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Firearm-related deaths in the United States and 35 other high- and upper-middle-income countries

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Background The Forty-Ninth World Health Assembly recently declared violence a worldwide public health problem. Improved understanding of cross-national differences is useful for identifying risk factors and may facilitate prevention efforts. Few cross-national studies, however, have explored firearm-related deaths. We compared the incidence of firearm-related deaths among 36 countries.

Methods Health officials in high-income (HI) and upper-middle-income countries (UMI) with populations greater than one million were asked to provide data using ICD-9 codes on firearm-related homicides, suicides, unintentional deaths and deaths of undetermined intent, as well as homicides and suicides for all methods combined. Thirty-six (78%) of the 46 countries provided complete data. We compared age-adjusted rates per 100 000 for each country and pooled rates by income group and geographical location.

Results During the one-year study period, 88 649 firearm deaths were reported. Overall firearm mortality rates are five to six times higher in HI and UMI countries in the Americas (12.72) than in Europe (2.17), or Oceania (2.57) and 95 times higher than in Asia (0.13). The rate of firearm deaths in the United States (14.24 per 100 000) exceeds that of its economic counterparts (1.76) eightfold and that of UMI countries (9.69) by a factor of 1.5. Suicide and homicide contribute equally to total firearm deaths in the US, but most firearm deaths are suicides (71%) in HI countries and homicides (72%) in UMI countries.

Conclusions Firearm death rates vary markedly throughout the industrialized world. Further research to identify risk factors associated with these variations may help improve prevention efforts.

Keywords Firearms, violence, suicide, homicide, cross-cultural comparison, developed countries, epidemiology

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In 1990, self-directed and interpersonal violence caused 2.7% of the world's disability adjusted life years (DALY) lost—the numbers of years of life lost from premature death combined with the loss of health from disability.[1] This percentage is projected to increase to 4.2% in 2020. In view of what it described as a dramatic increase in the incidence of intentional injuries, the Forty-Ninth World Health Assembly recently adopted a resolution declaring violence a leading worldwide public health problem and urged member states to assess and develop science-based solutions to the problem.[2]

Violence can be defined as the intentional use of physical force—against another person or against oneself—which results in or has a high likelihood of resulting in injury or death.[3] Much of the previous research conducted on violent deaths has focused on homicide or suicide. In some countries, firearms are the most frequently used weapons in homicide and suicide. This is particularly true in the United States, where 71% of homicides and 61% of suicides are firearm-related.[4] In 1993, a firearm was involved in the deaths of 39 595 people in the US (15.6 per 100 000), making firearm injuries the seventh leading cause of death.[5]

Most of the research on firearm-related deaths has focused on individual countries.[6–11] To our knowledge, only two descriptive epidemiological cross-national studies of firearm mortality have been published; one used the same data source as this paper and was restricted to children <15 years old,[12] and the other was restricted to firearm homicides among males 15–24 years of age.[13] International comparisons of firearm-related

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fatality rates are not common for two main reasons. First, firearm mortality is rarely tabulated as a summary measure, but rather, the individual components (e.g. firearm homicide) usually are included in the categories of homicide, suicide, unintentional deaths and deaths of undetermined intent. Second, within those categories, the information on the firearm components are not separately provided in the World Health Organization's *World Health Statistics Annual*,[14] the most common source of data for cross-national comparisons of mortality rates. In addition, it is not known if all countries collect information on firearm-related deaths.

International comparisons, however, may provide important insights into the magnitude of and risk factors for a health problem. These risk factors can be further studied and may lead to new prevention strategies. In this report, we describe firearm-related deaths in 36 countries and address several questions: How do firearm-related death rates in the US compare with rates in other countries of similar and lower economic status? Are firearm-related death rates similar among geographical regions? Do sex- and age-specific firearm death rates vary across income groups? We also place firearm death rates into the broader context of violent deaths by presenting overall homicide and suicide rates.

Methods

Inclusion criteria

Each year the World Bank classifies all nations by income based on their gross national product (GNP). Of the 208 nations included in the 1994 *World Development Report*,[15] 39 (19%) were classified as highly industrialized or having high-income economies (1992 GNP per capita ≥$8356), 43 (21%) were classified as having upper-middle-income economies (1992 GNP per capita = $2696 to $8355), 71 (34%) were classified as having lower-middle-income economies (1992 GNP per capita = $676 to $2695), and 55 (26%) were classified as having low-income economies (1992 GNP per capita ≤$675). We selected those countries in the high-income (HI) and upper-middle-income (UMI) groups on the assumption that they have the most accurate mortality surveillance systems. We further restricted our choice to those countries having a total population of more than one million. Forty-six countries (in this analysis Hong Kong, Northern Ireland and Taiwan were considered as countries) met our inclusion criteria.

Data collection

In January and February 1996, we wrote to the Ministry of Health or the National Institute for Statistics in each of these 46 countries. For the most recent year available, we requested the population count, the number of homicides by firearm (International Classification of Diseases, 9th Revision [ICD-9][16] codes E965.0–E965.4), suicides by firearm (codes E955.0–E955.4), unintentional deaths by firearm (codes E922.0–E922.9), deaths by firearm for which intentionality was undetermined (codes E985.0–E985.4), as well as the number of homicides (codes E960.0–E969) and suicides (codes E950.0–E959) by all methods combined. We solicited the information for males and females and for 5-year age groups. A reminder letter was sent to the countries that had not replied after 2 months and, if necessary, a second reminder was sent after 4 months. Countries that had not replied after 5 months were contacted by telephone. We did not request information on deaths attributed to legal intervention (codes E970.0–E978) or operations of war (codes E990–E999).

Response rate

Thirty-six (78%) of the 46 countries provided complete data; 4 (9%) countries sent incomplete data; and the remaining 6 (13%) countries did not reply. Mexico is included in the 36 countries even though it did not report on firearm deaths for which intentionality could not be determined, because firearm deaths of undetermined intentionality represent on average <8% of the total firearm mortality of each country. Twenty-six (96%) of the 27 HI countries and 10 (53%) of the 19 UMI countries with populations exceeding one million are included in our study. Eighty-three per cent of the 36 countries provided data for 1993 or 1994, and the remaining countries provided data for 1990, 1991, 1992, or 1995 (Table 1). The 36 countries in this study have a combined population of 1.2 billion people.

Data analysis

We calculated crude and age-adjusted rates of death per 100 000 for each country for firearm deaths for all reasons combined, homicides by firearm, suicides by firearm, unintentional deaths by firearm, deaths by firearm for which intentionality is undetermined, as well as homicides and suicides by all methods combined. We adjusted rates for age by using the standard world population from the *1994 World Health Statistics Annual*.[14] We also calculated sex- and age-specific rates and pooled rates by income group (HI and UMI). In addition, we calculated rates by geographical region in those regions where the population living in HI and UMI countries was well represented in our study e.g. 96% of the population living in HI and UMI countries in the Americas is represented in our study; 97% in Europe; and 100% in Asia and Oceania. Three countries (Mauritius, Israel and Kuwait) are included in our study, but not in the geographical comparison. Data from the US are presented separately from the pooled rates of the other countries in the HI group because of the exceptionally high US rates of firearm mortality. All rates presented in this report are age-adjusted.

Results

Homicide and suicide rates

During the one-year study period, the 36 countries combined reported 82 465 homicides (6.9 per 100 000) and 130 546 suicides (10.9 per 100 000). Homicide rates for individual countries range from 0.55 in England and Wales to 25.12 in Estonia. Suicide rates range from 1.46 in Kuwait to 34.05 in Estonia (Table 1). Some countries reported extremely high violent death rates (see the boxplots in Figure 1). The highest rates for homicide are mainly found in Estonia, Mexico, Brazil and the US. The highest suicide rates were reported by Estonia, Hungary and Slovenia, the only countries from Eastern Europe that are included in our study.

A firearm was involved in over half of the deaths classified as homicides in Northern Ireland (86%), Italy (74%), the US (71%), Brazil (56%), Mexico (56%) and Greece (51%). In the remaining countries a firearm was involved in less than half the homicides reported. A firearm was involved in almost one-quarter

Table 1 Violent death rates[a] for 36 selected high- and upper-middle-income countries

			Firearm total		Firearm homicide		Firearm suicide		Firearm unintentional		Firearm undetermined		Homicide		Suicide	
	Year	Population	Crude	Age-adjusted	Crude	Age-adjusted	Crude	Age-adjusted	Crude	Age-adjusted	Crude	Age-adjusted	Crude	Age-adjusted	Crude	Age-adjusted
High-income countries																
United States	1993	257 783 004	15.22	14.24	7.07	7.11	7.35	6.30	0.59	0.62	0.22	0.21	9.93	9.85	12.06	10 35
Northern Ireland	1994	1 641 711	6.82	6.63	5.24	5.07	1.34	1.32	0.12	0.11	0.12	0.13	6.09	5.85	8.41	7.79
Finland	1994	5 088 333	6.86	6.46	0.86	0.84	5.78	5.39	0.12	0.15	0.10	0.09	3.24	2.81	27.26	23.15
Switzerland	1994	7 021 000	6.40	5.31	0.58	0.57	5.61	4.53	0.13	0.15	0.07	0.06	1.32	1.27	21.28	16.29
France	1994	57 915 450	6.35	5.15	0.44	0.40	5.14	4.08	0.11	0.12	0.65	0.56	1.12	1.06	20.79	15.92
Canada	1992	28 120 065	4.78	4.31	0.76	0.68	3.72	3.33	0.22	0.23	0.07	0.07	2.16	2 00	13.19	11.51
Norway	1993	4 324 815	4.39	3.82	0.30	0.26	3.95	3.44	0.12	0.11	0.02	0.02	0.97	0.93	13.64	11.40
Austria	1994	8 029 717	4.56	3.70	0.42	0.37	4.06	3.25	0.05	0.05	0.02	0.03	1.17	1.05	22.12	17.03
Israel	1993	5 261 700	3.00	2.91	0.72	0.70	1.84	1.78	0.13	0.12	0.30	0.31	2.32	2.27	7.05	6.60
Belgium	1990	9 967 387	3 48	2.90	0.60	0.53	2.56	2.07	0.06	0.07	0.26	0.22	1.41	1.41	19.04	14.32
Australia	1994	17 838 401	2.94	2.65	0.44	0.41	2.35	2.10	0.11	0.11	0.03	0.03	1.86	1.79	12.65	11.14
Italy	1992	56 764 854	2.95	2.44	1.66	1.47	1.11	0.81	0.11	0.10	0.06	0.05	2.25	1.97	8.00	5.74
New Zealand	1993	3 458 850	2.66	2.38	0.17	0.15	2.14	1.88	0.09	0.10	0.26	0.25	1.47	1.48	12.81	11.71
Denmark	1993	5 189 378	2.60	2.09	0.23	0.22	2.25	1.74	0.04	0.05	0.08	0.08	1.21	1.29	22.33	16.25
Sweden	1993	8 718 571	2.36	1.92	0.18	0.18	2.09	1.65	0.03	0.04	0.06	0.05	1.30	1.22	15.75	12.12
Kuwait	1995	1 684 529	1.25	1.84	0.36	0.34	0.06	0.03	0.00	0.00	0.83	1 47	1.01	1.20	1.66	1.46
Germany	1994	81 338 093	1.57	1.24	0.22	0.20	1.17	0.88	0.04	0.04	0.15	0.13	1.17	1.12	15.64	11.29
Ireland	1991	3 525 719	1.21	0.97	0.03	0.03	0.94	0.75	0.11	0.08	0.14	0.11	0.62	0 58	9.81	8.75
Spain	1993	39 086 079	0.90	0.78	0.21	0.19	0.43	0.36	0.25	0.23	0.00	0.00	0.95	0.84	7.77	5.82
Netherlands	1994	15 382 830	0.70	0.70	0.36	0.30	0.31	0.31	0.01	0.01	0.03	0.02	1.11	0.98	10.30	10.30
Scotland	1994	5 132 400	0.58	0.54	0.19	0.18	0.33	0.30	0.02	0.03	0.04	0.03	2.24	2.24	12.16	10.72
England/Wales	1992	51 429 000	0.46	0.41	0.07	0.08	0.33	0.28	0.01	0.01	0.04	0.04	0.55	0.55	7.68	6.44
Taiwan	1994	21 086 686	0.42	0.37	0.15	0.12	0.12	0.11	0.11	0.10	0.04	0.04	1.78	1.67	6.88	6.43
Singapore	1994	2 930 200	0.24	0.21	0.07	0.05	0.17	0.15	0.00	0.00	0.00	0.00	1.71	1.57	14.06	12.90
Hong Kong	1993	5 919 000	0.19	0.14	0.12	0.09	0.07	0.05	0.00	0.00	0.00	0.00	1.23	1.12	10.29	8.50
Japan	1994	124 069 000	0.07	0.05	0.02	0.02	0.04	0.03	0.00	0.00	0.00	0.00	0.62	0.57	16.72	11.57
Upper-middle-income countries																
Brazil	1993	160 737 000	14 15	12.95	10.58	9.59	0.73	0.72	0.28	0.26	2.56	2.38	19.04	17.61	3.46	3.56
Mexico	1994	90 011 259	12.07	12.69	9.88	10.35	0.91	1.01	1.27	1.32	–[b]	–[b]	17.58	18.86	2.89	3.16
Estonia	1994	1 499 257	12.74	12.26	8.07	7.73	3.13	2.86	0.93	0.94	0.67	0.72	28.21	25.12	40.95	34.05
Argentina	1994	34 179 000	9.19	8.93	2.11	2.10	3.05	2.89	0.32	0.32	3.71	3.62	4.51	4.49	6.71	6.34
Portugal	1994	5 138 600	3.72	3.20	1.28	1.17	1.28	1.00	0.21	0.23	0.93	0.80	2.98	2 64	14.83	10.62
Slovenia	1994	1 989 477	3.07	2.60	0.35	0.30	2.51	2.13	0.20	0.15	0.00	0.00	2.01	1.92	31.16	23.38
Greece	1994	10 426 289	1.50	1.29	0.59	0.52	0.84	0.71	0.04	0.04	0.03	0.03	1.14	0.98	3.40	2.57
Hungary	1994	10 245 677	1.21	1.11	0.23	0.22	0.88	0.80	0 09	0.09	0.01	0.01	3.53	2.59	35.38	26.67
Mauritius	1993	1 062 810	0.19	0.19	0.00	0.00	0.09	0.12	0.09	0.07	0.00	0.00	2.35	2.37	12.98	12.01
South Korea	1994	44 453 179	0.13	0.12	0.04	0.04	0.02	0.02	0.05	0.05	0.02	0.02	1.62	1.50	9.48	8.78

[a] Crude and age-adjusted rates per 100 000 population and for one year between 1990 and 1995.

[b] Not available.

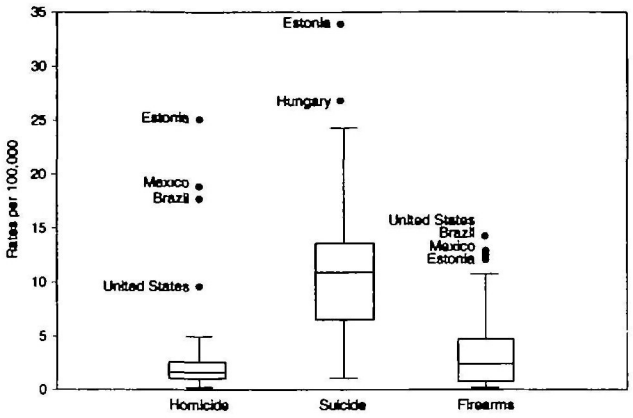

Figure 1 Distribution of homicide, suicide, and firearm death rates in 36 high- and upper-middle-income countries

NB: (1) Data for 1994 or most recent year available. (2) The boxplots above illustrate the distribution of homicide, suicide and firearm death rates by country. The lines within the boxes indicate the median value, the top and bottom lines of the boxes represent the 75th and 25th percentiles respectively. The interquartile range (IQR) equals the difference between these two values. The two lines outside the boxes, the whiskers, extend to the smallest and largest observations only if these values are less than 1.5 × IQR beyond the quartiles. Outliers are values beyond this limit.

(24%) of the deaths classified as suicides in all of the countries. A firearm was involved in less than half the suicides reported by each of the countries individually, with the exception of the US (61%).

Firearm-related deaths

Variations by country

During the one-year study period, 88 649 firearm deaths were reported by the 36 countries, for a pooled rate of 7.4 deaths per 100 000. Firearm death rates for individual countries vary widely. For example, age-adjusted rates of firearm mortality death range from 0.05 per 100 000 in Japan to 14.24 in the US (Table 1). Firearm homicide rates range from a low of 0.00 in Mauritius to 10.35 in Mexico. Firearm suicide rates range from 0.02 in South Korea to 6.30 in the US. Unintentional firearm death rates range from 0.00 in Hong Kong, Japan, Kuwait, and Singapore to 1.32 in Mexico.

Variations by geographical region

When responding countries are grouped by region, firearm mortality is highest in the Americas and lowest in Asia (Figure 2). In fact, the overall firearm mortality rate is five to six times higher in the Americas (12.72 per 100 000) than in Oceania (2.57) or Europe (2.17), and it is 95 times higher than in Asia (0.13). In the Americas most (58%) firearm deaths are homicides.

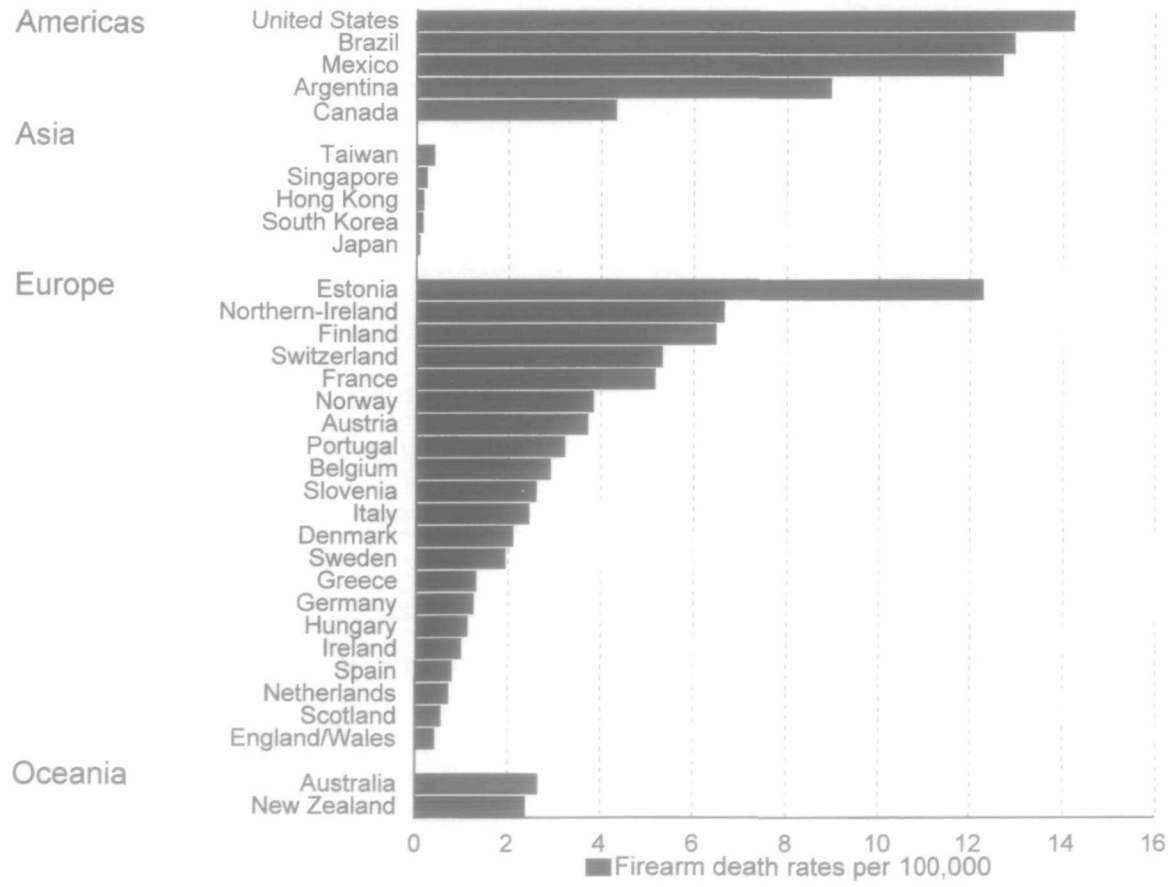

Figure 2 Firearm death rates, by country and region, in 36 high- and upper-middle-income countries

NB: Data for 1994 or most recent year available.

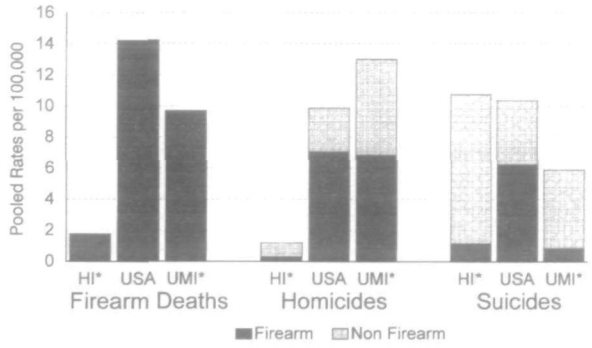

Figure 3 Firearm death, homicide, and suicide rates, by income, in 36 high- and upper-middle-income countries

* HI indicates high-income countries, and UMI indicates upper-middle-income countries

NB: Data for 1994 or most recent year available.

Suicides make up most of the firearm deaths in Europe (69%) and Oceania (80%). In Asia, 35% of the firearm deaths are reported as homicides, 37% as suicides, 20% as unintentional deaths and 8% as deaths of undetermined intent.

Rates by income group

The rate of firearm death in the US (14.24 per 100 000) is eight times the pooled rate for the other HI countries (1.76) and is 1.5 times the pooled rate for the UMI countries (9.69) (Figure 3). Firearm homicide rates are about 19 times higher in the US (7.11) and UMI countries (6.89) than in HI nations (0.37). In comparison, the US firearm suicide rate (6.30) is five times higher than the rate for HI nations (1.21) and is nearly seven times higher than the rate for UMI nations (0.91).

Comparing the proportion of homicides and suicides that involve a firearm, the US emerged as having a far greater proportion than either HI or UMI countries. Seventy-one per cent of homicides in the US involve a firearm, compared with 33% in HI countries and 54% in UMI countries. Sixty-one per cent of suicides in the US involve a firearm, compared with 11% in HI countries and 17% in UMI countries.

When we assessed the proportion of firearm deaths that are homicides and suicides, we observed marked variations in the income groups (Figure 4). In the US, the proportion of firearm deaths that are homicides (46%) is almost equal to the proportion that are suicides (48%). In the HI countries, however, the proportion of firearm deaths that are suicides is much greater (71%) than the proportion of such deaths that are homicides (19%). The reverse is true for UMI countries, where most firearm deaths are homicides (72%) rather than suicides (9%).

Variations by age and sex

Age and sex patterns of firearm mortality in HI and UMI countries are similar, differing only in magnitude. Firearm homicide and unintentional death rates are higher in younger age groups and firearm suicide rates are higher for older adults. However, when compared with their counterparts in the HI and UMI groups, the young people (15–24 year age group) in the US stand out in several ways. In the US, the 15–24 year age group has the highest age-specific rate of firearm homicide, whereas the rate is higher in the 25–34 year age group in HI and UMI countries (Figure 5). The 15–24 year age group in the US also has the highest age-specific rate of unintentional firearm deaths, but this is not the case in HI countries (Figure 6). Finally, in the US, firearm suicide rates among people 15–24 years old are higher than for those 25–54 years old (Figure 7). The reverse is true in the HI and UMI groups.

Although firearm mortality rates among males uniformly exceed rates among females, the rates among females are relatively closer to the rates among males in the US than in either the HI or UMI group. The male/female firearm mortality ratio in the US (6.0) is two-thirds to almost one-half the ratio in the HI (9.7) and UMI (10.9) countries. Five countries, however, have a lower male/female firearm mortality ratio than the US: Hong Kong (1.9), Kuwait (2.3), South Korea (3.2), Portugal (4.4) and Argentina (4.9).

Discussion

Our study explores the incidence of firearm-related deaths among 36 wealthier nations of the world. It is, to our knowledge, the first cross-national comparison of firearm death rates among males and females of all ages. During a one-year period, a firearm was involved in almost 90 000 deaths in the 36 countries included in our study. We observed marked variations in firearm deaths among these nations whether considered individually or grouped by income or geographical location. Among these 36 countries, the US is unique in several aspects. It has the

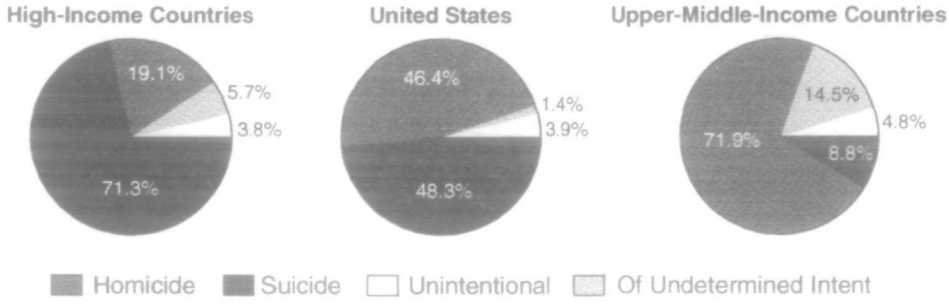

Figure 4 Proportion of firearm deaths, by cause and income, in 36 high- and upper-middle-income countries

NB: Data for 1994 or most recent year available

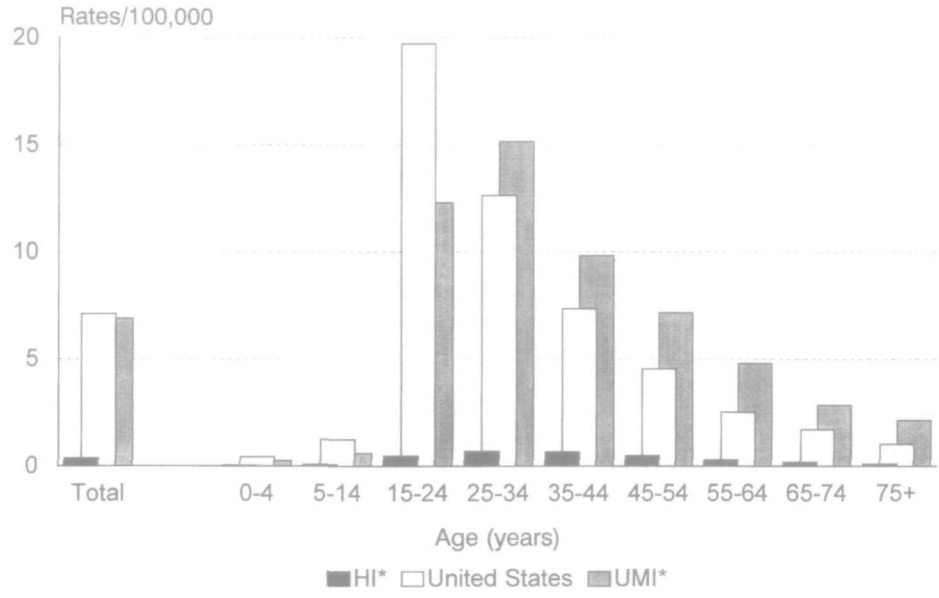

Figure 5 Firearm-related homicide rates by age, 36 high- and upper-middle-income countries by income group

* HI indicates high-income countries, and UMI indicates upper-middle-income countries

NB. Data for 1994 or most recent year available

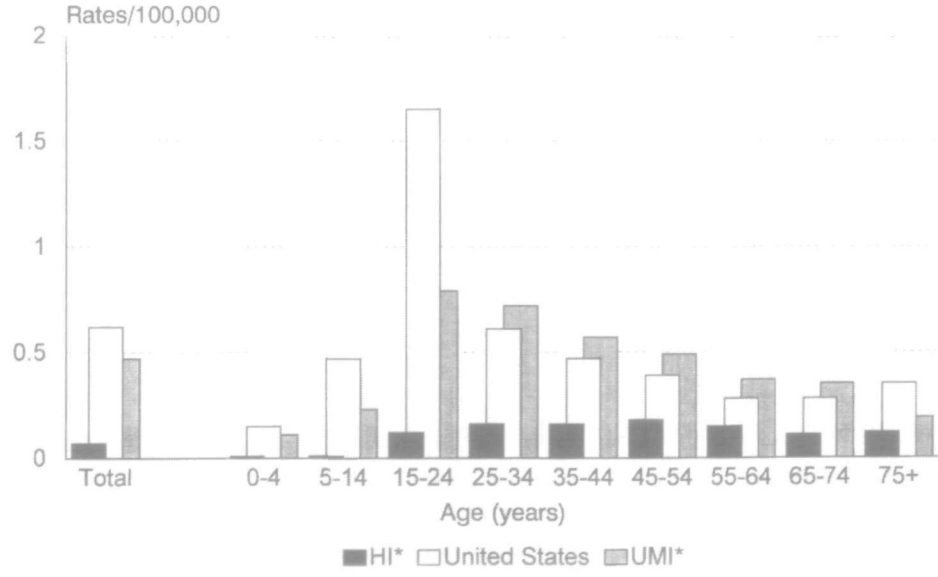

Figure 6 Unintentional firearm-related death rates by age, 36 high- and upper-middle-income countries by income group

* HI indicates high-income countries, and UMI indicates upper-middle-income countries.

NB. Data for 1994 or most recent year available.

highest overall firearm mortality rate, a high proportion of homicides that are the result of a firearm injury, and the highest proportion of suicides that are the result of a firearm injury. The US also has a relatively low male/female firearm mortality rate ratio—a finding which indicates that the difference between the rates for males and females is smaller in the US than in most other countries. Finally, the age-specific patterns indicate that the impact of all causes of firearm mortality—homicide, suicide, and unintentional injuries—is more pronounced in the younger age groups (<25 years old) in the US than in other nations.

Particularly high firearm mortality rates were noted among four nations in the western hemisphere (the US, Mexico, Brazil

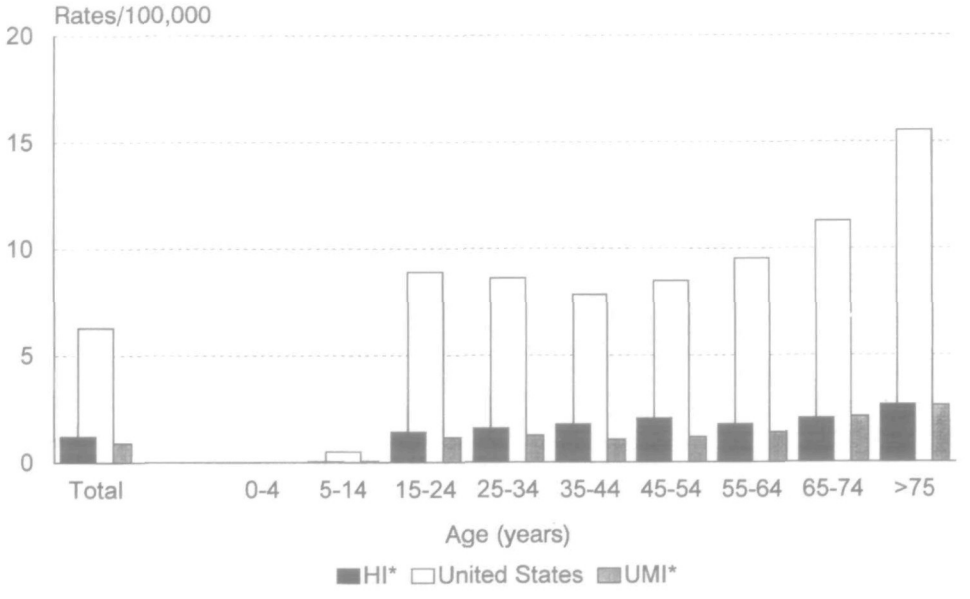

Figure 7 Firearm-related suicide rates by age, 36 high- and upper-middle-income countries by income group

* HI indicates high-income countries, and UMI indicates upper-middle-income countries.

NB: Data for 1994 or most recent year available.

and Argentina). In contrast, firearm mortality among the five participating Asian countries (Japan, South Korea, Hong Kong, Singapore and Taiwan) was very low. Higher rates of homicide in general and firearm homicide in particular were noted among UMI countries. HI countries reported low firearm suicide rates, but overall rates of suicide were otherwise comparable with the US rate.

The explanations for these observations is undoubtedly complex and in need of further study. A few areas worthy of pursuit have been identified, and future research is likely to expand the list. For the purposes of discussion, factors influencing firearm injury mortality can be separated into three general areas that are not mutually exclusive: factors that influence the use of a firearm, factors that influence the homicide rate, and factors that influence the suicide rate. Factors that have been suggested to influence the use of firearms include the social norms concerning the use of firearms, the availability of firearms in general, and the types of firearms that people choose to use.[17–21] Social norms may play a role in firearm-related mortality, homicide and suicide, in part by influencing if a weapon is used and what type of weapon is used. The use of firearms should be low in places where strong social norms inhibit people from using firearms. Social norms, for example, may be part of the reason for the very low rates of firearm mortality in all five Asian countries participating in our study.

Firearm availability varies greatly among nations: among the 14 countries in our study for which such data are available, the proportion of households possessing a firearm ranges from <1% in Japan to 48% in the US.[17] A positive association between firearm ownership and rates of firearm homicide, firearm suicide, and overall suicide has been reported.[17,18,21,22] Research findings are mixed, however, about the relationship between firearm ownership and overall homicide rates.[17,23,24] Because firearms are more lethal than other weapons, such as knives, choosing a firearm as a weapon increases the likelihood of a fatal outcome.[19] The types of firearms available may also influence mortality rates, because some models are more likely to be lethal than others.[20]

Firearm mortality rates may also be influenced by underlying causes of homicide and suicide that operate independently of the firearm-related factors just described. Social factors that may influence homicide rates include income inequality, low funding for social programmes, divorce, the proportion of households with working women, ethnic-linguistic heterogeneity, and social acceptance of violence.[25] Factors that may influence suicide rates include economic instability, unemployment, breakdown of the family group structure, intergenerational pressures and competition, secularization, and substance use and misuse.[26]

Even though the data in this report come from official sources and are based on ICD-9 codes, our findings should be viewed with some caution. First, the sensitivity and specificity of the surveillance systems may differ from country to country because of technical characteristics of the reporting system as well as cultural, political and religious factors. Second, only a small proportion of the total number of countries that form some of the regions or continents are represented in our study. Therefore, the pooled rates by geographical region do not represent the region, but rather just the HI and UMI countries in the region. Third, the number of countries is relatively small and unevenly distributed across the globe. Therefore, we cannot determine whether the observed geographical patterns are primarily determined by factors related to income or to other elements. For example, all five Asian countries in this study have very low rates of violent death, but the relative importance of income versus cultural, political and social factors cannot be determined. Finally, only 56% of the countries (including the US) reported detailed

firearm mortality data (at the fourth digit of ICD-9 coding) that enabled us to distinguish deaths caused by explosives from those associated with firearms. The firearm mortality rates for the other countries, therefore, may be slightly overestimated.

Widespread recognition of violence as a public health issue is relatively recent,[2] and the development of the specific role for public health workers is ongoing.[27] The descriptive data in this report indicate the value of surveillance of violent events, including firearm-related injuries, and that further study of international variation in rates, patterns and type of weapons may suggest new prevention strategies.

Our findings highlight the need for research and surveillance in several key areas. First, more information is needed about the frequency of violent deaths, including those from firearm injuries, in less industrialized and developing countries. Although developing countries have many public health priorities, violence also is an important contributor to their morbidity and mortality. The contribution of violence to morbidity and mortality is relatively greater for the poorer nations of the world than for the countries in this report.[1] Efforts to improve the completeness and the reliability of violent death data in developing countries will be an important first step toward addressing this problem.

Second, future studies should assess the impact of war on firearm deaths. Even though few countries included in our study experience deaths that could be attributed to operations of war, war is probably an important factor contributing to firearm mortality in other parts of the world. In 1990, war was estimated to be the sixteenth cause of DALYs lost throughout the world, but by 2020, it is projected to be the eighth leading cause of DALYs lost. Also needed are better methods to determine the number of people killed in armed conflicts, because such data are often lacking.

Finally, we should strive to improve our understanding of the factors that account for cross-national variations in violent and firearm death rates. For example, in most HI countries, suicide rates are high, but firearms play a relatively small role. In most UMI countries, firearms are involved in more than half of all homicides. In some nations, such as the US and Estonia, firearm death rates of all types are high, whereas in other nations, such as the five Asian nations in our study, firearm death rates of all types are low. A better understanding of the economic, sociocultural and other factors that underlie these differences will help in the design and implementation of national or regional interventions. The low rates in Asia show that such deaths can be prevented and provide hope that other nations may achieve similar levels.

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