

Homicide, Suicide, Motor Vehicle Crash, and Fall Mortality: United States' Experience in Comparative Perspective

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Abstract: US mortality data on motor vehicle crashes, falls, suicide, and homicide for 1980 are compared with corresponding data for France, Japan, West Germany, and the United Kingdom. Unadjusted and age-specific death rates are presented, together with age-adjusted rates of years of life lost (YLL). A large male excess in rates is typical outside the fall category. Motor vehicle crashes are the predominant cause of YLL, and the United States manifests the highest YLL rates for each sex. US fall death rates at the older ages

are exceeded by those of France and West Germany. The elderly generally manifest the greatest risk of suicide; American females exhibit a unique rate decline after ages 45–54 years, however. Beyond early adulthood, US suicide rates are lower than those of France, Japan, and West Germany. US homicide rates dwarf those of the comparison countries with 16- to 29-fold differentials separating prime-risk American males aged 25–34 years from their foreign counterparts. (*Am J Public Health* 1989; 79:1396–1400.)

Introduction

In a foreword to an influential report from the National Academy of Sciences, William Foege remarked on the persistence of injuries as a "major determinant of longevity" in the United States, and globally.¹ The 1980s have furnished much basic data on injury occurrence and witnessed renewed interest in their prevention.^{2–7} Federal Government support has been strengthened by the formation of a Center for Environmental Health and Injury Control at the Centers for Disease Control, the establishment of five regional university-based injury prevention research centers, and growing sponsorship of pertinent research projects and prevention programs by the National Institutes of Health.^{8,9}

Nationally, injuries rank fourth as a cause of death behind heart disease, cancer, and cerebrovascular disease,¹⁰ but they are the premier killer of Americans between ages one and 45 years,¹⁰ and are the leading cause of years of life lost (YLL) before age 65.¹¹ An international study revealed marked differences in all-cause injury death and age-adjusted YLL rates for the United States, France, Japan, the United Kingdom, and West Germany.¹² The aim of the present paper is to shed light on these findings through an examination of data on unintentional motor vehicular and fall mortality, suicide and homicide—the leading causes of injury mortality in the United States.⁴ The four comparison countries are of particular interest due to similarities they share with the United States in terms of development and mode of government, and because of their close political and economic links to this country. All five countries have populations exceeding 55 million, and thus may be considered demographically large.

Methods

Data are adapted from 1980 age-, sex-, and cause-specific mortality tabulations published by the World Health Organization (WHO).¹³ Total injury deaths (E800–E999) and deaths from motor vehicle traffic crashes (E810–E819), falls

(E880–E888), suicide (E950–E959) and homicide (E960–E969) are classified under an abbreviated three-digit external cause code according to the basic tabulations list of the ninth revision of the *International Classification of Diseases* (ICD-9).¹⁴

YLL rates are adjusted for age by means of a direct standardization procedure,¹⁵ using the 1980 US population as the reference. YLL represent the summation of the products of the number of deaths at each age, here starting at age one, and the years of life remaining up to the age ceiling, here age 65. Since the WHO age data are abridged, age at death for decedents is estimated as the mid-point of the respective age groups.

Results

Crude Rates and Causal Components

France manifests the highest crude injury death rates for either sex (116 per 100,000 males and 73 per 100,000 females) (Table 1). The United States has the second highest rate for males (105 per 100,000), West Germany the second highest rate for females. Male rates surpass female rates in all five countries, and the magnitude of the male excess ranges from 50 percent in the United Kingdom to 180 percent in the United States.

Motor vehicle crashes, falls, suicide, and homicide collectively account for between two-thirds and four-fifths of total injury deaths in each country. However, homicide is a major cause of death only in the United States. Homicide rates in the remaining four countries approach individual mortality rates for fire, poisoning, drowning, and other transportation (data not shown).

Except in Japan, motor vehicle crashes are the leading cause of injury mortality among males, with the United States having the highest sex-specific rates. Motor vehicle crashes are also the leading cause of injury mortality among females in the United States, but in the remaining countries they are surpassed by suicide, falls, or both. Male predominance universally characterizes motor vehicular mortality and suicide, but the sex differential is sharply reversed with respect to fall mortality in France, West Germany, and the United Kingdom.

Age-Specific Rates

Both sexes exhibit a bimodal age-specific pattern of motor vehicular mortality, irrespective of country (Figure 1). Peaks occur at ages 15–24 years and over 74, with male rates greatly exceeding female rates. Japan and the United King-

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ALL-CAUSE INJURY MORTALITY IN FIVE COUNTRIES

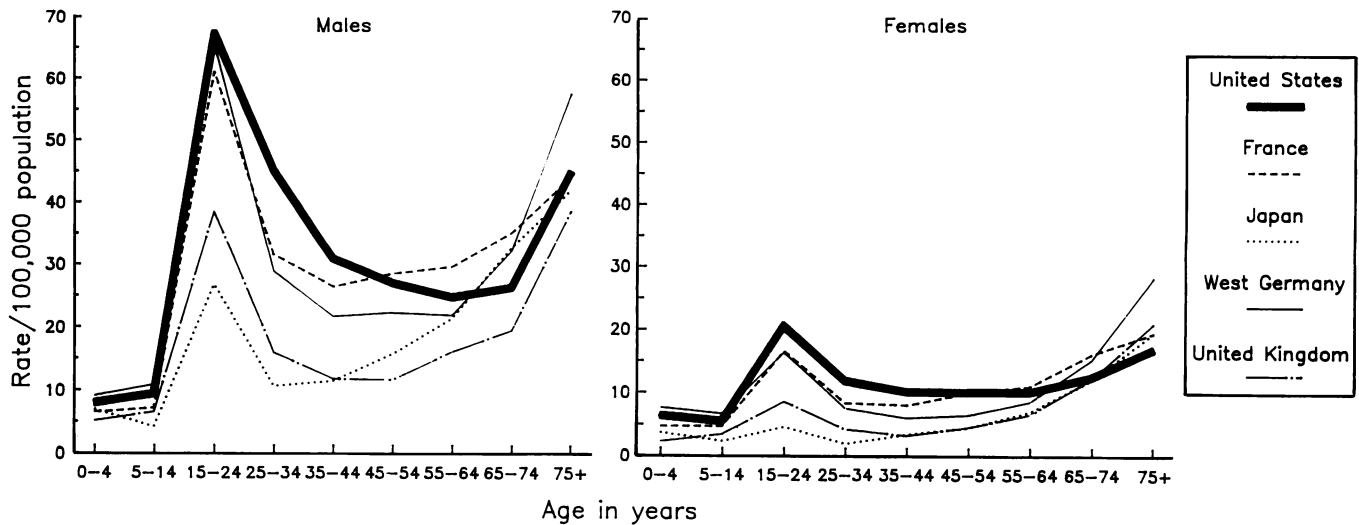


FIGURE 1—Age-Specific Motor Vehicle Crash Death Rates by Sex and Country, 1980

dom manifest the lowest motor vehicular death rates for both sexes, although there is a trend toward convergence at the upper end of the age spectrum. The United States has the highest motor vehicular death rate for females from ages 15 through 44 years, and the lowest rate in the over 74 population.

Fall mortality is profoundly selective of the elderly (Figure 2). In the over 74 age group, which reflects the greatest risk, there is considerable cross-national variation by sex, with rates peaking among French and West Germans. In France, West Germany, and the United Kingdom, female rates are approximately 50 percent higher than corresponding male rates. Japan has by far the lowest national rates, and US rates also are relatively low.

Generally, age-specific suicide rates are highest in France, Japan, and West Germany, with the elderly most at risk in all countries (Figure 3). Male rates universally exceed female ones. American females manifest a unique decline in their suicide rate after ages 45-54.

Homicide rates are usually lower than suicide rates,

except in the two youngest age groups, where there is a major departure from the norm by the United States because of extremely high homicide rates among adolescents and younger adults of both sexes (Figure 4). In the prime-risk 25-34 age group, the US rate for males ranges from 16 to 29 times other national rates. The US rate for females in that age group, while less than one-fourth that for US males, is still more than triple the second highest national homicide rate, that of West Germany.

Years of Life Lost

Motor vehicular, suicide, and fall YLL rates are invariably much greater for males than females (Table 2). This finding is repeated with US homicide YLL rates, which for each sex marginally surpass corresponding suicide rates, and dwarf other national homicide YLL rates. Suicide produces the highest sex- and cause-specific YLL rates in Japan; elsewhere it is motor vehicle crashes. Male suicide YLL rates are similar in the United States, France, Japan, and West Germany, and are at least double the British rate. Female suicide YLL rates are highest in France, Japan and West

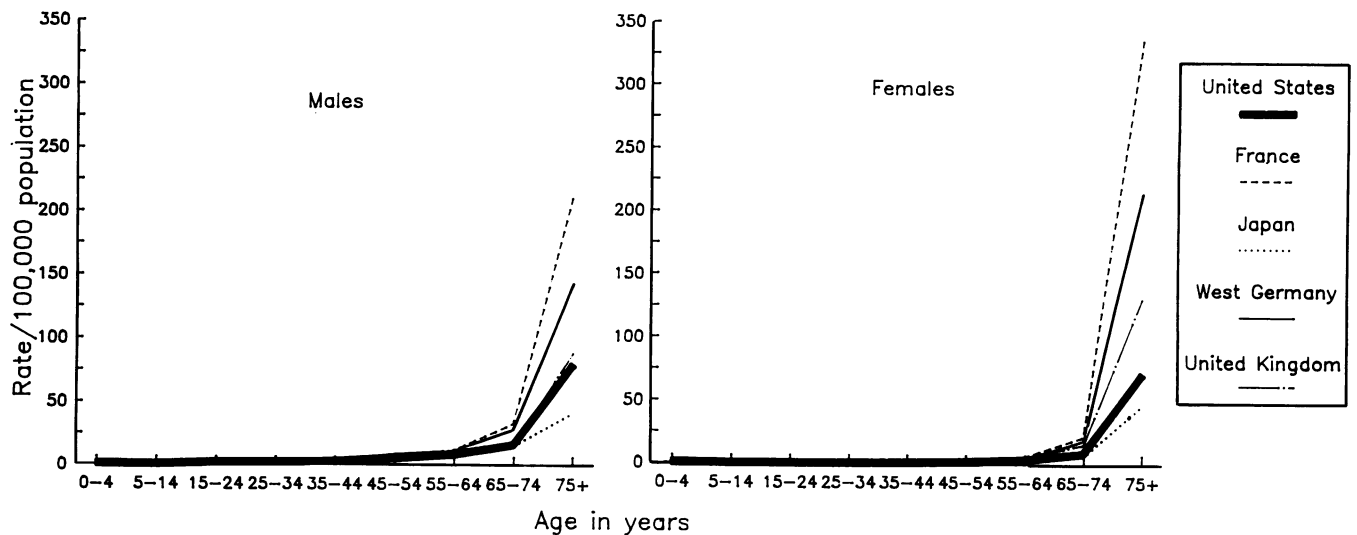


FIGURE 2—Age-Specific Fall Death Rates by Sex and Country, 1980

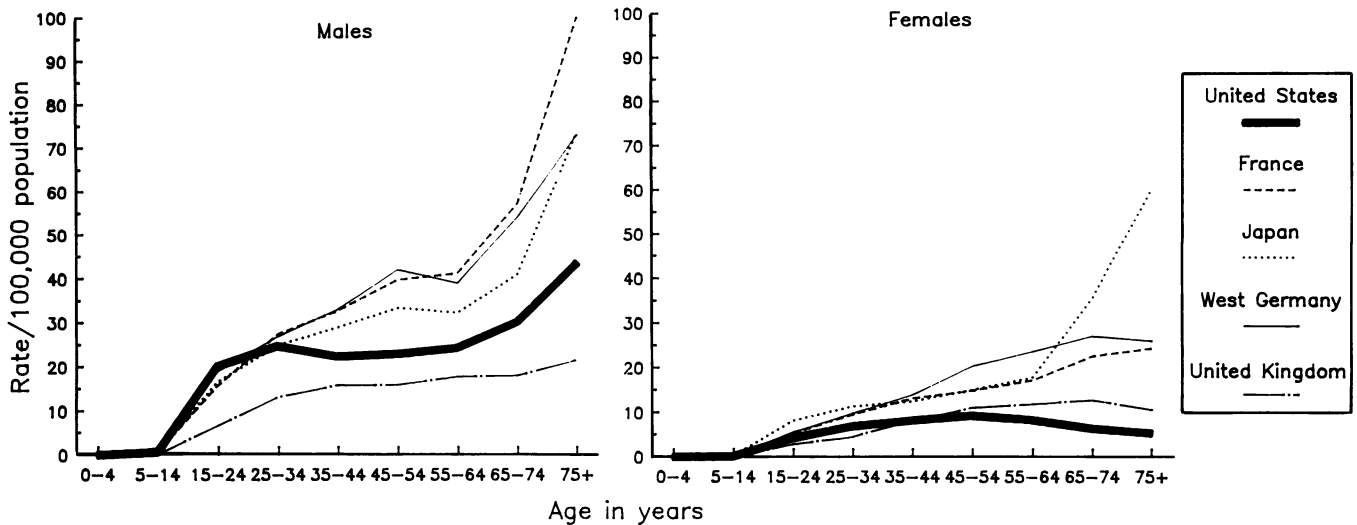


FIGURE 3—Age-Specific Suicide Rates by Sex and Country, 1980

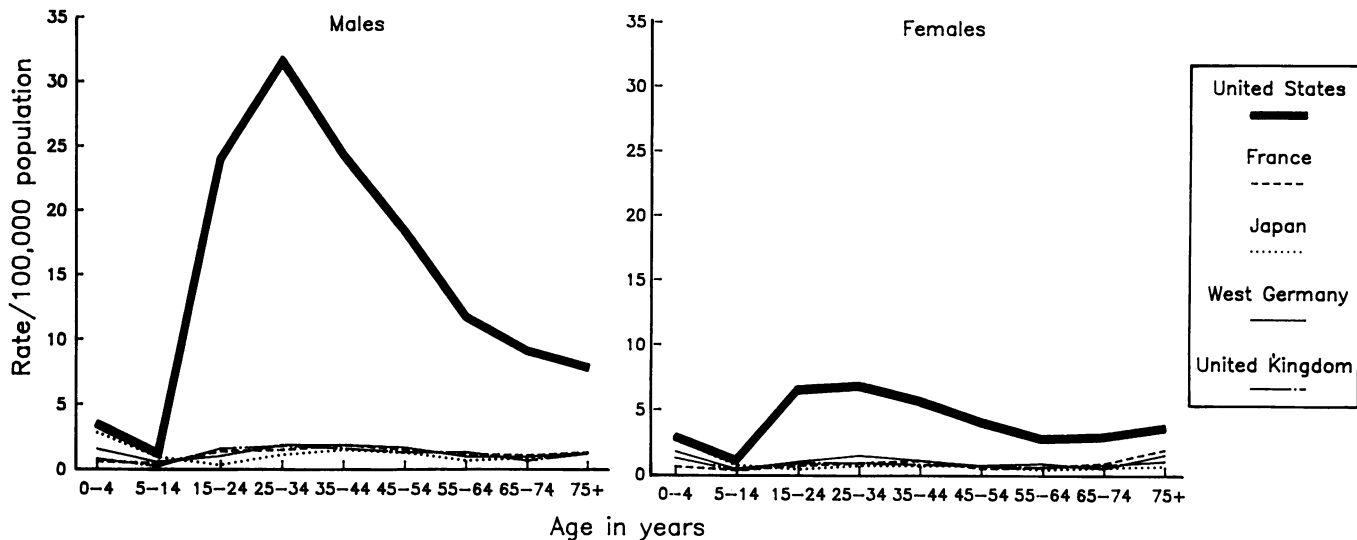


FIGURE 4—Age-Specific Homicide Rates by Sex and Country, 1980

Germany, and approach the British rate for males. Fall YLL rates are consistently small by sex and across countries.

Discussion

Focusing on 1980 motor vehicle crash, fall, suicide, and homicide data, this research has pointed to substantial differences in the injury mortality profiles of the United States and four other major Western bloc countries: France, Japan, the United Kingdom, and West Germany. Motor vehicle crashes are the predominant cause of injury mortality in the United States, and are also the predominant cause of YLL between ages one and 65 years in all countries under review, except Japan. The sharp peaks in motor vehicular death rates, which are exhibited at ages 15-24 years, have also been observed in many other countries.¹⁶

A better single indicator of road death risk than an overall population-based mortality rate is number of deaths per motor vehicle distance traveled. In 1980, the United States and the United Kingdom both registered 2.1 road deaths per 100 million vehicle kilometers traveled.¹⁷ The

Japanese figure was marginally higher (2.25). In contrast, the French and West German figures were 4.6 and 3.8, respectively. All countries in the study manifested appreciable declines on the exposure measure between 1970 and 1980; from 68 percent for Japan to 30 percent for the United States.^{17,18} Similar declines occurred in the overall motor vehicular mortality rates.^{13,19} A more protracted downward trend has also been noted for select populations.²⁰

A recent US study revealed large inter-county differences in motor vehicle crash mortality rates, which varied inversely with population density and income.²¹ The authors speculated that this variation reflected differences in a host of underlying variables, including road quality and design, speed, vehicle type and condition, seat belt use, and access to emergency care. These and other variables, such as alcohol use,⁵ vehicle safety design features,³ access to safer modes of transport, such as trains,⁵ and seat belt legislation and related timing, compliance, and enforcement²² should be integral to analytic epidemiologic research aimed at addressing spatial and temporal variations in the road toll.

TABLE 1—Injury Mortality by Sex, Cause and Country: Rates and Percentage Distribution, 1980*

Sex/Cause	United States		France		Japan		West Germany		United Kingdom	
	Rate	%	Rate	%	Rate	%	Rate	%	Rate	%
Male										
Motor Vehicle	34.4	32.6	30.5	26.3	15.1	24.2	30.4	34.7	17.6	33.7
Fall	6.4	6.1	15.0	12.9	5.1	8.2	11.6	13.2	6.9	13.2
Suicide	18.6	17.6	28.0	24.2	22.2	35.5	28.3	32.3	11.0	21.1
Homicide	17.0	16.1	1.2	1.0	1.1	1.8	1.3	1.5	1.2	2.3
Other Injury	29.1	27.6	41.2	35.6	19.0	30.3	16.0	18.3	15.5	29.7
All Injury	105.5	100.0	115.9	100.0	62.5	100.0	87.6	100.0	52.2	100.0
Female										
Motor Vehicle	12.0	31.7	10.8	14.8	4.8	16.9	11.0	21.1	6.9	19.4
Fall	5.4	14.3	30.0	41.1	2.5	8.8	19.3	37.1	12.1	34.0
Suicide	5.4	14.3	11.1	15.2	13.1	46.1	14.1	27.1	6.7	18.8
Homicide	4.4	11.6	0.8	1.1	0.8	2.8	1.0	1.9	0.8	2.2
Other Injury	10.6	28.1	20.3	27.8	7.2	25.4	6.6	12.8	9.1	25.6
All Injury	37.8	100.0	73.0	100.0	28.4	100.0	52.0	100.0	35.6	100.0

*Rates per 100,000 population.

Fall mortality primarily strikes the elderly. Yet geriatric fall deaths are probably markedly undercounted because many of the victims die of complications stemming from the initial injury, and may have a consequential condition coded as their underlying cause of death.²³⁻²⁵ It is unknown how much of this contributes to the differences observed in this study. There has been a secular decline in the US fall death rate, with a reduction of 35 percent occurring between 1970 and 1980 alone.⁵ This trend may be a product of improved medical care, such as hip surgery and earlier mobilization after hip fracture.^{4,5} But also unknown is how much of the observed cross-national fall mortality differentials can be explained by quality of care considerations.

Both validation of the WHO cause-of-death data and estimation of the amount of variation in rates attributable to different national coding practices lie outside the scope of this study. However, an explanation was sought for the relatively high percentage of unintentional injury deaths among French males in 1980 that were classified by WHO under the rubric of "all other accidents," and were reflected in the residual injury mortality categories in Tables 1 and 2. The French age mortality distribution for "other" unintentional injuries corresponds to the distribution for motor vehicular injuries, probably due to a frequent tendency by French physicians to

write "accident" (coded as unspecified unintentional injury) on the death certificate as the sole external cause descriptor in a fatal motor vehicular trauma case.*

Like motor vehicular death rates, suicide rates vary dramatically by country, age, and sex. The very high rate observed among elderly Japanese females may be a legacy of the unusual degree of sociocultural acceptance that was traditionally accorded suicide in Japan.^{26,27} Only the United Kingdom registers lower rates than the United States over most of the age spectrum. American females manifest the lowest national rates among the middle aged and elderly, and the decline in their rates after ages 45-54 is unique. Since American males do not repeat the trend, the finding probably cannot be explained by differential misclassification. However, the stigmatized nature of suicide, coupled with prohibitive clauses in life insurance policies, inevitably raises questions concerning underreporting.⁶ Case ascertainment is also affected by definition. While not conclusive, a review of studies on the validity and reliability of official suicide statistics underlines a claim that these data are of sufficiently high quality to justify their use in international epidemiologic comparisons.²⁸ Cross-national analytic studies, which incor-

*Personal communication, Rachid Salmi, MD, France, February 3, 1989.

TABLE 2—Years of Life Lost (YLL) Due to Injury by Sex, Cause and Country: Age-Adjusted Rates and Percentage Distribution, 1980*

Sex/Cause	United States		France		Japan		West Germany		United Kingdom	
	Rate	%	Rate	%	Rate	%	Rate	%	Rate	%
Male										
Motor Vehicle	12.5	38.4	10.6	26.3	4.8	31.9	11.0	48.9	6.4	46.0
Fall	.7	2.2	.8	3.2	.7	4.8	.8	3.7	.6	4.5
Suicide	4.9	15.1	5.4	20.3	5.0	32.9	5.8	25.6	2.4	17.3
Homicide	5.8	17.9	.4	1.5	.3	2.3	.4	1.8	.4	2.9
Other Injury	8.6	26.4	9.1	48.7	4.3	28.1	4.5	20.0	4.1	29.3
All Injury	32.5	100.0	26.3	100.0	15.1	100.0	22.5	100.0	13.9	100.0
Female										
Motor Vehicle	4.1	42.8	3.2	38.4	1.2	22.9	3.4	45.6	1.7	36.6
Fall	.2	2.1	.2	2.7	.1	1.9	.2	3.2	.1	3.1
Suicide	1.4	14.4	2.0	23.5	2.3	45.0	2.2	29.4	1.1	23.5
Homicide	1.6	16.4	.2	2.6	.3	5.0	.3	4.3	.2	4.8
Other Injury	2.3	24.3	2.8	32.8	1.3	25.2	1.3	17.5	1.7	32.0
All Injury	9.6	100.0	8.4	100.0	5.2	100.0	7.4	100.0	4.8	100.0

*YLL rates per 1,000 population.

porate determinants and correlates that have been identified in recent literature reviews,²⁹⁻³¹ may yield new insights into suicide etiology.

Although homicide accounts for fewer deaths in the United States than either motor vehicle crashes or suicide, US rates are grossly disparate from those in the comparison countries on all three measures utilized in this study. In 1980, handguns featured in an estimated 11,522 US homicides³²; about half of the total. Handguns were also implicated in fourth-fifths of cases of firearm-related murder and nonnegligent manslaughter,³³ yet constituted only 30 percent of the national civilian firearm stock.³² The foregoing statistics seem all the more alarming when one considers that in 1980 there were only eight handgun-related homicides in the United Kingdom,³² which strictly regulates the sale and distribution of firearms, as do France, Japan, and West Germany. The US handgun-related homicide rate was 500 times the British rate, and the overall homicide rate was two-and-a-half times the rate of Northern Ireland,¹³ a country in a state of civil war. Moreover, the homicide rate for both sexes rose by 30 percent between 1970 and 1980.^{13,19} Results of a recent study suggest that restricting handgun access would be the most effective way to reduce the high US homicide rate.³⁴ The epidemic of firearm-related homicide (and other violence) warrants unprecedented ameliorative efforts by government agencies at all levels.

Detection of large international differences in disease rates has spawned hypotheses which, following testing, have advanced both understanding of disease etiology and prevention.³⁵ For example, the determination of such differences in cancer incidence rates^{36,37} is credited with stimulating an array of analytic studies indicating that dietary factors have both causative and inhibitory roles in human carcinogenesis.³⁸ Similar progress could ensue from detection and analysis of international differentials in injury mortality and morbidity.

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