

# Violent Death Rates: The US Compared with Other High-income OECD Countries, 2010



Erin Grinshteyn, PhD,<sup>a</sup> David Hemenway, PhD<sup>b</sup>

<sup>a</sup>School of Community Health Sciences, University of Nevada-Reno, Reno; <sup>b</sup>Harvard School of Public Health, Boston, Mass.

## ABSTRACT

**BACKGROUND:** Violent death is a serious problem in the United States. Previous research showing US rates of violent death compared with other high-income countries used data that are more than a decade old.

**METHODS:** We examined 2010 mortality data obtained from the World Health Organization for populous, high-income countries ( $n = 23$ ). Death rates per 100,000 population were calculated for each country and for the aggregation of all non-US countries overall and by age and sex. Tests of significance were performed using Poisson and negative binomial regressions.

**RESULTS:** US homicide rates were 7.0 times higher than in other high-income countries, driven by a gun homicide rate that was 25.2 times higher. For 15- to 24-year-olds, the gun homicide rate in the United States was 49.0 times higher. Firearm-related suicide rates were 8.0 times higher in the United States, but the overall suicide rates were average. Unintentional firearm deaths were 6.2 times higher in the United States. The overall firearm death rate in the United States from all causes was 10.0 times higher. Ninety percent of women, 91% of children aged 0 to 14 years, 92% of youth aged 15 to 24 years, and 82% of all people killed by firearms were from the United States.

**CONCLUSIONS:** The United States has an enormous firearm problem compared with other high-income countries, with higher rates of homicide and firearm-related suicide. Compared with 2003 estimates, the US firearm death rate remains unchanged while firearm death rates in other countries decreased. Thus, the already high relative rates of firearm homicide, firearm suicide, and unintentional firearm death in the United States compared with other high-income countries increased between 2003 and 2010.

© 2016 Elsevier Inc. All rights reserved. • *The American Journal of Medicine* (2016) 129, 266-273

**KEYWORDS:** Accidents; Cross-national; Firearms; Guns; Homicide; Suicide; Unintentional death; Violence

Violent death is a serious public health problem in the United States. Among 15- to 24-year-olds, homicide is the second leading cause of death and suicide is the third leading cause; for 25- to 34-year-olds, suicide is the second leading cause and homicide is the third leading cause of fatality, following unintentional injuries for both groups.<sup>1</sup>

**Funding:** This research was funded in part by The Joyce Foundation Award Number 14-36094 (DH).

**Conflict of Interest:** None.

**Authorship:** Both authors had access to the data and played a role in writing this manuscript.

Requests for reprints should be addressed to Erin Grinshteyn, PhD, School of Community Health Sciences, University of Nevada-Reno, 1664 North Virginia St, Reno, NV 89557.

E-mail address: [egrinshteyn@unr.edu](mailto:egrinshteyn@unr.edu)

The United States is known to have higher levels of violent death, particularly homicide, compared with other developed nations. Although the United States does not appear to have higher rates of nonlethal crime, the rates of lethal violence and especially gun violence are much higher than in other high-income countries.<sup>2,3</sup> There are many more guns and less strong gun laws in the United States than in other developed nations.<sup>3</sup>

Approximately 2 decades ago, a report from the Centers for Disease Control and Prevention used data from the early 1990s to compare the United States with other high-income countries in terms of violent death (ie, suicide, homicide, firearm accidents) for children aged 5 to 14 years.<sup>4</sup> In a previous article, we updated and expanded that comparison to examine all age groups and both sexes using 2003 data. These 2003 data are now more than 12 years old. In this

article, we again update the data plus we provide country-level data for each high-income nation and contrast the US levels of lethal violence for whites, who traditionally have lower homicide rates than nonwhites in the United States, with all citizens (ie, whites and nonwhites) of other high-income nations.

## MATERIALS AND METHODS

### Data Source

Mortality data were assembled by the World Health Organization from national civil registration systems of each individual country. Underlying cause of death was classified as “the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury,”<sup>5</sup> with deaths classified in accordance with the rules of the International Classification of Diseases, 10th Revision (ICD-10).

### Study Population

We examined data for all populous (ie, >1 million inhabitants), high-income countries (as defined by the World Bank) that were members of the Organization for Economic Co-Operation and Development (OECD) in 2010.<sup>6</sup> Data were limited to 2010, the most recent year that had complete data for the greatest number of countries. Of the 27 high-income OECD countries that provided mortality to the World Health Organization (Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom [England and Wales, Northern Ireland, Scotland], and the United States), Iceland and Luxembourg were excluded for having very small populations.

Mortality data were categorized into 6 mutually exclusive categories using the ICD-10 classification system. Countries were included if they reported their mortality data using detailed 3- or 4-character ICD-10 codes. These categories were defined as firearm-related homicide (X93, X94, X95, U01.4), firearm-related suicide (X72, X73, X74), non-firearm-related homicide (X85, X86, X87, X88, X89, X90, X91, X92, X96, X97, X98, X99, Y00, Y01, Y02, Y03, Y04, Y05, Y06, Y07, Y08, Y09, U01.0, U01.2, U01.3, U01.5, U01.6, U01.7, U01.8, U01.9, U02), non-firearm-related suicide (X60, X61, X62, X63, X64, X65, X66, X67, X68, X69, X70, X71, X75, X76, X77, X79, X80, X81, X82, X83, X84, Y87.0, U03), unintentional firearm death (W32, W33, W34), or firearm death of undetermined cause (Y22,

Y23, Y24). Cause of death data included both 3- and 4-character ICD-10 codes (eg, X93 included both X93 and X930-X939) except where the 4-character code was specified as the being important to the definition (ie, Y87.0, Y87.1, U01.0-U01.3, U01.5-U01.9). All countries used detailed ICD-10 character codes except Korea, which provided only 3-character ICD-10 codes. Thus, 133 deaths were excluded using “Y87” because it was not possible to determine if those were Y87.0 (non-firearm-related suicide), Y87.1 (non-firearm-related homicide), or Y87.2-Y87.9, which were neither of these. Greece and Switzerland were excluded for not using detailed 3- or 4-character ICD-10 codes, because their method of reporting could not be aggregated with data from the other 23 countries. Thus, the final list of populous, high-income OECD countries included in this analysis included Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France,

Germany, Hungary, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Spain, Sweden, United Kingdom (England and Wales, Northern Ireland, Scotland), and the United States.

### Statistical Analysis

Data were stratified by age category (0-4 years, 5-14 years, 15-24 years, 25-34 years, 35-64 years, and 65+ years) and by sex. Death rates per 100,000 population were calculated for the United States, for each individual country, and for the aggregation of all non-US countries, by age and sex categories and overall. Overall numbers include small numbers of deaths attributed to those with an unknown age, although an “unknown” column is not presented in the tables because of the numbers being so small. Ratios were calculated comparing the United States with all non-US countries. Tests of significance were performed using Poisson and negative binomial regression techniques to assess the statistical significance of fatalities in the United States versus non-US countries. Negative binomial models were used if the dispersion parameter showed that the data were overdispersed, whereas Poisson models were used when the data were not overdispersed. All analyses were performed using Excel (Microsoft Corp, Redmond, Wash) and Stata version 13.1 (StataCorp LP, College Station, Tex).<sup>7</sup>

This research project was exempt from institutional review board approval and exempt from certification of exemption from institutional review board review based on determination from the University of Nevada Reno Institutional Review Board.

### CLINICAL SIGNIFICANCE

- The firearm homicide rate is 25 times higher and the firearm suicide rate is 8 times higher in the United States than in other high-income countries.
- Among all 23 countries, with less than half the total population, the United States accounted for 82% of all firearm deaths.
- Ninety percent of women, 91% of all children aged 0 to 14 years, and 92% of youth aged 15 to 24 years who were killed by firearms were in the United States.

**Table 1** Death Rates in the United States per 100,000 Population, 2010

	0-4 y	5-14 y	15-24 y	25-34 y	35-64 y	65+ y	Totals
<b>Overall</b>							
Firearm homicide rate	0.3	0.4	8.9	8.2	2.7	0.8	3.6
Nonfirearm homicide	3.2	0.2	1.8	2.3	1.8	1.2	1.7
Total homicide rate	3.4	0.6	10.8	10.4	4.6	2.0	5.3
Firearm suicide rate	0.0	0.2	4.7	6.3	8.5	10.6	6.3
Nonfirearm suicide rate	0.0	0.5	5.9	7.6	9.3	4.2	6.1
Total suicide rate	0.0	0.7	10.5	13.9	17.7	14.8	12.4
Unintentional firearm death rate	0.1	0.1	0.3	0.3	0.2	0.2	0.2
Undetermined firearm death rate	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Firearm death rates	0.4	0.7	14.1	14.9	11.5	11.6	10.2
Firearm deaths	82	300	6152	6120	14,071	4695	31,428
<b>Men</b>							
Firearm homicide rate	0.3	0.6	15.7	14.3	4.3	1.0	6.2
Nonfirearm homicide	3.6	0.2	2.5	3.1	2.6	1.6	2.3
Total homicide rate	4.0	0.8	18.3	17.4	6.9	2.6	8.5
Firearm suicide rate	0.0	0.3	8.3	11.0	14.6	22.5	11.2
Nonfirearm suicide rate	0.0	0.6	8.6	11.4	13.0	6.3	8.8
Total suicide rate	0.0	0.9	16.9	22.4	27.6	28.8	19.9
Unintentional firearm death rate	0.2	0.1	0.6	0.5	0.3	0.3	0.3
Undetermined firearm death rate	0.0	0.1	0.2	0.2	0.1	0.1	0.1
Firearm death rates	0.5	1.1	24.8	26.0	19.4	23.9	17.8
Firearm deaths	56	232	5537	5392	11,700	4181	27,106
<b>Women</b>							
Firearm homicide rate	0.2	0.2	1.8	1.9	1.2	0.7	1.1
Nonfirearm homicide	2.7	0.3	1.1	1.4	1.1	0.9	1.1
Total homicide rate	2.9	0.5	2.9	3.4	2.3	1.6	2.2
Firearm suicide rate	0.0	0.1	0.9	1.5	2.5	1.5	1.5
Nonfirearm suicide rate	0.0	0.4	2.9	3.8	5.7	2.7	3.6
Total suicide rate	0.0	0.4	3.9	5.3	8.2	4.2	5.1
Unintentional firearm death rate	0.0	0.0	0.1	0.1	0.1	0.0	0.1
Undetermined firearm death rate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Firearm death rates	0.3	0.3	2.9	3.6	3.8	2.2	2.7
Firearm deaths	26	68	615	728	2371	514	4322

## RESULTS

### United States

In 2010, there were >16,000 homicide deaths in the United States, a rate of 5.3 per 100,000 population. Some two thirds of these were firearm homicides, a rate of 3.6 per 100,000. Firearm homicides were especially high for the 15- to 24-year age group, at a rate of 8.2 per 100,000, and the 25- to 34-year age group, at a rate of 8.9 per 100,000. The rate of suicide (12.4/100,000) was twice as high as the homicide rate, and firearm suicides (6.3/100,000) were 75% higher than firearm homicides (3.6/100,000). Firearm suicide rates increased with age; however, nonfirearm and total suicide rates peaked among those aged 35 to 64 years and decreased among those aged  $\geq 65$  years. Men had more than twice the rate of violent death compared with women and more than 6 times the rate of death from firearms. There were more than 31,000 firearm deaths in 2010, or more than 86 firearm-related deaths per day (an average of 74 men and 12 women) (Table 1).

### Other High-income Countries

In 2010, the rate of homicide deaths in non-US high-income countries was 0.8 per 100,000 population and the firearm homicide rate was 0.1 per 100,000. The 25- to 34-year-olds and 35- to 64-year-olds had slightly higher homicide rates than the 15- to 24-year-olds. The total suicide rate among all age groups was 15.0 per 100,000, and the firearm suicide rate was 0.8 per 100,000. The rates of firearm suicide, nonfirearm suicide, and total suicide increased with age. Unintentional and undetermined firearm death rates were extremely low. There were more than 6600 firearm deaths in all 22 high-income countries included in these data in 2010, or approximately 18 per day (with 93% of the victims being men) (Table 2).

### US Comparisons with Other High-income Countries

In 2010, the US homicide rate was 7.0 times higher than the other high-income countries, driven by a gun homicide rate that was 25.2 times higher. For 15- to

**Table 2** Death Rates in the Non-US High-Income Countries per 100,000 Population, 2010

	0-4 y	5-14 y	15-24 y	25-34 y	35-64 y	65+ y	Totals
<b>Overall</b>							
Firearm homicide rate	0.0	0.0	0.2	0.3	0.2	0.1	0.1
Nonfirearm homicide	0.6	0.2	0.6	0.7	0.7	0.6	0.6
Total homicide rate	0.6	0.2	0.8	0.9	0.9	0.7	0.8
Firearm suicide rate	0.0	0.0	0.4	0.4	0.9	1.6	0.8
Nonfirearm suicide rate	0.0	0.4	8.2	13.2	18.5	20.7	14.2
Total suicide rate	0.0	0.4	8.5	13.6	19.5	22.3	15.0
Unintentional firearm death rate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Undetermined firearm death rate	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Firearm death rates	0.0	0.1	0.6	0.7	1.2	1.9	1.0
Firearm deaths	4	35	476	623	3321	2181	6640
<b>Men</b>							
Firearm homicide rate	0.0	0.0	0.3	0.4	0.3	0.1	0.2
Nonfirearm homicide	0.7	0.2	0.7	0.8	0.9	0.6	0.8
Total homicide rate	0.7	0.2	1.1	1.2	1.2	0.7	1.0
Firearm suicide rate	0.0	0.0	0.7	0.7	1.8	3.8	1.5
Nonfirearm suicide rate	0.0	0.5	11.5	18.9	27.6	31.9	20.7
Total suicide rate	0.0	0.5	12.2	19.6	29.4	35.6	22.3
Unintentional firearm death rate	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Undetermined firearm death rate	0.0	0.0	0.1	0.1	0.1	0.2	0.1
Firearm death rates	0.0	0.1	1.1	1.3	2.2	4.2	1.9
Firearm deaths	2	30	438	551	3042	2087	6150
<b>Women</b>							
Firearm homicide rate	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Nonfirearm homicide	0.6	0.1	0.4	0.5	0.5	0.5	0.5
Total homicide rate	0.6	0.2	0.5	0.6	0.6	0.6	0.6
Firearm suicide rate	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Nonfirearm suicide rate	0.0	0.3	4.6	7.5	9.5	12.4	7.9
Total suicide rate	0.0	0.3	4.7	7.6	9.6	12.5	8.0
Unintentional firearm death rate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Undetermined firearm death rate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Firearm death rates	0.0	0.0	0.1	0.2	0.2	0.1	0.1
Firearm deaths	2	5	38	72	279	94	490

24-year-olds, the US gun homicide rate was 49.0 times higher. By comparison, the overall US nonfirearm homicide rate was 2.7 times higher than in these other high-income countries (Table 3). The results were statistically significant.

The US firearm suicide rate was 8.0 times higher; however, the overall suicide rate in the United States was lower, 80% of the rate in other high-income countries. Unintentional firearms deaths were 6.2 times higher in the United States.

The overall firearm death rate in the United States from all causes was 10.0 times higher. The total population for the United States in 2010 was 309 million people; the combined population for the other high-income countries was 664 million; thus, there were more than twice as many people living in these other high-income countries than were living in the United States. Yet, among everyone in these high-income countries, 82% of all firearm deaths occurred in the United States, 90% of all women killed by firearms were US women, 91% of all children aged 0 to 14 years who were

killed by firearms were US children, and 92% of youth aged 15 to 24 years who were killed by firearms were US youth.

### US Comparisons with Specific Countries

The US firearm homicide rate was 7 times higher than that of the second highest country, Canada (3.6 vs 0.50 deaths per 100,000 population). The US firearm homicide rate was 600 times higher than the rate of the lowest country, Korea (3.6 vs 0.006 deaths per 100,000 population). The US total homicide rate (5.3 homicides per 100,000 population) was 2 times higher than the rate of the second highest country, the Czech Republic (which had 2.57 homicides per 100,000 population), and 18 times higher than the rate of the lowest country, the United Kingdom (0.30 homicides per 100,000 population) (Table 4).

The US firearm suicide rate was approximately twice the rate of the second highest country, Finland. However, the total suicide rate in the United States was ninth highest

**Table 3** Ratio of US Death Rates to Death Rates in Other High-Income Countries, 2010

	0-4 y	5-14 y	15-24 y	25-34 y	35-64 y	65+ y	Totals
<b>Overall</b>							
Firearm homicide rate	22.3	18.5	49.0	32.0	16.0	9.9	25.2
Nonfirearm homicide	5.2	1.4	3.1	3.4	2.5	2.1	2.7
Total homicide rate	5.6	3.4	14.0	11.4	5.0	3.1	7.0
Firearm suicide rate	—	11.2	12.5	15.6	9.1	6.5	8.0
Nonfirearm suicide rate	—	1.1	0.7	0.6	0.5	0.2	0.4
Total suicide rate	—	1.5	1.2	1.0	0.9	0.7	0.8
Unintentional firearm death rate	—	12.2	12.6	9.3	4.8	3.5	6.2
Undetermined firearm death rate	—	7.7	3.0	3.9	1.1	0.6*	1.4
Firearm death rates	33.8	14.2	22.5	20.6	9.4	6.2	10.0
Firearm deaths	86	335	6628	6743	17,392	6876	38,068
<b>Men</b>							
Firearm homicide rate	27.3	20.3	50.7	34.5	17.2	10.6	28.3
Nonfirearm homicide	5.6	1.2	3.4	3.8	2.7	2.6	3.0
Total homicide rate	6.0	3.7	17.3	14.2	5.8	3.6	8.7
Firearm suicide rate	—	9.6	11.8	15.1	8.2	6.0	7.3
Nonfirearm suicide rate	—	1.1	0.7	0.6	0.5	0.2	0.4
Total suicide rate	—	1.7	1.4	1.1	0.9	0.8	0.9
Unintentional firearm death rate	—	10.0	11.1	9.0	4.2	3.3	5.5
Undetermined firearm death rate	—	6.1	3.3	3.6	0.9	0.5*	1.2
Firearm death rates	46.4	12.8	22.1	20.6	8.6	5.7	9.3
Firearm deaths	58	262	5975	5943	14,742	6268	33,256
<b>Women</b>							
Firearm homicide rate	17.3	15.1	37.6	21.3	13.3	9.2	15.7
Nonfirearm homicide	4.8	1.7	2.5	2.8	2.1	1.7	2.3
Total homicide rate	5.1	3.0	6.2	5.6	3.7	2.6	4.0
Firearm suicide rate	—	—	25.1	21.4	26.9	28.0	24.8
Nonfirearm suicide rate	—	1.1	0.6	0.5	0.6	0.2	0.5
Total suicide rate	—	1.3	0.8	0.7	0.9	0.3	0.6
Unintentional firearm death rate	—	—	—	13.5	18.3	5.1	17.5
Undetermined firearm death rate	—	—	2.0	14.6*	2.4*	4.4*	3.0
Firearm death rates	21.4	22.3	28.2	21.0	18.6	16.0	18.7
Firearm deaths	28	73	653	800	2650	608	4812

\*All associations testing significant differences between US and non-US countries are significant at the  $P < .05$  level except for those denoted by asterisk.

among all 23 high-income OECD countries. The highest total suicide rate was found in Korea.

### White US Mortality Comparisons with Everyone in Other High-income Countries

Nonwhite homicide rates in the United States are far higher than white homicide victimization rates. Yet, even US whites have rates of homicide victimization far in excess of all people (including both whites and nonwhites) in other high-income countries. For example, the white firearm homicide rate in the United States was more than 13 times higher than rates for all races in the other countries, and the white overall homicide rate was more than 4 times higher (not shown).

Overall white firearm death rates (including firearm suicide, firearm homicide, and unintentional firearm deaths) in the United States were 9.0 times higher than the overall firearm death rates in the other high-income countries. The black overall firearm death rate in the United States was

16.6 times higher than the overall firearm death rate in these other countries (not shown).

### DISCUSSION

The United States has an enormous firearm problem compared with other high-income countries. Americans are 10 times more likely to die as a result of a firearm compared with residents of these other high-income countries. In the United States, the firearm homicide rate is 25 times higher, the firearm suicide rate is 8 times higher, and the unintentional gun death rate is more than 6 times higher. Of all firearm deaths in all these countries, more than 80% occur in the United States.

The United States has a serious homicide problem. The overall homicide rate in the United States is 7 times higher than in these other countries. Men in the United States are approximately 9 times more likely to be a homicide victim than their male counterparts in these other high-income countries, and women are 4 times

**Table 4** Total Death Rates per 100,000 Population by Non-US High-Income Countries, 2010

Country	Firearm Homicide Rate	Non-Firearm Homicide Rate	Total Homicide Rate	Firearm Suicide Rate	Non-Firearm Suicide Rate	Total Suicide Rate	Unintentional Firearm Death Rate	Undetermined Firearm Death Rate	Total Firearm Death Rate
Australia	0.2	0.9	1.1	0.8	10.2	11.0	0.0	0.1	1.0
Austria	0.2	0.4	0.5	2.7	12.4	15.1	0.0	0.1	3.0
Belgium	0.3	0.7	1.1	1.3	17.1	18.4	0.0	0.1	1.8
Canada	0.5	1.0	1.5	1.7	9.9	11.6	0.0	0.0	2.3
Czech Republic	0.1	2.4	2.6	1.4	11.2	12.5	0.1	0.2	1.8
Denmark	0.2	0.6	0.8	1.3	8.8	10.1	0.0	0.0	1.6
Finland	0.3	1.6	1.9	3.3	14.5	17.8	0.0	0.0	3.6
France	0.2	0.4	0.6	2.2	14.3	16.5	0.1	0.3	2.8
Germany	0.1	0.5	0.6	0.9	11.3	12.3	0.0	0.1	1.1
Hungary	0.1	1.4	1.5	0.8	24.1	24.9	0.0	0.0	0.9
Ireland	0.4	0.5	0.8	0.5	10.1	10.7	0.0	0.1	1.0
Italy	0.3	0.4	0.8	0.9	5.7	6.6	0.1	0.0	1.3
Japan	0.0	0.3	0.3	0.0	23.1	23.1	0.0	0.0	0.0
Netherlands	0.2	0.7	0.9	0.2	9.4	9.7	0.0	0.0	0.5
New Zealand	0.2	1.1	1.2	1.0	11.3	12.3	0.0	0.0	1.2
Norway	0.0	0.6	0.7	1.7	9.5	11.2	0.0	0.0	1.8
Portugal	0.5	0.5	1.0	1.1	9.3	10.4	0.0	0.2	1.8
Republic of Korea	0.0	1.3	1.3	0.0	31.5	31.5	0.0	0.0	0.0
Slovakia	0.2	1.0	1.2	0.9	10.8	11.7	0.4	0.2	1.8
Spain	0.1	0.6	0.7	0.4	6.4	6.9	0.1	0.0	0.6
Sweden	0.2	0.7	0.9	1.2	11.0	12.2	0.1	0.0	1.5
United Kingdom	0.0	0.3	0.3	0.2	6.6	6.8	0.0	0.0	0.2
United States	3.6	1.7	5.3	6.3	6.1	12.4	0.2	0.1	10.2

more likely to be a homicide victim than women in these other countries. The homicide rate is fueled by the firearm homicide rate in the United States. More than two thirds of the homicides in the United States are firearm homicides; by contrast, firearm homicide accounts for less than 20% of homicides in the other high-income countries.

The age groups with the highest rates of firearm homicide in the United States (15-24 years and 25-34 years) are also the age groups for which the relative risk for the US compared with these other high-income countries is also largest. In the United States, 15- to 24-year-olds are 49 times more likely and 25- to 34-year-olds are 32 times more likely to die from firearm homicide than similarly aged young people in these other high-income countries.

Between 2003 and 2010, the relative rate of overall homicide has changed little in the United States. In 2003, the ratio of US homicide death rates to the rates of the other high-income countries was 6.9<sup>8</sup>; in 2010 it was 7.0.

Nonwhites in the United States have far greater rates of homicide victimization than whites, but even the white homicide rate is greater than the total homicide rate of any of the other countries in our study. The white homicide victimization rate in the United States is 4 times higher than the average rate in the other high-income countries, driven in part by a white firearm homicide victimization rate that is 13 times higher.

These data cannot tell us why the US homicide rate is so exceptional compared with these other high-income countries. Maybe the United States is a more violent country. The United States does have the highest incarceration rates in the world, and the nonfirearm homicide rates are higher than all these other countries with the exception of the Czech Republic. Conversely, the nonlethal crime rates are similar to those in these other countries.<sup>9</sup> The United States has more firearms and weaker gun laws than these countries, and it is the firearm homicide rate that is so much higher than in any of these high-income nations. Studies have suggested that the nongun homicide rate in the United States may be high because the gun homicide rate is high.<sup>10</sup> For example, offenders take into account the threat posed by their adversaries. Individuals are more likely to have lethal intent if they anticipate that their adversaries will be armed. Under dangerous circumstances, offenders are more likely to kill adversaries to eliminate the risk of retaliation. Research suggests that during assaults, offenders are more likely to kill adversaries who pose a greater threat.<sup>11,12</sup>

Evidence indicates that gun availability increases the incidence of homicide.<sup>10,13,14</sup> International studies of high-income countries typically find that firearm availability is positively correlated with firearm homicide and usually overall homicide.<sup>15-17</sup>

The US firearm suicide rate is 8 times higher than the average of these other nations. However, the overall suicide

rate is slightly below average, with 8 countries having higher rates than the United States. Although 50% of suicides are firearm suicides in the United States, only 5% of suicides in these other nations are firearm suicides.

The fact that the overall rate of suicide in the United States is similar to other high-income countries is used as evidence that firearms do not affect suicide rates, only the method.<sup>18</sup> In other words, there is an assumption of close to complete substitution. However, the empirical literature concerning suicide in the United States is consistent and strong, showing that substitution is far from complete. Approximately 24 case-control and ecologic studies find that in homes and areas with more guns, there are more firearm suicides and more total suicides.<sup>13,14,19,20</sup> The effect size is large; differences in overall suicide rates across cities, states, and regions in the United States are best explained not by differences in mental health, suicide ideation, or even attempts, but by availability of firearms.<sup>21</sup>

Studies show that many suicides are impulsive, and the urge to die fades away.<sup>22,23</sup> Firearms are a swift and lethal method of suicide with a high case-fatality rate.<sup>24</sup> There is consensus among international suicide experts that restricting access to lethal means reduces suicide.<sup>25</sup> A major objective of the new US National Strategy for Suicide Prevention is to “promote efforts to reduce access to lethal means of suicide among individuals with identified suicide risk.”<sup>26</sup>

## Study Strengths and Limitations

Strengths include the fact that the World Health Organization data are a complete reporting of all the violent deaths occurring in these high-income countries in 2010. Data were coded using the same international classification system. In addition, high-income countries have the most accurate data systems. These countries are comparable to each other in terms of economic development, political stability, and democratic institutions. Although other cross-national studies have included middle-income or developing countries in comparisons,<sup>12,27-30</sup> it does not seem reasonable to compare the United States with Brazil, Mexico, Russia, South Africa, Turkey, or Uganda.

One limitation is that 2 countries were excluded for not using detailed 3- or 4-character ICD-10 codes. Yet, lacking comparable data from relatively small nations should not materially affect results. In addition, our study is cross-sectional in nature, but data from 2003<sup>8</sup> allow for an examination of changes across 7 years.

## CONCLUSIONS

Overall, our results show that the United States, which has the most firearms per capita in the world,<sup>31</sup> suffers disproportionately from firearms compared with other high-income countries. These results are consistent with the hypothesis that our firearms are killing us rather than protecting us.

## References

1. WISQARS. Weapon-related Injury Surveillance Centers for Disease Control and Prevention. August 2015. Available at: <http://www.cdc.gov/injury/wisqars>. Accessed August 1, 2015.
2. Zimring FE, Hawkins G. *Crime Is Not the Problem: Lethal Violence in America*. New York: Oxford University Press; 1997.
3. Hemenway D. *Private Guns, Public Health*. Ann Arbor, MI: University of Michigan Press; 2006.
4. Centers for Disease Control and Prevention (CDC). Rates of homicide, suicide and firearm-related death among children: twenty-six industrialized countries. *MMWR Morb Mortal Wkly Rep*. 1997;46:101-105.
5. World Health Organization Department of Health Statistics and Information Systems. WHO Mortality Data Base Documentation. Available at: <http://www.who.int/healthinfo/statistics/documentation.zip?ua=1> Date. Accessed June 1, 2015.
6. The Organisation for Economic Co-operation and Development (OECD). *OECD Country Classifications 2010*. 2010. Available at: <http://www.oecd.org/tad/xcred/43407491.pdf>. Accessed May 28, 2015.
7. StataCorp. Stata Statistical Software: Release 13. 2013, College Station, TX: StataCorp LP
8. Richardson EG, Hemenway D. Homicide, suicide and unintentional firearm fatality: comparing the United States with other high-income countries. *J Trauma*. 2011;70:238-243.
9. ICVS International Working Group. ICPSR ICVS Series. International Crime Victimization Surveys Series. Available at: <http://www.icpsr.umich.edu/icpsrweb/ICPSR/series/175>. Accessed June 1, 2015.
10. Hepburn LM, Hemenway D. Firearm availability and homicide: a review of the literature. *Aggress Violent Behav*. 2004;9:417-440.
11. Felson RB, Messner SF. To kill or not to kill? Lethal outcomes in injurious attacks. *Criminology*. 1996;34:201-227.
12. Felson RB, Berg MT, Rogers ML. Bring a gun to a gun fight: armed adversaries and violence across nations. *Soc Sci Res*. 2014;47:79-90.
13. Stroebe W. Firearm possession and violent death. *Aggress Violent Behav*. 2013;18:709-721.
14. Anglemeyer A, Horvath T, Rutherford G. The accessibility of firearms and risk of suicide and homicide victimization among household members. *Ann Intern Med*. 2014;160:101-110.
15. Killias M. Gun ownership, suicide, and homicide: an international perspective. *Understanding Crime: Experiences of Crime and Crime Control*. Rome: UNICRI; 1993.
16. Hemenway D, Miller M. Firearm availability and homicide rates across 26 high income countries. *J Trauma*. 2000;49:985-988.
17. Hemenway D, Shinoda-Tagawa T, Miller M. Firearm availability and female homicide victimization rates across 25 populous high income countries. *J Am Med Womens Assoc*. 2002;57:100-104.
18. National Research Council. *Firearms and Violence: A Critical Review*. The National Academies Press; Washington, DC. 2004.
19. Miller M, Hemenway D. The relationship between firearms and suicide: a review of the literature. *Aggress Violent Behav*. 1999;4:59-75.
20. Millier M, Barber C, White RA, Azrael D. Firearms and suicide in the United States: is risk independent of underlying suicidal behavior? *Am J Epidemiol*. 2013;178:940-955.
21. Miller M, Azrael D, Barber C. Suicide mortality in the United States: the importance of attending to method in understanding population-level disparities in the burden of suicide. *Annu Rev Public Health*. 2012;33:393-408.
22. Seiden R. Suicide prevention: a public health/public policy approach. *Omega (Westport)*. 1977;8:267-276.
23. Simon OR, Swann AC, Powell KE, Potter LB, Kresnow MJ, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*. 2001;32(1 Suppl):49-59.
24. Miller M, Azrael D, Hemenway D. The epidemiology of case fatality rates for suicide in the northeast. *Ann Emerg Med*. 2004;43:723-730.
25. Mann JJ, Alper A, Berolote J, et al. Suicide prevention strategies: a systematic review. *J Am Med Assoc*. 2005;294:2064-2074.

26. U.S. Department of Health and Human Services. *National Strategy for Suicide Prevention: Goals and Objectives for Action*. Rockville, MD: Office of the Surgeon General; 2012.
27. Krug EG, Powell KE, Dahlberg LL. Firearm-related deaths in the United States and thirty-five other high- and upper-middle-income countries. *Int J Epidemiol*. 1998;27:214-221.
28. Palsby DD, Kates DB Jr. Causes and correlations of lethal violence in America: American homicide exceptionalism. *Univ Colo Law Rev*. 1998;69:969-1008.
29. Killias M, Van Kesteren J, Rindlisbacher M. Guns, violent crime and suicide in twenty-one countries. *Can J Criminol*. 2001;156:429-448.
30. Altheimer I, Boswell M. Reassessing the association between gun availability and homicide at the cross-national level. *Am J Crim Justice*. 2012;37:682-704.
31. Graduate Institute of International and Development Studies. *Small Arms Survey, 2007*. [Dataset]. 2007. Available at: [http://www.smallarmssurvey.org/fileadmin/docs/H-Research\\_Notes/SAS-Research-Note-9.pdf](http://www.smallarmssurvey.org/fileadmin/docs/H-Research_Notes/SAS-Research-Note-9.pdf). Accessed October 1, 2015.