percent change –14%) and south Asian origin (percent change –53%) (Fig. 2).

Rates of death from colorectal cancer were high in Canadian men of European origin, in whom it was the second leading cause of cancer death, intermediate in those of Chinese origin (RR 0.71) and much lower in those of south

Table 2: Numbers of deaths and age-standardized death rates per 100 000 for cancer by ethnicity and sex

	Ethnic group											
	European origin			South Asian origin			Chinese origin			Other immigrants		
Sex; type of cancer	No. of deaths	Death rate	(and 95% CI)	No. of deaths	Death rate	(and 95% CI)	No. of deaths	Death rate	(and 95% CI)	No. of deaths	Death rate	(and 95% CI)
Men												
All cancer	184 731	343.6	(342.1,345.1)	647	122.3	(112.3,132.3)	2 412	258.1	(247.8,268.4)	60 913	356.1	(353.3,359.1)
Lung	69 259	129.5	(128.6,130.5)	115	22.1	(17.8,26.4)	671	74.0	(68.4,79.6)	21 823	127.3	(125.6,129.1)
Esophagus	6 444	9.7	(9.4,10.0)	24	4.8	(2.8,6.9)	78	8.6	(6.7,10.5)	1 504	8.8	(8.3,9.2)
Stomach	11 210	14.7	(14.4,15.0)	34	6.3	(4.0,8.6)	157	16.8	(14.1,19.4)	4 224	24.6	(23.9,25.4)
Colorectum	19 649	36.8	(36.3,37.3)	45	8.3	(5.7,10.9)	240	26.1	(22.8,29.4)	6 078	35.6	(34.6,36.5)
Liver	4 029	5.3	(5.1,5.5)	29	4.9	(3.0,6.9)	418	43.4	(39.2,47.6)	1 280	7.5	(7.1,7.9)
Pancreas	11 320	17.6	(17.2,18.0)	47	9.0	(6.3,11.8)	100	10.9	(8.8,13.1)	3 487	20.3	(19.6,21.0)
Nasopharynx	542	0.7	(0.5,0.7)	4	0.4	(0,0.7)	157	14.6	(12.3,17.0)	181	1.0	(0.9,1.2)
Prostate	12 178	23.2	(22.7,23.6)	39	9.9	(6.8,13.0)	51	5.9	(4.3,7.5)	3 761	22.4	(21.6,23.2)
Other cancer	50 100	85.9	(104.9,106.7)	310	56.5	(49.7,63.2)	540	57.5	(52.6,62.4)	18 575	108.6	(107.0,110.2)
Women												
All cancer	144 905	236.2	(235.0,237.4)	744	131.3	(121.6,141.0)	1 773	161.6	(154.1,169.1)	45 222	247.4	(245.0,249.8)
Lung	28 923	47.6	(47.0,48.1)	47	9.4	(6.6,12.1)	345	31.9	(28.6,35.3)	7 275	39.5	(38.5,40.4)
Esophagus	1 886	2.3	(2.2,2.5)	31	5.7	(3.6,7.8)	15	1.4	(0.7,2.1)	480	2.6	(2.3,2.8)
Stomach	5 520	6.2	(6.0,6.4)	26	4.7	(2.8,6.6)	108	9.6	(7.8,11.4)	1 957	10.6	(10.1,11.1)
Colorectum	15 706	25.6	(25.2,26.0)	27	4.8	(2.9,6.6)	199	18.3	(15.7,20.9)	4 824	26.2	(25.4,27.0)
Liver	2 174	2.4	(2.3,2.6)	16	3.4	(1.7,5.1)	106	9.7	(7.8,11.5)	663	3.6	(3.3,3.9)
Pancreas	8 881	11.4	(11.1,11.6)	39	8.0	(5.4,10.6)	86	8.0	(6.3,9.7)	2 367	12.8	(12.2,13.3)
Nasopharynx	210	0.2	(0.2,0.3)	1	0.1	(0,0.3)	60	5.2	(3.9,6.5)	71	0.4	(0.3,0.5)
Breast	32 833	53.8	(53.2,54.4)	213	32.5	(28.0,37.0)	238	21.2	(18.4,23.9)	10 532	58.5	(57.4,59.7)
Uterus	4 330	5.6	(5.4,5.8)	39	7.0	(4.7,9.3)	72	6.5	(5.0,8.0)	990	5.5	(5.1,5.9)
Ovary	10 919	14.4	(14.1,14.7)	69	12.2	(9.3,15.2)	82	7.3	(5.7,8.9)	3 022	16.6	(15.9,17.1)
Other cancer	33 573	66.8	(66.2,67.5)	236	43.5	(37.8,49.1)	462	42.4	(38.6,46.3)	13 041	71.1	(69.8,72.4)

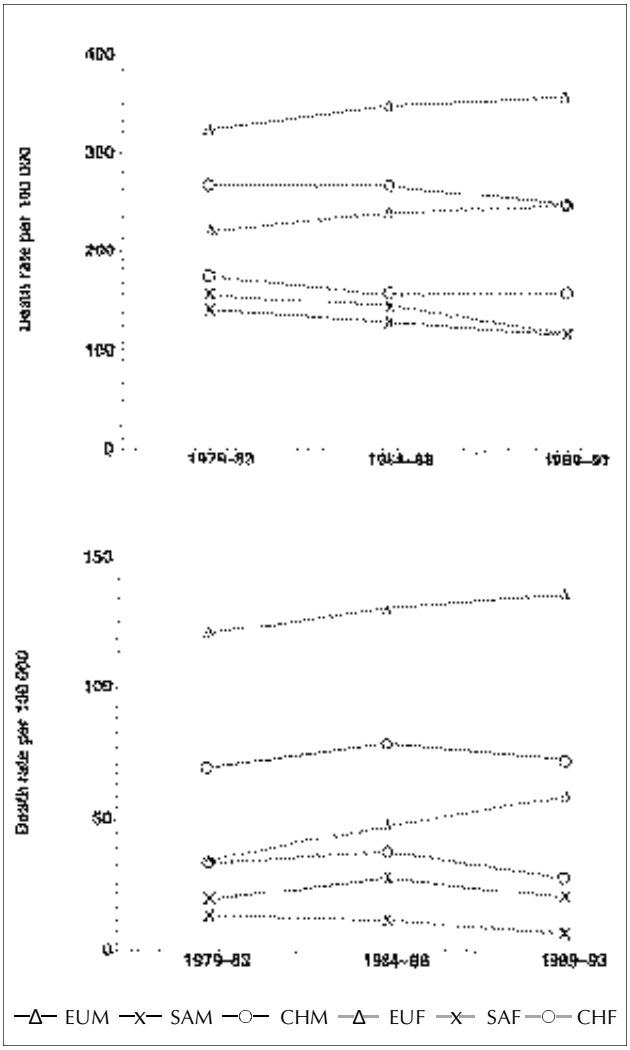

Fig. 2: Changes in age-standardized death rates per 100 000 for all cancers (top) and lung cancer (bottom) from 1979/83 to 1989/93.

Asian origin (RR 0.22). The rates for women followed a similar pattern, with higher rates in those of European origin than in those of Chinese (RR 0.72) and south Asian origin (RR 0.19) (Table 2).

Other causes

Men (RR 1.64) and women (RR 2.07) of south Asian origin had a substantially increased risk of death from diabetes compared with those of European origin, whereas men (RR 0.61) and women (RR 0.83) of Chinese origin were at a much lower risk (Table 3). Men of European origin had a higher risk of death from COPD than those of Chinese (RR 0.47) and south Asian (RR 0.46) origin. Similarly, women of European origin had a higher rate of death from COPD than those of south Asian (RR 0.39) and Chinese (RR 0.38) origin. Interestingly, the relation between lung cancer mortality and COPD mortality varied by ethnic group: the ratio of the former to the latter was much lower for Canadians of south Asian origin than for those of European or Chinese origin, with a 3-fold difference among ethnic groups.

Other immigrants

Among immigrants who were not of south Asian or Chinese origin, all-cause death rates for men (RR 0.98) and women (RR 1.02) were similar to the rates for Canadians of European origin (Table 1). Cause-specific death rates, including those for IHD (RR 0.99 for men and 0.99 for women) (Table 1) and cancer (RR 1.04 for men and 1.05 for women) (Table 2), were also similar to the rates for people of European origin.

Interpretation

We found strikingly different patterns in cause-specific death rates between Canadians of European, south Asian and Chinese origin. Canadians of European origin had

Table 3: Numbers of deaths and age-standardized death rates per 100 000 for other causes of death by ethnicity and sex

	Ethnic group							
	European origin		South Asian origin		Chinese origin		Other immigrants	
Sex; cause	No. of deaths	Death rate (and 95% CI)	No. of deaths	Death rate (and 95% CI)	No. of deaths	Death rate (and 95% CI)	No. of deaths	Death rate (and 95% CI)
Men								
COPD	22 876	44.1 (43.6,44.7)	85	20.2 (15.8,24.5)	179	20.8 (17.7,23.8)	5 242	31.1 (30.3,32.1)
Diabetes	10 092	19.1 (18.7,19.5)	149	31.4 (26.1,36.7)	100	11.6 (9.4,13.9)	2 573	15.1 (14.5,15.7)
Liver disease	14 986	27.4 (27.0,27.9)	119	17.3 (13.9,20.7)	62	6.4 (4.7,7.9)	4 370	25.3 (24.5,26.1)
Kidney disease	3 794	7.1 (6.9,7.3)	32	6.1 (3.8,8.4)	88	9.8 (7.7,11.8)	1 121	6.6 (6.2,7.0)
Women								
COPD	10 830	17.6 (17.3,17.9)	34	6.8 (4.5,9.2)	71	6.6 (5.1,8.1)	2 593	13.9 (13.3,14.5)
Diabetes	8 546	13.9 (13.6,14.1)	132	28.7 (23.8,33.6)	122	11.4 (9.4,13.4)	2 455	13.1 (12.6,13.7)
Liver disease	6 717	11.1 (10.8,11.4)	22	4.0 (2.2,5.7)	45	4.2 (3.0,5.4)	1 852	10.2 (9.7,10.7)
Kidney disease	2 895	4.7 (4.5,4.9)	37	7.2 (4.8,9.6)	62	5.7 (4.3,4.9)	817	4.4 (4.1,4.7)

Note: COPD = chronic obstructive pulmonary disease.

high rates of death from IHD and cancer, those of south Asian origin had high rates of death from IHD and diabetes, with low cancer mortality, and those of Chinese origin had very low rates of death from IHD, with intermediate cancer mortality.

The high rate of death from IHD documented in Canadians of south Asians origin in our study is consistent with reports from other countries,[8–10] although comparable data for India are not available. Although established risk factors such as smoking and hypertension are likely to be important among Canadians of south Asian origin,[11] the excess mortality among migrant south Asians is not explained by an increased prevalence of these risk factors in comparison to local populations.[12,13] A syndrome of metabolic abnormalities characterized by central obesity, a predisposition to impaired glucose tolerance and non-insulin-dependent diabetes, and a lipid profile of low levels of high-density lipoprotein and high triglyceride levels has been associated with higher IHD rates in south Asians.[14] The prevalence of diabetes is higher in south Asians than in other ethnic groups,[15,16] and we found increased diabetes mortality in Canadians of south Asian origin, with a 2- and 3-fold increased risk compared to Canadians of European and Chinese origin respectively. The markedly lower rates of death from IHD observed for the latter 2 groups suggests that the higher IHD mortality in Canadians of south Asian origin is amenable to lifestyle changes. Lower rates of death from IHD compared to those for people of European origin have been observed in people of Chinese origin living in the United States,[17] Hong Kong[18] and mainland China.[19] Lower cholesterol levels and a dietary pattern of low saturated fat and cholesterol intake[20] may account for the lower IHD mortality among Chinese. Mean serum cholesterol levels in Chinese in China are 4.0 to 4.2 mmol/L, much lower than those found in Western populations.[21]

Rates of death from CBVD showed less ethnic variation than those from IHD. In China and Taiwan, stroke is the predominant cause of cardiovascular mortality,[22] and rates are generally higher than in Western countries. In contrast to our findings, high rates of death from CBVD have been reported for people of south Asian origin in South Africa[23] and the United Kingdom.[9] Like people of south Asian and Chinese origin in other countries, those in Canada had a high risk of stroke in the first period of our study, 1979/83. However, rapid declines in rates of death from stroke over the study period led to a reduction in these initial differences.

We found that the proportional mortality from cancer was highest among men and women of Chinese origin, and, unlike the other ethnic groups, cancer was the leading cause of death among men of Chinese origin. Cancers of particular importance were those of the lung, liver and nasopharynx. High lung cancer mortality has been reported for Chinese populations worldwide,[24] yet smoking accounts for only 20% to 40% of lung cancer deaths in Chinese,[24] compared with 75% to 80% in Europeans.[25] Various hypotheses have been advanced to explain this striking observation, including dietary factors, exposure to environmental smoke from tobacco,[26] domestic or industrial sources, and increased genetic susceptibility;[27,28] however, no clear explanation exists. In our study, cancer mortality was lower in Canadians of south Asian origin than in those of European origin. This observation is consistent with reports from other countries.[29] The lung cancer rates in India are among the lowest in the world,[24] a pattern that may reflect lower smoking rates.[30]

The risk of death from colorectal cancer is influenced by dietary factors and has been shown to be increased in Europeans who eat a high-fat, low-fibre diet.[31] The lower mortality from colorectal cancer observed for Canadians of south Asian origin in our study may reflect important dietary differences in fibre and β-carotene intake or variations in colonic metabolism in this group.[32] Notably, rates of death from all cancers diverged over time, with increasing rates in Canadians of European origin and decreasing rates in those of south Asian and Chinese origin. These changes may reflect differences in environmental risk exposure over time. Population-based studies are needed to explore these contrasting trends.

A potential limitation of our study is that our analysis was based on death certificates, which may contain errors in the documented cause of death. However, we are not aware of data showing that the rate of such errors varies by ethnic group in Canada. Also, such errors are unlikely to have an important effect where very large relative differences exist in rates of death from various diseases. In addition, the assignment of ethnicity using last names may have led to misclassification of some people. However, since last names have high validity and reliability for south Asian and Chinese ethnicity, we believe the potential for misclassification is likely to be very small. We determined ethnic origin for deaths by last name and country of birth and for population by self-reported ethnicity. Although these methods differ, last name and country of birth have been shown to be valid measures of self-reported ethnicity in population surveys of these ethnic groups[3] and, therefore, are likely to provide consistent results.

A "healthy migrant" effect operating as a selective influence has been proposed as an explanation for lower mortality among immigrant groups.[33] The significance of this factor in explaining the differences between Canadians of south Asian, Chinese and European origin observed in our study appears limited. The relative risk of death for all other immigrants to Canada (excluding south Asians and Chinese) was similar to that for people of European origin. This indicates that the healthy migrant effect had at most a modest influence on our findings.

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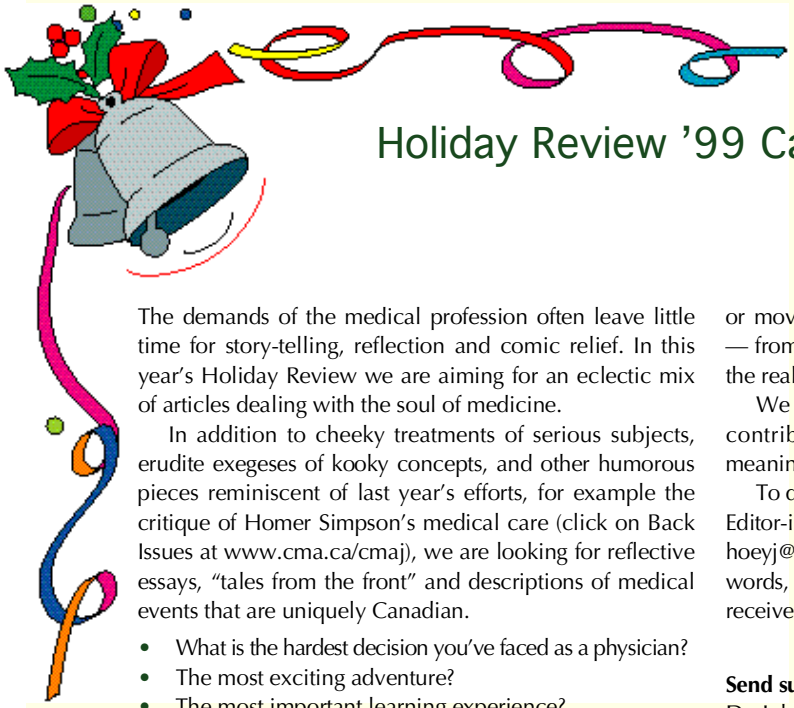

Holiday Review '99 Call for Papers

The demands of the medical profession often leave little time for story-telling, reflection and comic relief. In this year's Holiday Review we are aiming for an eclectic mix of articles dealing with the soul of medicine.

In addition to cheeky treatments of serious subjects, erudite exegeses of kooky concepts, and other humorous pieces reminiscent of last year's efforts, for example the critique of Homer Simpson's medical care (click on Back Issues at www.cma.ca/cmaj), we are looking for reflective essays, "tales from the front" and descriptions of medical events that are uniquely Canadian.

- What is the hardest decision you've faced as a physician?
- The most exciting adventure?
- The most important learning experience?
- How have values in the medical profession changed?

We encourage you to submit reflective essays on these and other topics, personal accounts of unusual, thrilling or moving moments in your professional life, and stories — from the recent and more distant past — that elucidate the realities of medical practice in the Canadian context.

We also hope to include photographs and artwork contributed by readers that capture something of the meaning of medical practice in Canada and beyond.

To discuss an idea for the Holiday Review issue, contact Editor-in-Chief Dr. John Hoey, tel 800 663-7336 x2118; hoeyj@cma.ca. Articles should be no more than 1200 words, preferably accompanied by illustrations. Entries received by Oct. 1, 1999, are more likely to be published.

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