Avoidable Mortality in the United States and Canada, 1980–1996

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A number of measures are currently used to evaluate health care performance for populations. Most measures focus on components of economic efficiency, medical efficacy, social acceptability, and organizational structure.[1–4] Because of a lack of relevant data, health care outcomes are infrequently evaluated. Also, the relationship between health outcomes and health care is often obscured by various genetic, social, and environmental factors that, in addition to health care, influence health outcomes.[5] Available evaluations of health care outcomes are usually focused on hospital or physician performance, as opposed to population health or entire health care systems.

In 1976, Rutstein et al. proposed "avoidable mortality" as a simple and practical population-based method of counting "untimely and unnecessary deaths" from diseases for which effective public health and medical interventions are available.[6] An excess of such deaths could be viewed as a signal of possible shortcomings in the health care system that warranted further investigation. For a sentinel disease to be defined as avoidable, there must be identifiable, effective interventions and available health care providers. Use of the avoidable mortality measure became common in Europe following refinements in the original Rutstein et al. disease groups by Charlton in the disease groups by Charlton et al.[7] and subsequently the European Community Concerted Action Project on Health Services and "avoidable mortality" (ECCAP).[8]

In this study we examined avoidable mortality in the United States and Canada from 1980 to 1996. We postulated that there may be differences in avoidable mortality between the 2 countries, and that, if differences existed, avoidable mortality might be a useful population-based outcome measure that would encourage further evaluation and improvement of health care systems.

METHODS

Data for avoidable mortality disease groups for 1980–1996 were obtained from the Centers for Disease Control and Prevention for the United States[9,10] and the Canadian Mortality Database for Canada.[20]

Avoidable mortality was classified according to the ECCAP disease and age groups (Table 1),[8] with the following differences: appendicitis, cholelithiasis, and cholecystitis were combined into a single surgical disease group; and rheumatic heart disease deaths from all respiratory diseases for children aged 1 through 14 years were excluded. Maternal and perinatal mortality were compared only from 1985 to 1989 because of incomplete data for other years. Standardized mortality ratios (SMRs) were calculated to adjust for the different age and sex composition of the countries. Previously defined ECCAP working disease classifications were used to allow an unbiased comparison of the national health care systems. We used the European Community 1985–1989 as the reference population to allow comparisons with the previously published European Community estimates.[8]

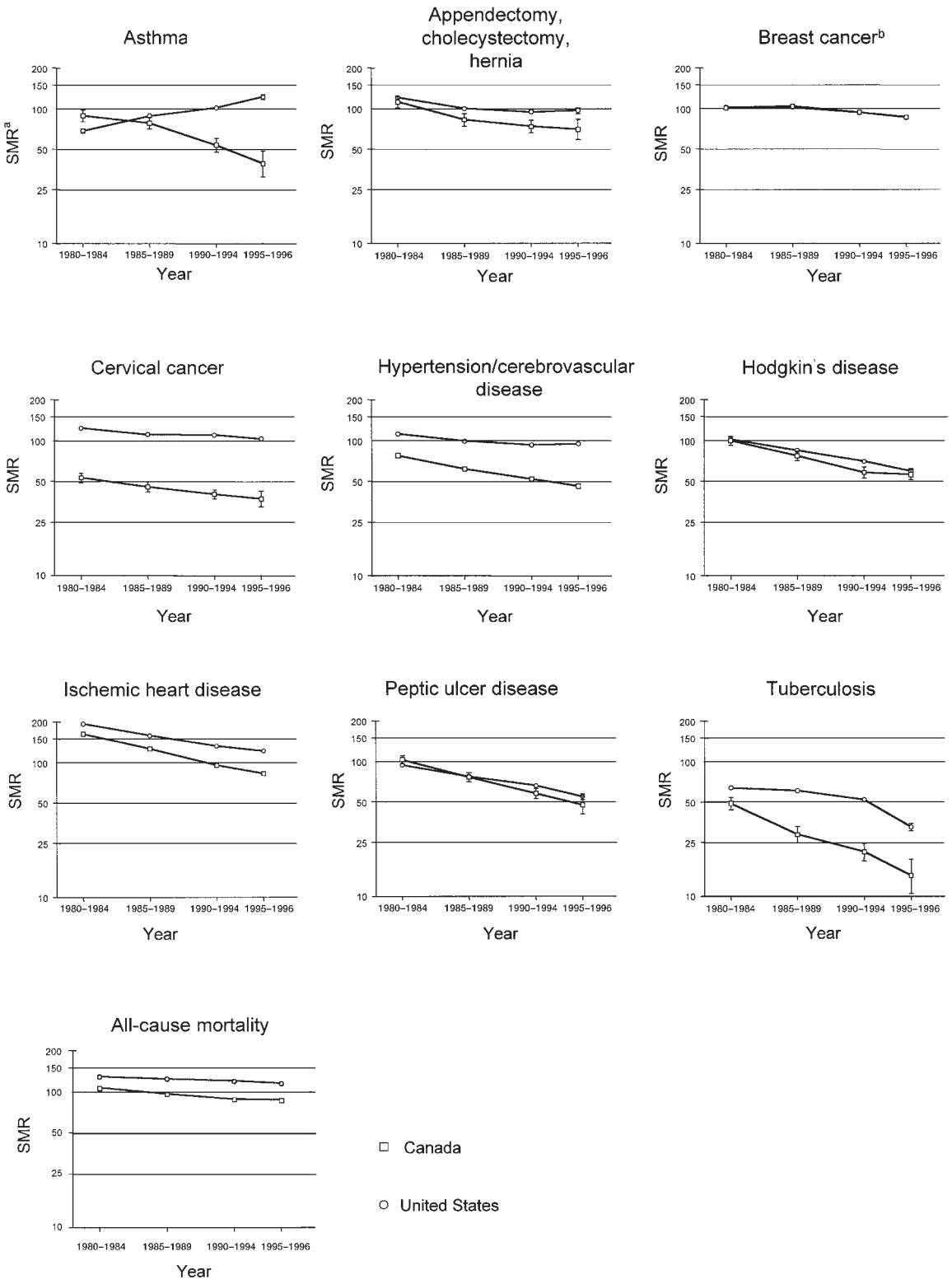
RESULTS

Table 2 shows avoidable deaths in the United States and Canada for the reference period 1985–1989. During this time, there were 800 000 avoidable deaths in the United States and 83 000 in Canada. In both countries, ischemic heart disease accounted for approximately one quarter of all deaths in persons aged 15–64 years and more than one half of all avoidable deaths. Compared with Canada, the United States had higher mortality ratios for 9 of the 11 disease groups. Breast cancer mortality was marginally lower in the United States than in Canada (rate ratio 0.98, $P<.005$); there was no difference between the 2 countries in mortality from peptic ulcer. In Canada, the lowest mortality ratios were observed for asthma, cervical cancer, hypertension and cerebrovascular disease, tuberculosis, and maternal mortality. For these conditions, public health and primary care are usually the responsible health care sectors (Table 1). With the notable exception of asthma mortality in the United States, mortality for all avoidable disease groups decreased during the study period in both Canada and the United States (Figure 1). For most disease groups, the rate of decline was more rapid in Canada than in the United States.

DISCUSSION

Avoidable mortality is a potentially useful performance indicator because it focuses attention on the primary purpose of health care, namely, reducing death.[1] Avoidable mortality is also one of the few outcome measures that can use existing data to compare national health care systems.

Avoidable mortality disease groups were specifically selected to reflect outcomes of the health care system, but deaths from these conditions were undoubtedly affected by other factors that were not controlled in ou- Hill et al. suggested that adjusting avoidable mortality for underlying disease incidence



Note. SMR = Standardized mortality ratio; Whiskers represent confidence interval $P < 0.005$; some confidence intervals too small to show.
[a]United States and Canadian SMRs are indistinguishable in this figure.

FIGURE 1—Avoidable mortality in the United States and Canada, 1980–1996.

TABLE 1—Selected Avoidable Causes of Mortality

Avoidable Cause	*International Classification of Diseases, 9th Revision* Codes	Age Groups, y	European Community Reference Death Rate, 1985–1989[a]	Responsible Health Care Sector[b]	Other Potential Factors Contributing to Excess Mortality
Maternal mortality	630–676	All ages	7.3 per 100 000 live births and stillbirths	Primary care **Hospital**	
Perinatal mortality	All causes	<1 week and stillbirths >28 weeks' gestation	9.98 per 1000 live births and stillbirths	Primary care **Hospital**	Prevalence of premature births
Hodgkin's disease	201	15–64	0.71	Primary care **Hospital**	
Cervical cancer	180	15–64	3.18	Public health **Primary care** Hospital	Sexual habits; coding error
Breast cancer	174	25–64	34.10	**Screening programs (varies by area)** Public health Primary care Hospital	Risk factors affecting incidence: obesity, family history
Tuberculosis	010–018, 137	5–64	0.79	**Public health** Primary care Hospital	Ethnic group (immigration); noncompliance with treatment
Asthma	493	5–44	0.59	**Primary care**	Prevalence of disease
Appendicitis, cholelithiasis and cholecystitis, abdominal hernia	540–543, 574–575.1, 576.1, 550–553	5–64	0.45	Primary care **Hospital**	Coding error
Ischemic heart disease	410–414, 429.2	35–64	88.51	**Public health** **Primary care** Hospital	Coding error; health behavior affecting incidence: smoking, weight; nutrition
Hypertension and cerebrovascular disease	401–405, 430–438	35–64	34.72	Public health **Primary care** Hospital	Coding error; health behavior affecting incidence: smoking, weight; nutrition
Peptic ulcers	531–534	25–64	1.45	Primary care **Hospital**	Drug use, alcohol, smoking
All-cause mortality	001–999	0–64	1006		Both avoidable and nonavoidable causes

Note. Adapted from the European Community Working Group on Health Services and "Avoidable Deaths," 1997.[8]
[a]Per 100 000 unless otherwise noted.
[b]Bold items indicate most important provider.

should control for many of these environmental and host factors.[11] Avoidable mortality differences between geographic areas have been shown to persist in studies that were able to control for disease incidence or proxies for disease incidence such as socioeconomic status.[7,12,13] Notwithstanding, it could be argued that avoidable mortality should not be "overcontrolled" for disease incidence, given that reducing disease is an important goal of the health care system (i.e., public health).

Similarly, socioeconomic status is associated with access to effective medical interventions—a component of health care performance that is captured in unadjusted avoidable mortality measures but not in hospital-specific measures such as survival following medical procedures.[14,15] Hisnanick and Coddington suggested that comprehensive health care incorporating health promotion and disease prevention accounted for a 57% decrease in avoidable mortality among Native Americans between 1972 and 1987.[16] Other possible causes of variation in mortality data, such as errors in coding of deaths, are unlikely to account for the observed differences between the 2 countries for the 11 disease groups.

The lowest mortality ratios in Canada were for disease groups in which public health or primary care was expected to play a major role (asthma, cervical cancer, hypertension and cerebrovascular disease, tuberculosis, and maternal mortality), as opposed to those most

TABLE 2—Standardized Mortality Ratios (SMRs)[a] of Avoidable Deaths[b] in Canada, United States, and the European Community, 1985–1989.

	Maternal Mortality	Perinatal Mortality	Cervical Cancer	Hodgkin's Disease	Asthma	Hypertension and Cerebrovascular Disease	Breast Cancer	Ischemic Heart Disease	Tuberculosis	Appendicitis Cholecystitis, Abdominal Hernia	Peptic Ulcers	All-Cause Mortality
						Canada[a]						
SMR	59*	81*	46*	76*	78*	62*	104*	127*	29*	84*	76*	96*
Deaths	150	15 384	1166	564	388	8707	10 370	45 120	216	59	634	255 101
						US[a]						
SMR	101	101	111*	84*	88*	99*	102*	158*	61*	100	77*	124*
Deaths	1468	40 928	12 992	5462	3869	125 910	93 375	508 160	4100	3714	5760	2 744 737

[a]Standardized mortality ratios (SMRs) are referenced to the European Community 1985–1989. SMR > 100 indicates a mortality ratio greater than the reference population.
[b]Avoidable deaths are defined in Table 1. All-cause mortality includes both avoidable and unavoidable deaths of persons aged 0–64 years.
*$P < .0005$ compared with the European Community.

often treated in a hospital (Hodgkin disease, appendicitis, cholecystitis, abdominal hernia, and peptic ulcer). One of the most frequently cited differences between Canada and United States is the degree to which comprehensive health care is freely available at the point of use.[17] Another difference is the Canadian emphasis on primary care, demonstrated by a higher per capita proportion of primary care physicians than in the United States.[18]

Rutstein et al. originally intended that measures of avoidable mortality merely provide a warning sign of possible health care system shortcomings[6]; therefore, it would be unwise to conclude, solely on the basis of differences in mortality, that the Canadian health care system performs better than the United States system. Yet the differences in avoidable mortality between the United States and Canada warrant further investigation, given that reducing mortality is a major objective of the health care system. Whether use of the avoidable mortality measure can ultimately stimulate improvement in health care systems remains largely to be seen. There are an increasing number of examples of high levels of avoidable mortality having led to further investigations of underlying influences[8]; however, it is not clear whether these investigations have led to health system improvements. Further, measures of avoidable mortality have not yet been subjected to the kinds of evaluative reviews that have been conducted for other performance measures, such as procedure-specific report cards.[19] ■

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Contributors

D.G. Manuel planned the study, analyzed the data, and wrote the article. Y. Mao assisted with the study design, supervised the data analyses, and contributed to the writing of the article.

Human Participant Protection

No protocol approval was needed for this study.

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