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ORIGINAL CONTRIBUTIONS

Guns in the Home and Risk of a Violent Death in the Home: Findings from a National Study

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Data from a US mortality follow-back survey were analyzed to determine whether having a firearm in the home increases the risk of a violent death in the home and whether risk varies by storage practice, type of gun, or number of guns in the home. Those persons with guns in the home were at greater risk than those without guns in the home of dying from a homicide in the home (adjusted odds ratio = 1.9, 95% confidence interval: 1.1, 3.4). They were also at greater risk of dying from a firearm homicide, but risk varied by age and whether the person was living with others at the time of death. The risk of dying from a suicide in the home was greater for males in homes with guns than for males without guns in the home (adjusted odds ratio = 10.4, 95% confidence interval: 5.8, 18.9). Persons with guns in the home were also more likely to have died from suicide committed with a firearm than from one committed by using a different method (adjusted odds ratio = 31.1, 95% confidence interval: 19.5, 49.6). Results show that regardless of storage practice, type of gun, or number of firearms in the home, having a gun in the home was associated with an increased risk of firearm homicide and firearm suicide in the home.

firearms; homicide; suicide; violence; wounds and injuries

Over 50,000 homicides and suicides occur each year in the United States (1), making them among the leading causes of death, particularly for young people. In 2001, homicide was the second leading cause of death and suicide the third for persons 15–24 years of age (2). Approximately 60 percent of all homicides and suicides in the United States are committed with a firearm (2).

Although an estimated 40 percent of adults in the United States report keeping a gun in the home for recreational or protective purposes (3), the risks and benefits of this practice are widely disputed in the literature (4, 5). Ecologic analyses have suggested a link between the prevalence of gun ownership and rates of homicide and suicide (6–8) and between regulations restricting access to firearms and rates of homicide and suicide (9–12). Although these studies are useful in demonstrating an association between access to firearms and rates of homicide and suicide at the aggregate level, it is not possible with this methodology to adequately assess whether access to a gun increases the risk of a violent death at the individual level.

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To address these limitations, previous researchers have used case-control study methodology to evaluate the relation between gun ownership and risk of a violent death in the home. For example, Kellermann et al. (13, 14) examined the relation between gun ownership and injury outcomes. After they controlled for a number of potentially confounding factors, the presence of a gun in the home was associated with a nearly fivefold risk of suicide (adjusted odds ratio = 4.8) (13) and an almost threefold risk of homicide (adjusted odds ratio = 2.7) (14). Other case-control studies have also found an increased risk of suicide for those with firearms in the home, with relative risks ranging from 2.1 to 4.4 (15–19).

Some studies have specifically examined the association between purchase of a handgun and risk of a violent death (20, 21). In a case-control study of members of a large health maintenance organization, Cummings et al. (20) found that a history of family handgun purchase was associated with an elevated risk of both homicide and suicide. Wintemute et al. (21) reported similar findings for suicide in a population-based cohort study of persons who had purchased a handgun in California. In both studies, the effects persisted for more than 5 years. However, studies conducted in other countries have failed to find a clear link between access to a firearm and risk of a suicide (22).

Many of the studies conducted to date have been based on small samples and were limited to specific population groups such as adolescents or older adults (15–19). Most of the studies have also been limited to a few counties, geographic areas, or states. We know of only two national case-control studies that have examined the relation between access to a firearm and a violent death (23, 24). One study focused on the perpetration of homicide as opposed to victimization and found a relatively weak association (adjusted odds ratio = 1.4) between gun ownership and homicide perpetration (23). The other study focused on victimization and found a strong association for suicide (adjusted odds ratio = 3.4) but a weak association for homicide (adjusted odds ratio = 1.4) (24). In both studies, cases and controls were drawn from different data sources, and neither study was able to control for many of the potential confounders of homicide or suicide.

To evaluate the relation between firearms in the home and violent deaths in the home, we analyzed data from a US mortality follow-back survey. The purpose of our study was twofold: 1) to determine whether having a firearm in the home increases the risk of a homicide or suicide in the home relative to other causes of death in the home, and 2) to determine whether having a firearm in the home increases the risk that a homicide or suicide in the home will be committed with a firearm or by using other means. To our knowledge, this is the first national study to specifically examine the relation between firearms and violent deaths in the home.

MATERIALS AND METHODS

Sample

Data for this study are from the 1993 National Mortality Followback Survey, which is based on a nationally representative 10 percent systematic sample of decedents aged 15 years or older in the United States (25). All 50 states with the exception of South Dakota, which was excluded because of a state law restricting the use of death certificates for research purposes, are represented in the National Mortality Followback Survey. The sample was drawn from death certificates received by the National Center for Health Statistics from state vital registration offices. To produce more reliable estimates, Blacks, persons less than 35 years of age or older than age 100 years, and persons who died from external causes of homicide, suicide, and unintentional injury were oversampled in this survey. The study protocol was reviewed and approved by the Centers for Disease Control and Prevention Institutional Review Board.

Data on each decedent in the National Mortality Followback Survey were obtained from death certificates and proxy-respondent interviews. All deaths were classified by using the *International Classification of Diseases*, Ninth Revision. The proxy interviews were conducted with next of kin or another person familiar with the decedent's life history approximately 6 months from the date of death. The decedent's next of kin, identified on the death certificate as having provided information, were initially contacted by letter and were asked to participate in the survey. In cases where no next-of-kin information was available from the death certificate, letters were sent to funeral directors requesting contact information for the next of kin. Over 90 percent of the proxy respondents were relatives, mostly immediate family members (spouse, parent, child, or sibling).

Interviews with the proxy respondents covered a wide range of topics including the decedent's access to health care, daily activities, life events, alcohol consumption and tobacco and drug use, and history of problem behaviors. The interviews also included a number of questions on firearms in the home of the decedent. The overall response rate for the proxy respondent survey was 83 percent.

We used the death certificates for information on the decedent's cause and manner of death and proxy-respondent interviews for all other demographic and behavioral information on the decedent. The study sample consisted of deaths that occurred in the home. Included were persons who subsequently died en route to or at a hospital. Deaths were classified by whether they were homicides ($n = 490$; *International Classification of Diseases*, Ninth Revision codes E960–E969), suicides ($n = 1{,}049$; *International Classification of Diseases*, Ninth Revision codes E950–E959), or the result of other causes ($n = 535$). Accidental poisonings or poisonings of undetermined intent, unintentional firearm injuries and firearm injuries of undetermined intent, and other deaths of undetermined cause were excluded from the study sample on the basis that they could be homicides or suicides. Deaths for which information on firearms in the home was missing were also excluded. By cause, these deaths were distributed similarly to those in the study sample. Overall, the study sample captured 89 percent of deaths for which the incident occurred in the home ($n = 2{,}074/2{,}338$).

Measures

Outcomes of interest. To determine whether having a firearm in the home increases the risk of a violent death in the home relative to other causes of death in the home, two outcome variables were created: 1) homicide versus other causes, and 2) suicide versus other causes. Violent deaths, whether from suicide or homicide, were excluded, respectively, from the "other causes of death" category. To determine whether having a firearm in the home increases the risk that a homicide or suicide will be committed with a firearm, we focused on homicides and suicides separately and created two additional outcome variables: 3) homicides committed with firearms versus homicides committed by using other methods, and 4) suicides committed with firearms versus suicides committed by using other methods.

Main exposure variable. The main exposure variable was the presence of a firearm in or around the home. Proxy respondents were asked, "At any time during the last year of life, were there any firearms kept in or around the home where the decedent stayed? Include those kept in a garage, outdoor storage area, truck, or car." Responses were coded as follows: yes—one or more firearms were kept in or around the home; no—no firearms were kept in or around the home.

Refined measures of exposure. Proxy respondents were also asked how many guns were kept in or around the home; whether the firearms were handguns, shotguns, rifles, or other types of guns; and how the firearms were stored. Three refined measures of exposure were created: 1) number of guns (coded as one gun, two or more guns), 2) type of gun (coded as handguns only, long guns only, handguns and long guns), and 3) storage practice (coded as ≥1 gun unlocked, all guns locked).

Characteristics of the decedent. A number of demographic and behavioral characteristics identified in the literature as being associated with either homicide or suicide were included in the analysis. Included were age, sex, race/ethnicity, education, marital status, residential status (i.e., whether the decedent lived alone or with others), region of death, alcohol consumption within 4 hours of death, use and frequency of using illicit drugs (cocaine, crack cocaine, heroin, hallucinogens, amphetamines, marijuana or hashish) in the past year of life, and whether the decedent expressed a wish to die during the last month of life.

The suicide model also included whether the decedent had thoughts of attempting suicide within the last month of life and symptoms of depression and anxiety in the last month of life. Evidence of depression and anxiety was based on the mean score of responses to three or more of the following nine items: seemed worried or apprehensive, seemed drowsy or sluggish, seemed unresponsive or withdrawn, seemed impatient or annoyed, said things such as "I'm no good" or "I'm worthless," cried for long periods of time for no apparent reason, slept more or less than usual, ate more or less than usual, and had trouble concentrating or making decisions. Mean scores ranged from 1 = never to 4 = often. The nine items are similar in wording and content to those used in existing scales of depression and anxiety but are not from a specific scale or index. Existing scales of depression and anxiety are designed for individual patient or respondent administration rather than proxy administration.

Analysis

We began with a bivariable analysis and calculated prevalence estimates for the characteristics of the decedent and the main exposure variable—presence of a firearm in or around the home. We then computed crude odds ratios and 95 percent confidence intervals to assess the association between each of the four outcome variables and the presence of a firearm in or around the home.

Next, we conducted a multivariable analysis by using logistic regression to examine the association between each of the four outcome variables and the main exposure variable, after adjusting for demographic and behavioral characteristics of the decedent. In modeling each outcome variable, we began with the main exposure variable, characteristics of the decedent (potential confounders), and all two-way interactions between the main exposure variable and characteristics of the decedent. Interactions were initially assessed simultaneously by using a likelihood ratio test and were then assessed individually in a backward stepwise fashion. The importance of interaction terms as well as main effects was assessed by using the Wald chi-square test statistic.

Finally, for models assessing whether the presence of a firearm in the home increases the risk that a homicide or suicide will be committed with a firearm, we performed a more refined analysis of exposure. We began with the final logistic regression model derived from the multivariable analysis and substituted our main exposure variable with the more refined measures of exposure (namely, type of gun, number of guns, and storage practice) to assess the association between certain firearm-related characteristics and each outcome.

All data were weighted to account for unequal selection probabilities and nonresponse and were poststratified to produce national estimates. Data were analyzed by using SUDAAN software (26) to account for the complex sampling design. p values of <0.05 were considered statistically significant.

RESULTS

The demographic characteristics of the decedents are presented in table 1. Homicide victims were mostly male, less than 35 years of age, and of racial or ethnic minority status. Suicide victims were predominately male, older, and non-Hispanic White. There was a slightly higher proportion of males among persons who died of other causes. These decedents were also mostly older than 45 years of age and non-Hispanic White. Although a large proportion of homicide victims had never married, most of the suicide victims and persons who died of other causes were married at the time of death or had been previously married. The majority of decedents, regardless of cause of death, were living with other people at the time of death. A large proportion of both homicide and suicide victims died in the southern region of the United States.

TABLE 1. Distribution of deaths in the home by cause and demographic characteristics, United States

	Homicide decedents		Suicide decedents		Other decedents	
	No.	Weighted %	No.	Weighted %	No.	Weighted %
Total	490		1,049		535	
Sex						
Male	363	62.6	741	80.7	283	55.8
Female	127	37.4	308	19.3	252	44.2
Age group (years)						
15–24	131	25.0	167	14.8	31	3.9
25–34	147	29.2	173	17.5	73	9.1
35–44	94	18.5	146	17.4	52	9.4
≥45	118	27.3	563	50.3	379	77.6
Race/ethnicity						
Non-Hispanic White	151	41.8	865	87.3	372	82.6
Non-Hispanic Other	269	46.8	99	7.2	123	13.6
Hispanic	60	11.4	52	5.5	30	3.9
Education						
Elementary <10 years	62	13.9	139	13.8	118	27.4
Some high school	152	30.3	205	20.7	99	12.8
High school graduate	163	37.3	371	37.8	164	33.5
>High school	87	18.5	285	27.7	117	26.3
Marital status						
Never married	252	45.5	292	28.9	120	16.1
Married	118	28.1	448	44.8	183	53.8
Widowed	36	9.0	156	12.2	158	19.6
Divorced/separated	80	17.4	144	14.2	72	10.5
Residential status						
Lived alone	106	20.7	290	27.7	176	24.5
Lived with others	373	79.3	738	72.3	352	75.5
Region of death						
Northeast	41	11.6	128	14.4	84	12.8
Midwest	100	19.3	258	23.7	134	27.1
South	244	49.8	398	39.8	205	30.6
West	105	19.4	265	22.1	112	29.5

Nearly three quarters of suicide victims lived in a home where one or more firearms were present, compared with 42 percent of homicide victims and one third of those who died of other causes (table 2). A firearm was used in 68 percent of both homicides and suicides. A larger proportion of homicide decedents than suicide decedents and those who died of other causes were drinking alcohol within 4 hours of death and used illicit drugs in the past year. A larger proportion of suicide decedents than homicide decedents and those who died of other causes expressed a wish to die, suicidal ideation, and symptoms of depression and anxiety in the last month of life.

Over three quarters (76.3 percent) of the homicide victims knew their assailant. Nearly one third (31.7 percent) of the homicides occurred during a family argument, 15.4 percent during a robbery, 4.1 percent during a drug deal, 0.2 percent during an abduction, and 44.1 percent for other unspecified reasons. In 4.5 percent of the homicides, multiple circumstances were reported.

Table 3 presents the crude and adjusted odds ratios for the presence of a firearm in the home and risk of a homicide or suicide relative to other causes of death in the home. There were no significant interaction effects in the model for homicide. After we adjusted for demographic and behavioral characteristics of the decedent, we found an increased risk of homicide for those with firearms in the home (adjusted odds ratio = 1.9, 95 percent confidence interval: 1.1, 3.4). Female sex, age less than 45 years, and being of a racial or ethnic

TABLE 2. Distribution of deaths in the home by cause, presence of a firearm in the home, method, and behavioral characteristics, United States

	Homicide decedents		Suicide decedents		Other decedents	
	No.	Weighted %	No.	Weighted %	No.	Weighted %
Total	490		1,049		535	
Firearm in the home	188	41.9	734	72.4	166	32.0
Method						
Firearm	339	68.1	687	67.8		
Other method	151	31.9	362	32.2		
Drank alcohol within 4 hours of death	117	35.8	234	31.0	98	30.2
Used illicit drugs in the past year	102	23.1	159	17.8	49	8.0
Expressed a wish to die in the past month	38	8.6	388	42.7	70	10.6
Suicidal ideation in the past month	14	3.3	330	36.3	15	2.1
Symptoms of depression and anxiety in the past month	23	4.5	265	27.6	33	5.7

minority group were also important predictors of homicide risk ($p < 0.01$).

There was a significant sex-by-gun-in-the-home interaction for suicide. Males with firearms in the home were at a significantly greater risk of suicide than males without guns in the home (adjusted odds ratio = 10.4, 95 percent confidence interval: 5.8, 18.9). Females with firearms in the home were also at an elevated risk of suicide compared with females without guns in the home, but the difference was only borderline significant (adjusted odds ratio = 2.3, 95 percent confidence interval: 1.0, 5.0). Other important predictors of suicide risk included young age (<35 years), suicidal ideation, and symptoms of depression and anxiety in the last month of life ($p < 0.01$). Living alone was borderline significant ($p = 0.05$).

To determine whether having a firearm in the home increases the risk that a homicide or suicide in the home will be firearm related, we focused on homicides and suicides separately and compared those committed with a firearm with those committed by using other means. These models were adjusted for demographic characteristics but not psychological and behavioral characteristics of the decedent because there were no significant differences between those who used a firearm and those who used some other means in terms of their psychological or behavioral characteristics. These models were also adjusted for significant interaction terms, where applicable. The results of this analysis are presented in table 4.

We found two significant, two-way interaction terms in the model assessing whether a homicide in the home will be committed with a firearm versus another method: a significant gun-in-the-home-by-residential-status interaction, and a significant gun-in-the-home-by-age interaction. Among those living alone at the time of death, there was no association between the presence of a firearm in the home and method of homicide. However, for persons living with others at the time of death, there was a significant association between the presence of a firearm in the home and risk of a firearm homicide among those aged 35 years or older (adjusted odds ratio = 16.4, 95 percent confidence interval: 5.9, 45.3). We found no significant interactions in the model for suicide. Those persons with guns in the home were at significantly greater risk than those without guns in the home

TABLE 3. Crude and adjusted odds ratios for the presence of a firearm in the home and risk of a violent death in the home, United States

Firearm in the home	Homicide vs. other causes		Suicide vs. other causes	
	OR†	95% CI†	OR	95% CI
Crude	1.5	0.8, 3.0	5.6*	2.9, 10.6
Adjusted‡	1.9**	1.1, 3.4		
Males			10.4*	5.8, 18.9
Females			2.3	1.0, 5.0

* $p < 0.01$, Wald chi-square test; ** $p = 0.02$, Wald chi-square test.
† OR, odds ratio; CI, confidence interval.
‡ Adjusted for sex, age group, race/ethnicity, education, marital status, residential status, region of death, alcohol consumption within 4 hours of death, illicit drug use, and an expressed wish to die. The model for suicide was also adjusted for depression/anxiety, suicidal ideation, and the interaction between the presence of a firearm in the home and sex. Because of the presence of a significant firearm-in-the-home-by-sex interaction term in the adjusted model, the association between suicide and a firearm in the home is shown separately for males and females. The reference group for males and females is, respectively, males and females without guns in the home.

TABLE 4. Crude and adjusted odds ratios for the presence of a firearm in the home and risk of a firearm homicide or firearm suicide in the home, United States

Firearm in the home	Firearm homicide†		Firearm suicide‡	
	OR§	95% CI§	OR	95% CI
Crude	3.5*	2.0, 6.1	27.9*	18.7, 41.4
Adjusted¶			31.1*	19.5, 49.6
Lived alone				
Aged 15–24 years	0.3	0.0, 2.1		
Aged 25–34 years	0.9	0.2, 4.6		
Aged ≥35 years	3.5	1.0, 12.8		
Lived with others				
Aged 15–24 years	1.2	0.3, 5.4		
Aged 25–34 years	4.0	0.9, 16.7		
Aged ≥35 years	16.4*	5.9, 45.3		

* $p < 0.01$, Wald chi-square test.
† Homicides committed with firearms vs. homicides committed by using other methods.
‡ Suicides committed with firearms vs. suicides committed by using other methods.
§ OR, odds ratio; CI, confidence interval.
¶ Adjusted for sex, age group, race/ethnicity, education, marital status, residential status, and region of death. The model for firearm homicide was also adjusted for the interaction between the presence of a firearm in the home and residential status, and between a firearm in the home and age. Because of the presence of two significant, two-way interactions in the model for firearm homicide, the association between a firearm in the home and firearm homicide is shown by residential status and age. The reference group for each category is those without a gun in the home.

TABLE 5. Adjusted odds ratios for the more refined measures of a firearm in the home and risk of a firearm homicide or firearm suicide in the home, United States

	Firearm homicide†		Firearm suicide‡	
	AOR§,¶	95% CI§	AOR¶	95% CI
Type of gun*				
Handguns only	2.8	0.9, 8.7	38.2	20.3, 71.9
Long guns only	6.0	2.1, 16.7	21.1	11.8, 37.6
Handguns and long guns	8.0	3.0, 21.4	36.2	19.9, 66.0
No gun	1.0		1.0	
No. of guns*				
≥2	6.3	2.3, 17.3	27.4	16.5, 45.7
1	3.0	1.1, 8.1	39.8	21.8, 72.6
None	1.0		1.0	
Storage practice*				
≥1 gun unlocked	3.1	1.3, 7.2	29.2	17.8, 48.1
All guns locked	7.7	2.0, 30.4	25.6	13.0, 50.4
No gun	1.0		1.0	

* $p < 0.01$, Wald chi-square test.
† Homicides committed with firearms vs. homicides committed by using other methods.
‡ Suicides committed with firearms vs. suicides committed by using other methods.
§ AOR, adjusted odds ratio; CI, confidence interval.
¶ Adjusted for sex, age group, race/ethnicity, education, marital status, residential status, and region of death.

TABLE 6. Comparison of the more refined measures of a firearm in the home and risk of a firearm homicide or firearm suicide in the home, United States

	Firearm homicide*		Firearm suicide†	
	AOR‡,§	95% CI‡	AOR§	95% CI
Type of gun				
Handguns only	0.3	0.1, 1.2	1.0	0.5, 2.0
Long guns only	0.7	0.2, 3.0	0.6	0.3, 1.0
Handguns and long guns	1.0		1.0	
Handguns only	0.5	0.1, 2.1	1.9	1.0, 3.7
Long guns only	1.0		1.0	
No. of guns				
≥2	2.1	0.6, 8.0	0.7	0.4, 1.2
1	1.0		1.0	
Storage practice				
≥1 gun unlocked	0.3	0.0, 2.9	1.2	0.7, 2.2
All guns locked	1.0		1.0	

* Homicides committed with firearms vs. homicides committed by using other methods.
† Suicides committed with firearms vs. suicides committed by using other methods.
‡ AOR, adjusted odds ratio; CI, confidence interval.
§ Adjusted for sex, age group, race/ethnicity, education, marital status, residential status, and region of death.

of dying from a firearm suicide versus one committed by using other means (adjusted odds ratio = 31.1, 95 percent confidence interval: 19.5, 49.6). No variables other than a firearm in the home were important predictors of firearm homicide. In addition to a gun in the home, male sex and living in the South were important predictors of firearm suicide ($p < 0.01$).

The results of the analysis that examined whether the type of gun or number of guns in the home or manner of storage increased the risk that a homicide or suicide would be committed with a firearm are presented in tables 5 and 6. Those persons with guns in the home, regardless of the type of gun, number of guns, or storage practice, were at significantly greater risk of dying from a firearm homicide and firearm suicide than those without guns in the home (table 5). There were no significant differences between those with only handguns in the home and those with only long guns or both handguns and long guns, those with two or more guns, and those having one gun in the household; and between those who stored one or more guns unlocked and those who stored all guns locked (table 6).

DISCUSSION

The findings of this study add to the body of research showing an association between guns in the home and risk of a violent death. Those persons with guns in the home were at significantly greater risk than those without guns in the home of dying from a suicide in the home relative to other causes of death. This finding was particularly the case for males, who in general have higher rates of completed suicide than females do. The findings showing an increased risk of homicide in homes with guns are also consistent with previous research (14, 20, 23, 24), although, when compared with suicide, are not as strong. Studies that have examined the risk of either violent victimization or perpetration at the individual level show relative risks between 1.4 and 2.7 (14, 20, 23, 24). Our findings are also in this range.

Our findings also suggest that the presence of a gun in the home increases the chance that a homicide or suicide in the home will be committed with a firearm rather than by using other means. Victims of suicide living in homes with guns were more than 30 times more likely to have died from a firearm-related suicide than from one committed with a different method. Guns are highly lethal, require little preparation, and may be chosen over less lethal methods to commit suicide, particularly when the suicide is impulsive. Suicidal persons may also be more likely to acquire a gun to commit suicide and, given the lethality of the weapon, are more likely to complete suicide, although the evidence on this point is mixed (20–22).

For victims of homicide, there was also a strong association between guns in the home and risk of dying from a firearm-related homicide, but this risk varied by age and whether the person was living with others at the time of death. These deaths may have been related to domestic violence or to other interpersonal disputes either involving them or someone else in the household. The majority of victims knew their assailant, suggesting that the assailant was either a family member or was acquainted with the victim or victim's family and less likely to be an unknown intruder.

Some of the research conducted to date has found a higher risk of a violent death in homes with handguns and unlocked and loaded guns (13, 17, 19). However, many studies have either not examined the risk associated with specific firearm-related characteristics (e.g., type of gun or storage practice) (14, 15, 18, 23, 24) or have found no significant differences (16). In our study, the risk of dying from a firearm-related homicide or suicide was greater in homes with guns, but this risk did not vary by specific firearm-related characteristics. Simply having a gun in the home increased the risk of a firearm homicide or firearm suicide in the home. Whether certain types of guns or storage practices confer greater or lesser risk, or reflect recall and reporting biases when studied, is unclear. Previous research suggests that proxy respondents and nonusers of firearms are not always knowledgeable about the number or types of guns in the household or the storage practice and may be inclined to give socially desirable responses (27–29).

A number of limitations should be considered when interpreting the findings from this study. First, our study was based on data from death certificates and proxy interviews. The accuracy and completeness of information from these types of data sources can vary. With death certificates, for instance, there is the possibility of misclassification regarding the cause or manner of death. In the case of proxy interviews, knowing the outcome might have introduced bias in assessing behavioral or psychological characteristics of the decedent prior to death. The nature, degree, or direction of recall bias among proxies reporting on violent deaths versus nonviolent deaths is not known, however. Second, the gun in the home may not have been the gun used in the death. This possibility seems less likely with suicide, but, with homicide, it is certainly plausible that someone brought a gun into the home.

Third, it is possible that the association between a gun in the home and risk of a violent death may be related to other factors that we were unable to control for in our analysis. For instance, with homicide, the association may be related to certain neighborhood characteristics or the decedent's previous involvement in other violent or illegal behaviors. Persons living in high-crime neighborhoods or involved in illegal behaviors may acquire a gun for protection. The risk comes not necessarily from the presence of the gun in the house but from these types of environmental factors and exposures.

Fourth, our analysis was restricted to violent deaths in the home. The dynamics of homicides or suicides occurring in other locations may be very different. However, the degree of bias with suicide is likely to be small given that over three quarters of all suicides (76.3 percent) in this nationally representative sample occurred in the home; of those that occurred outside the home, 52.7 percent were committed with a firearm. Finally, our study focused on fatal outcomes for a sample of decedents. We were unable to ascertain the risk of a nonfatal outcome and were also unable to weigh the risk of a violent death against any protective benefits of gun ownership.

Much of the debate in the literature has focused on the risks and benefits of gun ownership in terms of lives saved versus

lives harmed. Studies of defensive gun use suggest that millions of defensive gun use incidents occur each year by people to protect themselves or their property against assaults, theft, or break-ins (30, 31). However, guns are also involved in unintentional firearm shootings and domestic altercations in the home and are the primary method used in suicides in the United States (1, 32). The body of research to date, including the findings of this study, shows a strong association between guns in the home and risk of suicide. The findings for homicide, while showing an elevated risk, have consistently been more modest. They suggest a need for more research to better distinguish the risk and protective factors associated with guns in the home, including an examination of the risk posed by forces both internal and external to the home.

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