

Pediatric Mortality and Hospital Use in Canada and the United States, 1971 through 1987

ABSTRACT

Since 1971 pediatric mortality rates have decreased markedly but differently in Canada and the United States. These trends were examined in light of changes in hospital use and health care financing. Annual mortality and hospital use rates for children aged 14 years and younger were calculated. Between 1971 and 1987, all-cause mortality in Canada fell from 165 to 74 per 100 000; the American rate fell from 172 to 96 per 100 000. American hospitalization rates remained essentially constant until 1983 and then fell by 27.5%, while Canadian hospitalization rates declined throughout. In 1987 Canadian children had higher hospitalization rates, while American children had higher mortality rates. These differences may be associated with differences in health financing; the adoption of US prospective payment systems was temporally coincident with sharp declines in hospitalization rates for American children. (*Am J Public Health.* 1995;85:1276-1279)

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Introduction

Since 1970, North American health care expenditure growth has outstripped economic growth.¹ In 1989, the United States spent 40% more per person on health care than did Canada.² Hospital use dominates health care spending in both countries and is integral to managing morbidity. In 1978, Canadian children had higher hospitalization rates than American children.³ Between 1983 and 1984, children's hospitalization rates dropped 12% in the United States.⁴

We describe 17-year trends in Canadian and American mortality and hospitalization rates among children under 15 years of age. Despite similar trends in both countries' mortality and hospitalization rates, differences in their absolute levels and temporal changes may be associated with differences in health care financing.

Methods

Mortality and hospitalization data from 1971 through 1987 for Canada⁵ and the United States⁶ are organized by cause; the *International Classification of Diseases* (ICD)⁷ is used in these classifications. For each year, we summed the number of deaths for children less than 1, 1 through 4, 5 through 9, and 10 through 14 years of age. Census population estimates were used to calculate annual mortality rates per 100 000 children. American population figures for 1965 were used to standardize mortality rates by age and sex. Selected age-specific rates are reported for children less than 1, 1 through 4, 5 through 9, and 10 through 14 years of age.

Choosing children under 15 years of age reduces the potentially confounding roles of firearms and motor vehicles in mortality and ensures relative compatibility with hospitalization data. (US hospitalization data are reported as aggregate figures under the age of 15 years, thus precluding standardization. However, the two countries' 0- to 14-year populations have similar age structures.^{5,6})

Hospital discharges^{8,9} were used to calculate annual hospitalization rates with the same population estimates and ICD codes as above. Canadian data are censal, covering all hospitals; American data are gathered from a sample of approximately 400 hospitals (those with more than 1000 beds are oversampled). The sampling fraction varies inversely with the number of beds, and discharge samples are selected by random-digit matching with medical record numbers.⁹

Rates were compared by means of 95% confidence intervals (CIs) for proportions. Average rates of change over time¹⁰ were estimated with linear regression, and differences between these rates were evaluated by comparing the confidence intervals of regression coefficients.¹¹

Results

Mortality

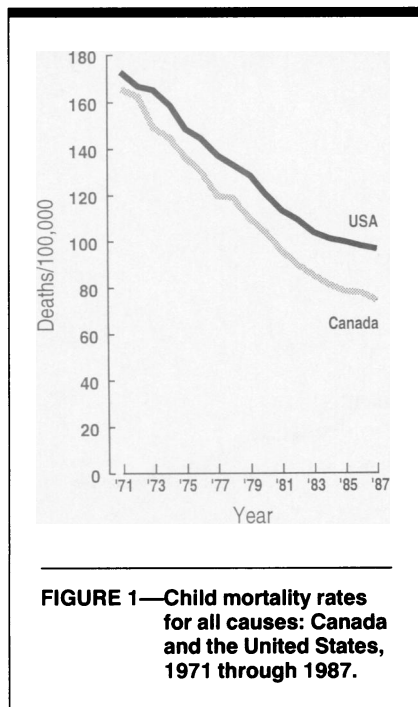
Between 1971 and 1987, age-adjusted, all-cause mortality among children 0 to 14 years of age declined significantly faster in Canada than in the United States (Figure 1). Beginning at 165 deaths per 100 000 in 1971, Canadian mortality declined at an average annual rate of 5.5 per 100 000 to 74 in 1987 (95% CI = 71, 77). By contrast, American mortality fell from 172 deaths per 100 000 in 1971 to 96 in 1987, an average annual decline of 4.6 per 100 000 per year (95% CI = 4.3, 4.9).

Age-specific mortality data (Table 1) showed similar declines among 10- to 14-year-olds in both countries and greater declines among younger children. The three largest contributors to mortality, together constituting more than 50% of deaths, were identical in both countries:

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perinatal conditions (ICD codes 760 to 779), congenital anomalies (ICD codes 740 to 759), and injuries (ICD codes 800 to 999). Mortality rates for these causes are shown in Figure 2.

Hospital Use

Trends in all-cause hospital use differed in the two countries (Figure 3). Between 1971 and 1983, the American rate essentially did not change (7004 per 100 000 in 1971 [95% CI = 6997, 7010] and 7076 per 100 000 in 1983 [95% CI = 7070, 7983]), while the Canadian rate fell from 11 191 per 100 000 (95% CI = 11 167, 11 216) to 8925 per 100 000 (95% CI = 8900, 8949). However, these trends changed sharply after 1983. From 1983 through 1987, the American rate fell 27.5% (from 7076 per 100 000 to 5130), while the Canadian rate fell only 5.9% (from 8925 per 100 000 to 8401).

Respiratory conditions (ICD codes 460 to 519), injuries, and digestive conditions (ICD codes 520 to 579) accounted for more than 50% of hospitalizations (Figure 4). Over the entire period, the rate of decline of respiratory disease hospitalizations was markedly greater in Canada than in the United States, while rates of decline of hospitalization attributed to gastrointestinal conditions were greater in the United States. (The 1978 to 1980 data for gastrointestinal conditions were affected by coding changes made between the eighth and ninth editions of the ICD.)

TABLE 1—Age-Specific Child Mortality Rates: Canada and the United States, 1971 and 1987

Age, y	Canada		United States		Average Annual Decline	
	1971	1987	1971	1987	Canada	United States
0-1	1755	732	1904	1019	65.6	60.2
1-4	85	44	83	52	2.9	2.1
5-9	47	21	42	24	1.7	1.2
10-14	41	25	40	27	1.2	0.9

Note. Values are numbers of deaths per 100 000 population.

The Canadian experience with neoplasms, however, failed to follow all-cause trends. In 1987, Canada's mortality rate from neoplasms was 21% higher, and its hospitalization rate 10.2% lower, than that of the United States.

Discussion

Between 1971 and 1987, all-cause mortality and hospital use fell unequally in the two countries. Canadian children's hospital use declined more slowly than that of American children. By contrast, American children's mortality declined less rapidly than that of Canadian children, resulting in considerably higher American mortality rates in 1987 (Table 1).

While part of this difference could theoretically arise from differential mortality associated with race,¹² Canadian data are not reported by race. However, evidence from parents of high socioeconomic status, selected here to minimize poverty-race interactions, suggests that Black and White American infants with birthweights greater than 2500 g have similar neonatal mortality rates.¹³ Furthermore, the same data demonstrate better survival among Black infants at very low birthweights.¹⁴ Additional data on mortality from congenital anomalies and injuries (Figure 2) are not amenable to causal interpretation in terms of race. Mortality from congenital anomalies has declined in both countries at approximately the same rate, while that from injuries has declined more rapidly in Canada. Thus, mortality differences in the two countries are consistent with changing causal interactions of environmental and biological factors combined with different policy environments and programs, including those directly affecting health services.

Markedly lower American hospitalization rates may represent more efficient hospital use or inappropriately low use.

However, three published estimates of the proportion of pediatric bed-days judged "inappropriate" are similar: 21.3% at an American university center,¹⁵ 16.2% at one Canadian university center,¹⁶ and 24% at another.¹⁷ These estimates suggest that lower rates do not reflect more efficient care. Factors such as distance to hospital and bed density found to be associated with geographic variation¹⁸⁻²⁰ are an issue in both countries, with the exception of differences in insurance coverage.^{21,22} These shared factors, combined with similar medical education, postgraduate training, and health care facilities, suggest that within-country practice style differences are likely to be equal to or greater than between-country differences.

In terms of insurance, however, Canada and the United States differ markedly. Data gathered in 1977²³ and 1987²⁴ indicate that the percentage of young Americans without insurance coverage increased from 12.5% in 1977 to 16.9% in 1987, leaving an additional 3.25 million children without health insurance. Moreover, the decline in American hospitalizations noted here coincides temporally with the introduction and expansion of prospective payment systems. These systems, based on diagnostically related groups (DRGs), have replaced Medicaid payments to providers at "prevailing local rates." Children's hospitals were exempted from DRGs when they were introduced in 1983 for federally funded Medicare insurance; however, several states adopted payment for Medicaid insurance based on DRGs, and their use subsequently spread to private insurers.²⁵ National Hospital Discharge Survey data indicate that children's hospital use fell 12% between 1983 and 1984.⁴ Our results suggest that the 12% decline in American hospitalization between 1983 and 1984⁴ was not a one-time adjustment to financ-

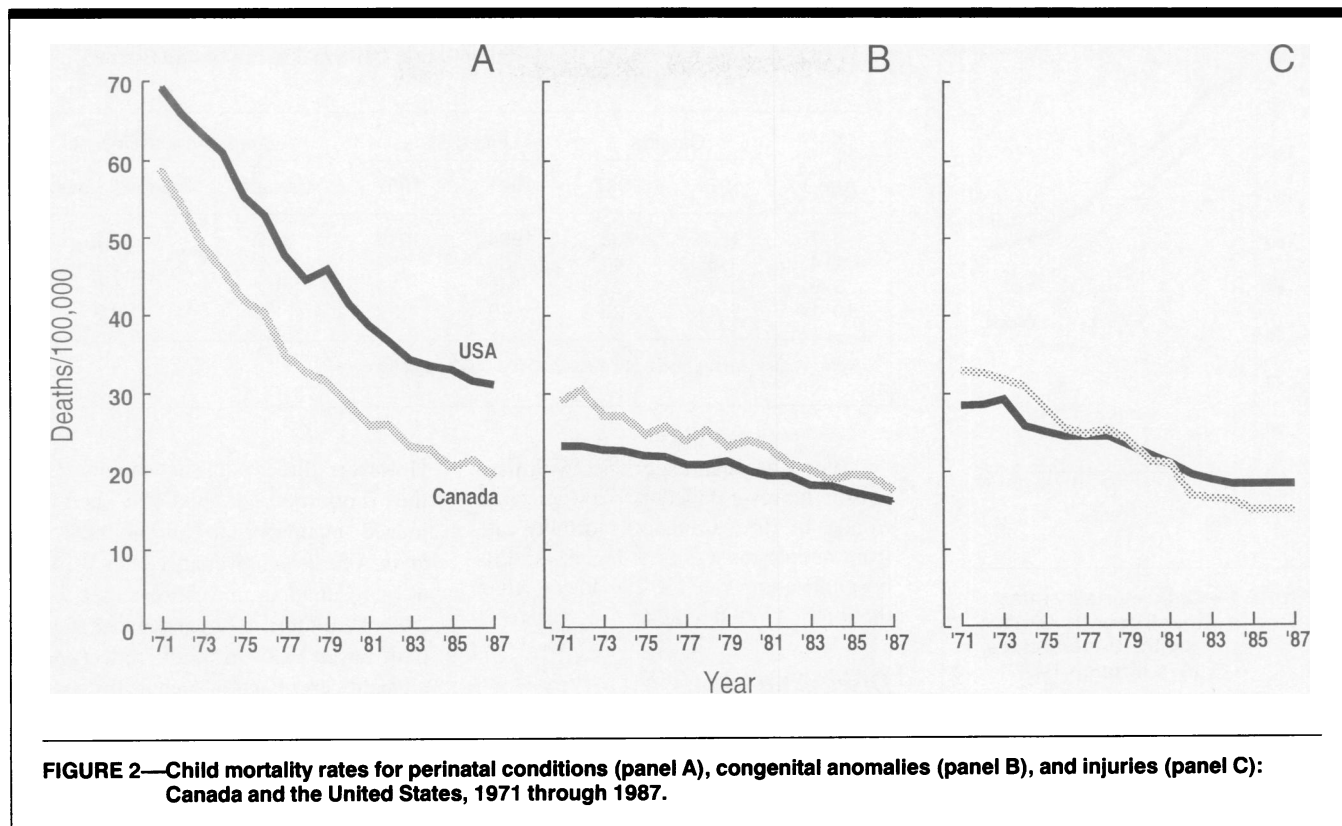


FIGURE 2—Child mortality rates for perinatal conditions (panel A), congenital anomalies (panel B), and injuries (panel C): Canada and the United States, 1971 through 1987.

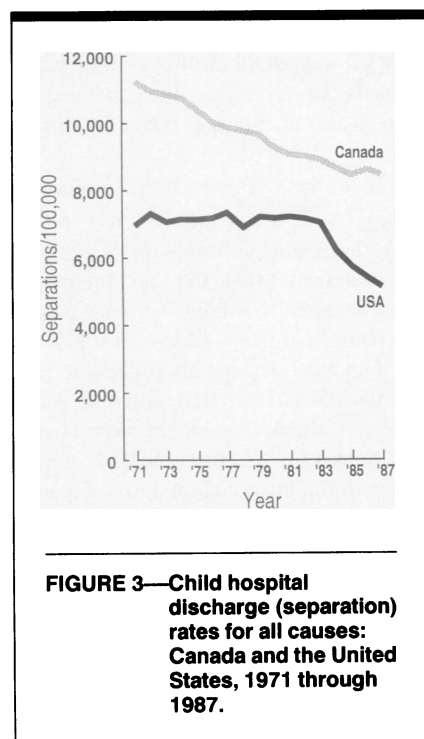


FIGURE 3—Child hospital discharge (separation) rates for all causes: Canada and the United States, 1971 through 1987.

ing changes but the beginning of a decline that continued until at least 1987.

Optimal hospitalization for any condition is a function of the condition's incidence and severity and of alternatives to inpatient care. The marked short-term reduction in the American hospitalization

rate between 1983 and 1987 appears unlikely to represent a corresponding change in incidence or severity of conditions such as respiratory illness or injuries. Furthermore, substitutes for inpatient care would more likely have shortened hospital stays rather than reduced hospitalizations.

Our data suggest that the spread of prospective payments to Medicaid and private-sector insurance has been associated with a marked decrease in hospital use by American children. In addition to the temporal association in the United States between declining hospital use and changes in financing, the Canadian experience (i.e., neither such financing changes nor a sharp decline in hospital use occurred) suggests that hospital use would not have fallen so abruptly in the absence of health care financing changes.

If Canadian all-cause mortality rates were applied to the 1987 American population, approximately 10 000 deaths (26% of actual deaths) would not have occurred. Similarly, applying American hospitalization rates to the Canadian population in 1987 yields approximately 177 500 fewer hospitalizations.

Clearly, such comparisons ignore complicated relationships between mortality and hospitalization, and it is not our intention to suggest a direct link. Neverthe-

less, access to hospitals is one of the determinants of health.²⁶ Child health is also affected by the family's access to income sufficient to provide a balanced, adequate diet; a relatively safe environment; and attention to potential health problems. Thus, a portion of the better Canadian mortality experience may be attributable as much to social welfare programs as it is to universal health insurance.

In summary, both Canadian and American child mortality and hospital use rates have fallen significantly. However, Canadian hospital use remains higher, whereas American mortality is greater than that in Canada. Further research should investigate whether these factors are causally related and whether clinical practice guidelines will optimize hospital care by reducing physician uncertainty. Finally, the sensitivity of children's health to changes affecting income security, access to primary or hospital care, and commitment to child health requires prompt attention, for both the sake of children and the sake of our common future. □

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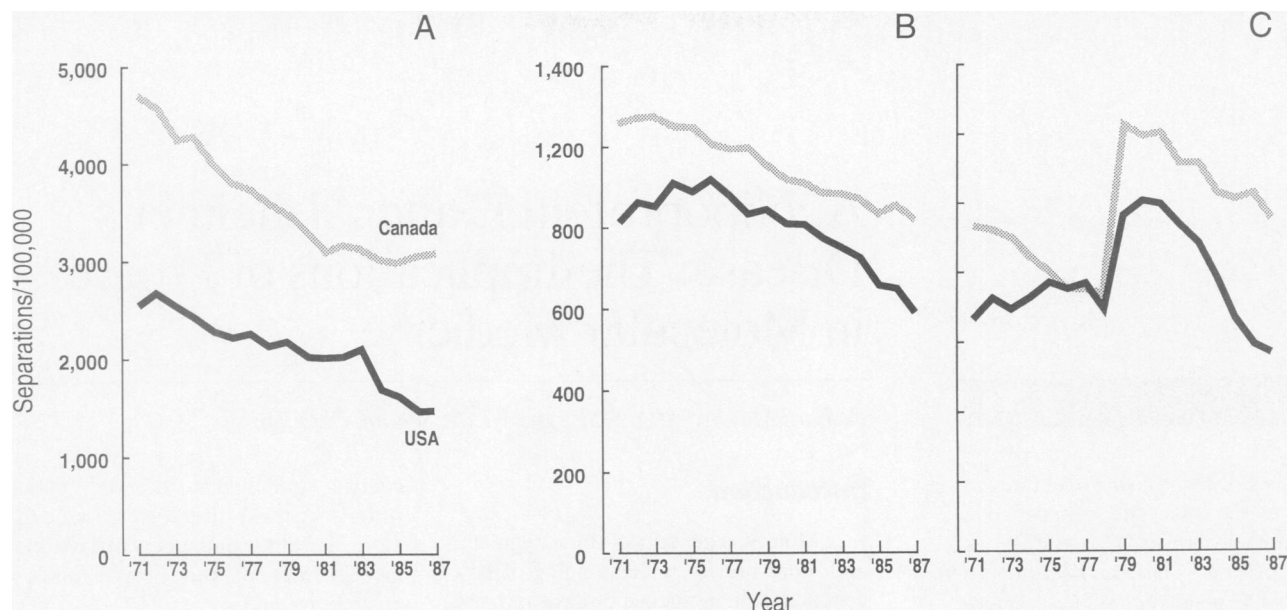


FIGURE 4—Child hospital discharge (separation) rates for respiratory conditions (panel A), injuries (panel B), and digestive conditions (panel C): Canada and the United States, 1971 through 1987.

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