United States General Accounting Office

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GAO
United States
General Accounting Office
Washington, D.C. 20548

Program Evaluation and
Methodology Division

B-240648.2

March 19, 1991

The Honorable Howard Metzenbaum
Chairman, Subcommittee on Antitrust, Monopolies,
and Business Rights
Committee on the Judiciary
United States Senate

Dear Mr. Chairman:

At your request, we examined the extent to which certain safety devices could prevent firearms-related deaths. Specifically, we examined the proportion of accidental deaths that might have been averted by two technological modifications to firearms: a child-proof safety device that automatically engages and a device that indicates whether a gun is loaded. We also looked at injuries caused by accidental firearm discharges, for which we developed new information.

This report presents the findings of our research, which shows that the two safety devices could potentially save many lives and would undoubtedly also prevent many injuries. We also present information on the likely number of individuals injured in accidental shootings and discuss a range of alternatives for dealing with this public health problem.

As we arranged with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from its date. At that time, copies of the report will be sent to the Chairman of the Consumer Product Safety Commission, and we will make copies available to others upon request.

If you have any questions or would like additional information, please call me at (202) 275-1854 or Robert York, Acting Director of Program Evaluation in Human Services Areas, at (202) 275-5885. Other major contributors to this report are listed in appendix IV.

Sincerely yours,

Eleanor Chelimsky

Eleanor Chelimsky
Assistant Comptroller General

Executive Summary

Purpose

In 1988, some 1,501 people were killed in the United States by accidental discharges of firearms, and many more were injured. Among those killed were 277 children under age 15.

Concerned about these accidental shootings, the Chairman of the Subcommittee on Antitrust, Monopolies, and Business Rights of the Senate Committee on the Judiciary asked GAO to examine the extent to which certain safety devices could prevent such deaths or injuries. Specifically, GAO was asked to examine the proportion of accidental firearms fatalities that might have been prevented by two types of technological modifications to firearms: a child-proof safety device that automatically engages and a device that indicates whether a gun is loaded. GAO also examined nonfatal injuries, in an effort to establish the totality and costs of deaths and injuries from accidental firearm discharges as well as the relative size of fatal accidents vis-a-vis that totality.

Background

The debate over firearms policy receives nationwide attention on a continuing basis, but only rarely has that debate focused on firearms as consumer products. Nonetheless, one recommendation that has been made is that guns be treated like other consumer products. Some have proposed making guns safer so as to reduce the number of accidental firearm discharges resulting in injuries and deaths. This proposal is in line with efforts aimed at improving the safety of a variety of consumer products implicated in accidental injuries and deaths. However, the Consumer Product Safety Commission, the primary federal agency with responsibility for product safety, is not allowed to take action that will restrict the manufacture or sale of firearms. No other agency is explicitly charged with monitoring firearms safety.

Firearms are the fourth leading cause of accidental deaths among children 5 to 14 years old and the third leading cause of accidental deaths among 15- to 24-year-olds. Across all age groups, accidental shootings are the sixth leading cause of potential years of life lost because of accidents.

Results in Brief

From a nationally projectable sample, GAO estimates that 31 percent of accidental deaths caused by firearms might be prevented by the addition of two safety devices. Of the 107 accidental firearms-related fatalities GAO examined for calendar years 1988 and 1989, 8 percent could have been prevented had the firearms been equipped with a child-proof safety device. (This 8 percent represents instances in which children

under the age of 6 accidentally shot and killed themselves or other persons.) In an additional 23 percent of the cases, people accidentally shot and killed themselves or others with firearms they thought were unloaded. These deaths could have been prevented by a loading indicator.

Although it has long been assumed that far more injuries than deaths occur from accidental discharges of firearms, no information has been available on the actual number of injuries. GAO examined data on accidental shootings in 10 cities and found that in 1988 and 1989, these areas had a ratio of 105 injuries for each death (that is, more than 100 to 1). Although this estimate, based on a judgmental sample, cannot be generalized to the country as a whole, it is nevertheless reasonable to infer from it that the number of accidental injuries from firearms nationwide is substantial and far exceeds the number of fatalities.

GAO's Analysis

Prevention of Accidental Deaths and Injuries

About 1 of every 3 deaths from accidental firearm discharges could be prevented by a firearms safety device. From data in autopsy and police reports, GAO determined the numbers of accidental firearm deaths in 1988 and 1989 that (1) could have been prevented and (2) could not have been prevented by either of the two safety devices studied. GAO examined 107 total deaths from accidental firearm discharges. In that sample of fatalities, 34 could have been prevented by safety devices; 52 could not have been. Not enough data were available to determine whether the other 21 were preventable.

A child-proof safety device (that is, one that prevents the trigger from accidentally being engaged) could have prevented all the accidents in which children under the age of 6 killed themselves or others (8 percent of the total). However, according to experts in pediatric injuries, including experts with research experience in firearms, a child-proof safety device on a firearm (whether based on the child's strength, cognitive skills, or both) could reliably be expected to deter only children under the age of 6.

A safety device that indicates whether a firearm is loaded could have prevented another 23 percent of the deaths. Many accidental deaths

caused by firearms, other than those affecting children, involve uncertainty about whether the weapon is loaded. For example, one might empty a firearm but not notice that a round remains in the chamber, one might typically leave a weapon unloaded and so assume that it is always unloaded, or one might pull the trigger several times without discharge (dry-firing) and so assume the chamber to be empty even though it is not.

Other accidental deaths GAO examined were not considered preventable by these devices. For example, death can be caused by a gun that discharges when it is accidentally dropped or falls from its storage location or by a hunter mistakenly believing he or she is shooting at game.

From our sample, we can project that about 458 (plus or minus 89) of the 1,501 deaths in 1988 could have been prevented by either a child-proof device or a loading indicator device. In addition to the lives that could be saved, there are medical expenses and other economic costs to society that would not occur were these deaths to be prevented. Averting 458 deaths would avoid costs estimated to exceed $170 million.

Deaths and Injuries

According to statistics maintained by the National Center for Health Statistics, the number of deaths annually caused by accidental firearm discharges has generally been decreasing, ranging from 1,955 deaths in 1980 to 1,501 deaths in 1988. This is a decline of 23 percent over 8 years. However, no national data have been maintained on the number of injuries caused by accidental firearm discharges. In fact, few police departments maintain records on injuries caused by firearms. GAO identified 10 cities whose police departments maintain such data. These cities had populations ranging from about 93,000 to over 1 million.

The police data GAO examined showed that there were 527 injuries and 5 deaths from accidental shootings in 1988 and 1989. Thus, across these 10 cities, the ratio of nonfatalities to fatalities was about 105 to 1.

An estimate of the overall costs associated with unintentional firearm injuries and deaths can be derived by combining the incidence data with information on the cost of injuries. If there were 1,500 deaths and some 12,000 hospitalizations (less than one tenth the number of injuries estimated from our sample) from accidental shootings every year, that would translate into an estimated lifetime cost, each year, of close to $1 billion.

Recommendation

The number of individuals being injured and killed each year in accidental shootings is substantial. GAO has determined that two technologies—child-proof safeties and loading indicators—show promise for reducing the number of deaths and injuries. However, obstacles remain to realizing this promise and, in addition, other approaches (for example, training gun owners or limiting access to firearms) may be equally or more effective.

The human, economic, and public health costs of these shootings to the victims, their families, and society are considerable. The magnitude of the problem requires that all possible efforts be made to reduce the number of accidental shootings.

The Consumer Product Safety Commission, the primary federal agency with responsibility for product safety, is currently not allowed to take any action that might restrict the availability of firearms to the consumer. GAO recommends that the Consumer Product Safety Act be amended to clearly establish that the Consumer Product Safety Commission can regulate the risk of injury associated with firearms.

Agency Comments

GAO did not request comments on a draft of this report.

Contents

Figures

Abbreviation

GAO General Accounting Office

Introduction

A 4-year-old boy shoots his 2-year-old brother with the .22-caliber pistol he finds under the seat of his father's pickup truck. A 10-year-old finds a .38-caliber revolver in a dresser drawer. He does not think it is loaded and accidentally kills his 8-year-old sister while playing with the gun.

These and similar incidents highlight an issue of concern: accidental injuries and deaths from firearms. Currently in the United States, about 1,500 people die each year from accidental shootings, and an unknown number of people are injured. Firearms are the fourth leading cause of accidental deaths among children 5 to 14 years old and the third leading cause of accidental deaths among 15- to 24-year-olds. Across all age groups, accidental shootings are the sixth leading cause of potential years of life lost from accidents.[1] Some 277 children under age 15 were killed in accidental shootings in 1988.

The Chairman of the Subcommittee on Antitrust, Monopolies, and Business Rights of the Senate Committee on the Judiciary requested that we undertake a study to try to estimate the number of deaths and injuries that might be prevented by two possible technological modifications to firearms: child-proof safeties that would automatically engage and loading indicators that would show when a live round was in the chamber, ready to be fired.

In response to this request, we conducted a study to examine the magnitude of the problem of unintentional firearms injuries and to estimate the effect of the two proposed technological modifications in preventing such accidents.

Background

The debate over firearms policy receives nationwide attention on a continuing basis. Most of this debate has focused on issues of gun ownership, such as waiting periods for purchase, background checks, gun licensing, and banning certain types of weapons. These issues generally focus on problems with the illegal use of firearms versus rights of gun ownership for protection and recreation.

Absent from most of the gun control debate is a discussion of firearms as consumer products. One recommendation that some researchers in public health have made is that guns be treated like other consumer products. That is, they propose that steps be taken to make guns safer

[1]The standard method of calculating potential years of life lost is to subtract the age at death of the accident victim from age 65.

to at least reduce the number of injuries and deaths resulting from the accidental discharge of firearms. This proposal is in line with efforts aimed at improving the safety of a variety of consumer products implicated in accidental injuries and deaths, including automobiles, toys, and poisonous substances. The federal government has increasingly played a role in mandating changes to products to improve their safety. However, the Consumer Product Safety Commission, the primary federal agency with responsibility for product safety, is not allowed to take action that will restrict the availability of firearms to the consumer. No other agency has been charged with monitoring the public health risks firearms may entail.

This report looks at the probable effects of two specific suggestions from the public health literature for improving the safety of firearms: child-proof safeties and loading indicators.

Accidental Shootings

As mentioned above, shootings are among the leading causes of accidental deaths, particularly among young people. It should be noted that accidental shooting deaths represent only a small proportion of the total number of people injured and killed by firearms each year. The majority of deaths from firearms (56 percent) are suicides, with homicides accounting for most of the remainder (39 percent). Only 5 percent of firearms-related deaths each year are caused by accidental shootings.

Nonetheless, the number accidentally injured or killed by firearms may represent a substantial number of cases. While data on the number of fatalities are available, there is little information on the number of injuries caused by accidental shootings. And, despite attention to the issue of firearm accidents by public health researchers, there is little in the way of empirical evidence on the circumstances of accidents involving firearms, so not much is known about the details of those shootings.

National data are available on the number of deaths caused by unintentional shootings. The National Center for Health Statistics annually collects national data for all causes of death. Numbers for the years 1980-88 are shown in table 1.1. No comparable information is available for nonfatal injuries.

Table 1.1: Unintentional Firearm Deaths and Injuries 1980-88

	1980	1981	1982	1983	1984	1985	1986	1987	1988
Deaths	1,955	1,871	1,756	1,695	1,668	1,649	1,452	1,440	1,501
Nonfatal injuries	NA	NA	NA	NA	NA	NA	NA	NA	NA

As can be seen, there was a generally downward trend in the number of deaths each year until 1987, with an increase in 1988, the most recent year for which information is available. We do not know why the number of deaths has declined, but there are several possible explanations. Education in gun safety and public awareness campaigns may be having some effect. There may be fewer deaths because gun owners are taking more precautions in storing and handling their weapons. There may also be a greater general awareness of the dangers associated with firearms, so individuals refrain from handling unfamiliar weapons. The many products entering the market for securing firearms may also be having an effect. Many devices are available for storing guns or protecting them from unauthorized users. Another possible explanation is that more shooting victims may be surviving their injuries because of better trauma care and better access to care. Any or all of these influences may be working to bring down the number of fatalities.

Objectives, Scope, and Methodology

The central objective of this project was to provide an estimate of the proportion of firearms accidents that might be prevented by the addition of a child-proof safety or a loading indicator. This issue divides into two questions:

- What proportion of firearm accidents might have been prevented with a child-proof safety?
- What proportion of accidents might have been prevented with a loading indicator?

A second objective of our research was to add to the base of knowledge on firearm accidents, particularly by contributing information on the number of injuries. No national estimates are available on accidental injuries from firearms. As a result, there is no clear understanding of (1) the universe of accidents, both fatal and nonfatal, annually caused by firearms; (2) the relative importance of fatal accidents in terms of that universe (that is, it is not known if the deaths in any given year represent 5 percent of the accidental shootings or 50 percent); and (3) the costs represented by this unknown universe of deaths and injuries.

The scope of our work was limited to unintentional injuries and deaths from firearms. This eliminates the vast majority of gunshot injuries, specifically those related to any types of criminal activity or suicide attempt. Similarly, we limited the scope of "preventable" shootings to those that could have been averted by means of a child-proof safety or a loading indicator. We collected data for 1988 and 1989, the most recent years for which complete data were available at the time of our research.

For our examination of preventability, we looked at cases in which there had been a death as a result of an accidental firearm discharge. We collected data from a nationally representative sample of jurisdictions. This allowed us to develop a statistically valid estimate of the proportion of deaths preventable with a child-proof safety or loading indicator.

We determined if there were any deaths from accidental shootings in 1988 or 1989 by contacting state vital records offices and the coroners or medical examiners in the selected jurisdictions. The determination of whether a particular shooting might have been prevented by a child-proof safety or a loading indicator required detailed information about the particular incident. Generally, this meant that we needed information on the shooter, the weapon, and the circumstances of the accident.

By limiting the cases to fatalities, we could contact coroners or medical examiners in the selected jurisdictions to obtain the needed information. Information from these files for deaths was sufficiently detailed in about 80 percent of the cases to allow a determination of preventability.

We limited this examination of preventability to fatal shootings primarily because less information is maintained on accidental injuries than on deaths. In our preliminary investigation, we learned that the information we needed to make a determination of preventability was very often not available in cases in which there was only an injury and no death. In fact, in many instances, it might not be possible to locate any information about a nonfatal accident.

We learned that many police departments do not maintain retrievable records on accidental shootings (since these are not crimes), and even when they do, they document more completely the incidents in which a shooting victim died. Even in deaths believed from the outset to be accidental, the homicide unit is often involved in the investigation. Additionally, details of the circumstances surrounding accidental deaths are

usually available from coroners' and medical examiners' reports. In contrast, information from the case records of injuries we examined was rarely sufficient to allow us to determine preventability. Consequently, we restricted our preventability determinations to cases involving accidental deaths.

We did examine accidents involving nonfatal injuries in order to develop some information about the frequency of such accidents and to explore the relative proportion of injuries to deaths. Our examination of these accidents is based on data drawn from 10 cities. The lack of data in many police departments for such accidental shootings limited our study. We identified 10 urban police departments that maintained accessible records on accidental firearm injuries and were willing to provide the case file information. Police departments that were included in our study were for the following cities: Tucson, Arizona; San Jose, California; Denver, Colorado; Atlanta, Georgia; Louisville, Kentucky; St. Paul, Minnesota; Albuquerque, New Mexico; Columbia, South Carolina; Dallas, Texas; and Salt Lake City, Utah. Because this was a convenience sample of departments, the results from these 10 cities cannot be generalized to the country as a whole.

A more detailed discussion of the scope and methodology we used is provided in the chapters covering each part of the work. The sampling plan is discussed in detail in appendix I.

It should be noted that we did not investigate the specifics of design modifications to firearms to make them child-proof or to indicate whether they were loaded. We learned that various devices exist and are available on some firearms, but we did not examine the difficulty or cost associated with providing such devices on all firearms. We have examined the potential effectiveness of such devices in preventing accidental shooting deaths on the assumption that all firearms would be equipped with them. We comment further on this in chapter 4.

As requested by the subcommittee, we did not request comments on our report from any federal agency. Our work was performed in accordance with generally accepted government auditing standards.

Study Strengths and Limitations

There is very little specific information currently available about the details and circumstances surrounding accidental shootings. In particular, there is little known about nonfatal shootings. One strength of this study is that it adds to the knowledge on this topic.

A second strength is the method we used for our examination of preventability. Because we collected data from a nationally representative sample of jurisdictions, we have developed a valid estimate of the proportion of deaths preventable nationwide by means of a child-proof safety or a loading indicator. In carrying out this study, we went to great lengths to obtain information on the accidental shootings in our sample, contacting coroners and medical examiners and, when necessary, seeking additional information from police records.

We have attempted to make the most conservative choices in our assumptions. For example, in considering at what age a child-proof safety might be effective in consistently preventing a child from firing a weapon, we chose the youngest age proposed by any expert in the area. Undoubtedly, some older children would also be prevented from firing weapons equipped with such devices, but we have only counted children under 6 in our calculations of preventability.

The limitations to our investigation relate primarily to our examination of the proportion of firearm accidents resulting in injuries. Because we had to rely solely upon police department records for this information, there are potential gaps in the data. As is usual in the United States, each police department has its own recordkeeping system, with accidental shootings filed under different categories in different departments. In some instances, the department retrieved the records for us from computerized files, while in other instances we had to conduct a hand search of all records filed under some broader heading. These different recordkeeping systems may account for some variability in the number of cases identified in the different cities. But any bias must necessarily be in the conservative direction (that is, the numbers can only underreport the actual totals), because all the cases we report were of identifiable accidental shootings.

An additional limitation is that we could not evaluate all possible alternatives for reducing firearm accidents; we could evaluate only the potential effectiveness of child-proof safeties and loading indicators. We discuss other possible approaches in chapter 4.

It should be noted that most of these limitations are merely reflections of immaturity in this area of research. This is also true of other areas in which police data and uncounted or hidden populations are involved and for which no national monitoring agency responsibility exists.

Organization of the Report

In chapter 2, we address the question of firearm accidents that could be prevented by child-proof safeties and loading indicators. Our research on nonfatal injuries from firearm accidents is discussed in chapter 3, and we discuss the implications of our findings in chapter 4. The sampling plan and estimation methodology are provided in appendix I. Appendix II contains a discussion of the costs of firearm injuries. Suggested legislative language for implementing our recommendation is provided in appendix III. Major contributors to the report are listed in appendix IV.

The Preventability of Accidental Deaths From Firearms

In this chapter, we report on our estimate of the proportion of all accidental firearm deaths that could be prevented by either a child-proof safety device or a device that indicates whether a gun is loaded. We first describe the methodology we used to determine which deaths could have been prevented. Next, we provide our findings on the numbers of accident cases in our sample that were preventable by a child-proof safety or loading indicator and the accidents that were not thereby preventable. We include a description of some of the characteristics of the accidents in our sample and conclude with estimates of preventable deaths nationwide.

Methodology

To determine the percentage of accidental deaths from firearms that could have been prevented by either of the two types of devices, we examined data from medical examiners and coroners in a sample of jurisdictions from across the United States. We randomly selected 110 urban and rural jurisdictions (counties and independent cities) and determined if there had been any deaths in the jurisdictions from accidental shootings in 1988 or 1989, the most recent years for which data were available. To determine if there were any such deaths, we contacted state vital records offices and the coroners or medical examiners in the selected jurisdictions.

We requested complete case file information (investigation reports, autopsy results, and so on) from the medical examiner or coroner for every accidental death from firearms that we identified. In some cases, when medical examiners' or coroners' data were insufficient to allow a preventability determination, we sought supplemental information from police department records. In total, we reviewed 107 case files.

After our review of case files, we divided the accidental firearm deaths into four categories: (1) those that could have been prevented by a child-proof safety device, (2) those that could have been prevented by a loading indicator device, (3) those that could not have been prevented, and (4) those for which a preventability determination could not be made.

We constructed criteria for determining which cases fell into each category. For deciding which accidents could have been prevented by a child-proof safety device, we sought the advice of experts. Several types of child-proof devices are on the market. Through various means, such devices lock the trigger to prevent it from being pulled. According to pediatrics experts and experts on deaths and injuries from firearms, a

child-proof device can be reasonably expected to prevent only children up to about age 6 from discharging a firearm. Children under that age are not considered strong enough physically or developed enough cognitively to be able to disengage a safety mechanism designed to be child-proof. Therefore, our criterion for determining the number of deaths that could have been prevented by a child-proof device was the age of the child firing the weapon.

Loading indicators allow one to determine at a glance whether a firearm is unloaded and whether a round remains in the chamber. Our criterion for determining the number of deaths that could have been prevented by a loading indicator was that there was evidence that the shooter believed the weapon was unloaded. We required that there be evidence of one of three situations in the case file. First, the shooter believed the firearm to be unloaded because either the shooter had emptied the firearm but failed to note that a round remained in the chamber or the shooter's common practice was to leave the weapon unloaded and so assumed it to be. Second, the shooter pulled the trigger several times without the firearm discharging (dry-firing) and so assumed it to be unloaded. Or third, the firearm had been stored for over a month, so the shooter did not remember whether it was loaded but assumed it was not.

We judged an accidental firearm death to be nonpreventable in cases in which there was specific evidence that the conditions above for child-proof safeties and loading indicators were not met (that is, shooter over age 6, shooter knew weapon was loaded). Examples of nonpreventable accidents (that is, not preventable by either of these two devices) included cases in which a weapon fell or was knocked to the ground and consequently discharged. Hunting accidents in which victims were mistakenly shot (for example, the 18-year-old man who was shot by a friend who mistook him for a deer) were also considered nonpreventable.

We classified as "undeterminable" any death for which the case file lacked sufficient detail to enable a determination of preventability. These included self-inflicted shootings in which there was no way of determining whether the victim had checked the gun before firing it.

For addressing the question of how many accidental shootings might have been prevented by the two safety devices, we examined accidental deaths from firearms, rather than injuries, primarily because more information is maintained on accidental deaths than on injuries. For example, police departments document more completely incidents in

which a shooting victim died. Even in deaths believed from the outset to be accidental, the homicide unit is often involved in the investigation. Additionally, details of the circumstances surrounding accidental deaths are usually available from coroners' and medical examiners' reports. Information from such sources was often sufficiently detailed to allow a determination of preventability. In contrast, information from the case records of injuries we examined was rarely sufficient to allow us to determine preventability. Consequently, we restricted our preventability determinations to cases involving accidental deaths.

Findings

Child-Proof Safety Devices

Of the 107 deaths we reviewed, 9 (8 percent) resulted from shots fired by children under age 6. These deaths could have been prevented by a child-proof safety device. Although children under the age of 6 generally cannot disengage a child-proof device, they are quite capable of firing a handgun, as demonstrated by medical examiners' and coroners' reports. In one case, for example, a 1-1/2-year-old boy and his 3-1/2-year-old brother were playing with a .38 caliber handgun that they found under their father's pillow. The weapon discharged, striking the younger child and killing him.

Loading Indicator Devices

Of the 107 deaths, 25 (23 percent) could have been prevented had the firearm had a loading indicator. These deaths occurred when the shooter, typically a male between 13 and 24 years old, believed for one reason or another that the firearm was unloaded. In one case, a 15-year-old boy removed a .22 caliber handgun from his father's nightstand and pointed it playfully at his 11-year-old sister. He had already removed the clip, for he was familiar with the gun (having fired it at the range once before), and thus believed the gun was unloaded. However, he did not realize that a round remained in the firing chamber; upon discharge, it struck his sister in the head.

Other deaths occurred when the shooter dry-fired a weapon one or more times and so believed it to be unloaded. In one case, a 17-year-old boy took a large-caliber handgun he believed to be unloaded and, in the presence of two friends, put it in his mouth. He pulled the trigger and, when the weapon failed to discharge, he placed it to his head and again pulled the trigger. The weapon then discharged.

In still other cases, the shooter habitually unloaded a firearm before storing it and so assumed it to be unloaded. For example, one man was cleaning his .44 caliber handgun that he always kept unloaded, but he had forgotten that he had placed a loose round in the chamber 2 weeks earlier. When he cocked the hammer to clean it, he inadvertently touched the trigger. The bullet struck his wife in the chest.

Other Accidents

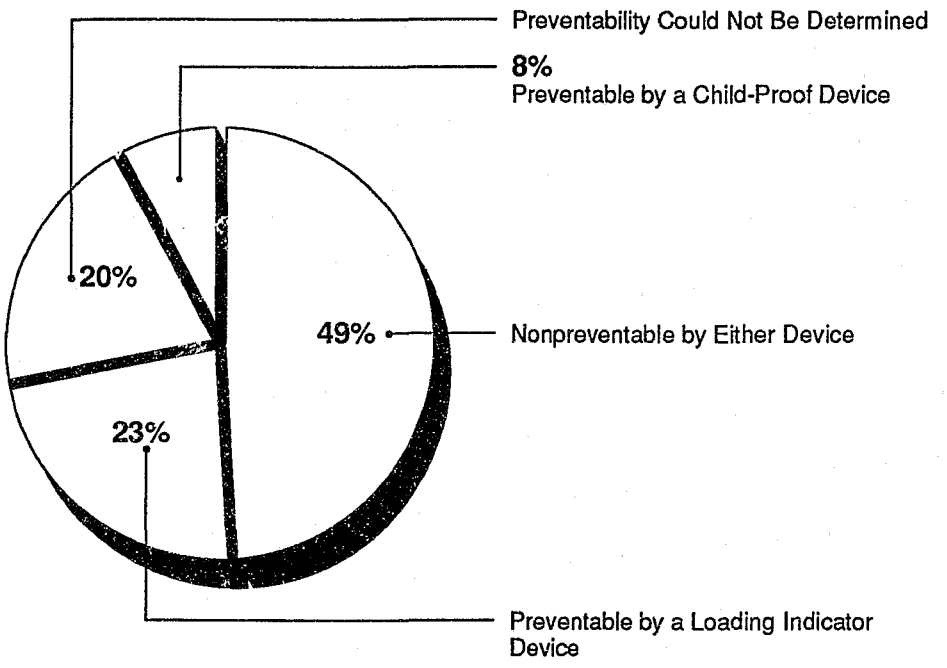
In 52 (49 percent) of the 107 cases we examined, the accident involved neither a child under the age of 6 nor a firearm believed to be empty. These deaths largely include those that occurred because a weapon discharged when it fell or was knocked to the ground. For example, in one case, a hunter was jumping into the back of a pickup truck when his rifle knocked against the truck bed and discharged. The bullet entered the cab of the truck, killing a passenger.

Although we classified such cases as "nonpreventable" by a loading indicator, we believe that some clearly would have been prevented had the shooter (1) been more careful in handling the weapon, (2) not been intoxicated, or (3) received training in firearm handling. We used gun safety materials published by the National Rifle Association to develop statements of basic safety practices. Among the 107 cases we examined, 90 involved clear violations of good gun-handling practices. For example, 7 cases involved intoxication or some use of alcohol and 10 cases involved Russian roulette.

In 21 (20 percent) of the 107 cases we examined, the case file information was insufficient to enable us to determine preventability. In one case, a 42-year-old male was admitted to a hospital with a gunshot wound in the abdomen. The case file indicated only that the wound was self-inflicted and occurred as the victim was reportedly putting the gun in a holster. It did not contain information on whether the victim thought the firearm was unloaded. Undoubtedly, some unknown proportion of these cases also could have been prevented by the presence of a loading indicator.

Figure 2.1 shows, for the 107 accidental deaths we reviewed, those that could have been prevented, those that could not have been prevented by either a child safety or loading indicator device, and those for which a preventability determination could not be made.

Figure 2.1: Proportion of Preventable to Other Deaths Caused by Accidental Firearm Discharges[a]

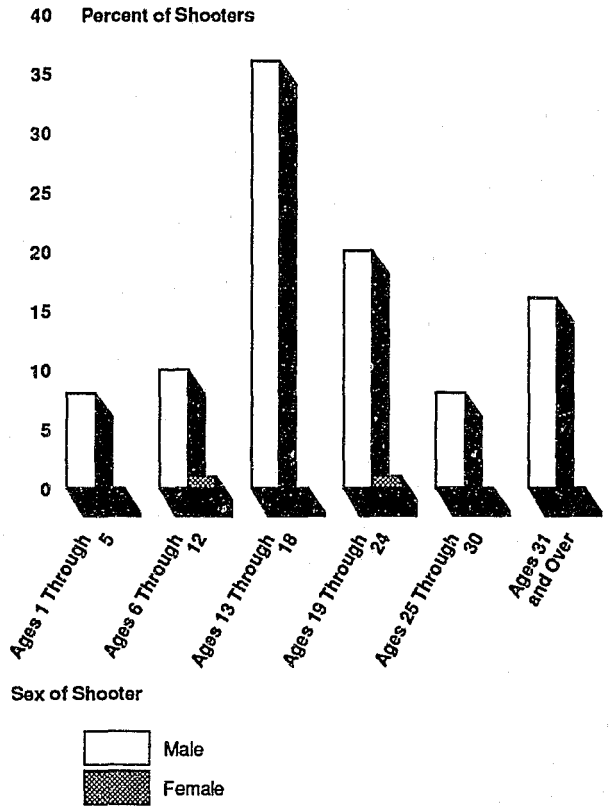


[a]From our sample of 107 cases, calendar years 1988 and 1989.

Characteristics of Accidental Deaths From Firearms

In the course of our review, we observed several interesting characteristics about accidental deaths from firearms. (Figures 2.2 through 2.6 show selected characteristics of the case files we reviewed.) As shown in figure 2.2, many more shooters were male than were female, and more shooters were between the ages of 13 and 24 than in other age groups.

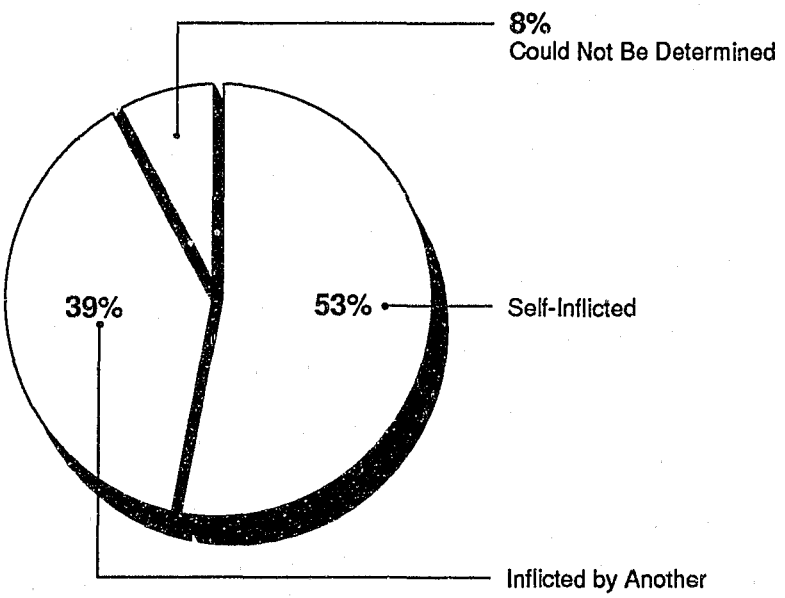
Figure 2.2: Sex and Age Group of Shooters[a]



[a]Based on 86 case files that included both sex and age.

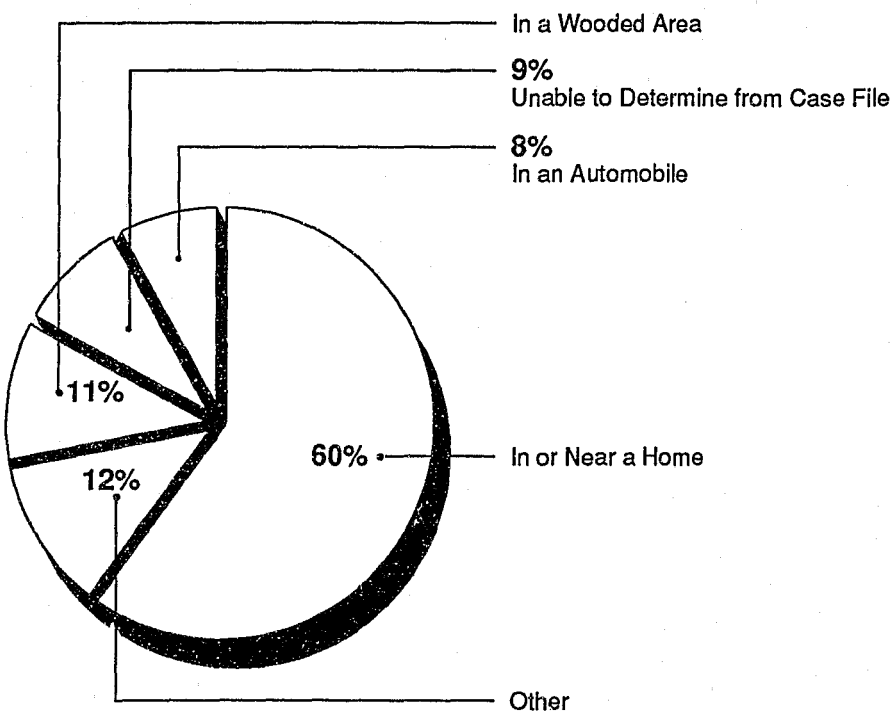
Slightly more than half the deaths were from self-inflicted wounds, as shown in figure 2.3.

Figure 2.3: Percent of Accidental Deaths That Were Self-Inflicted



More deaths occurred in or near a private residence than in vehicles, parks, or streets, as shown in figure 2.4.

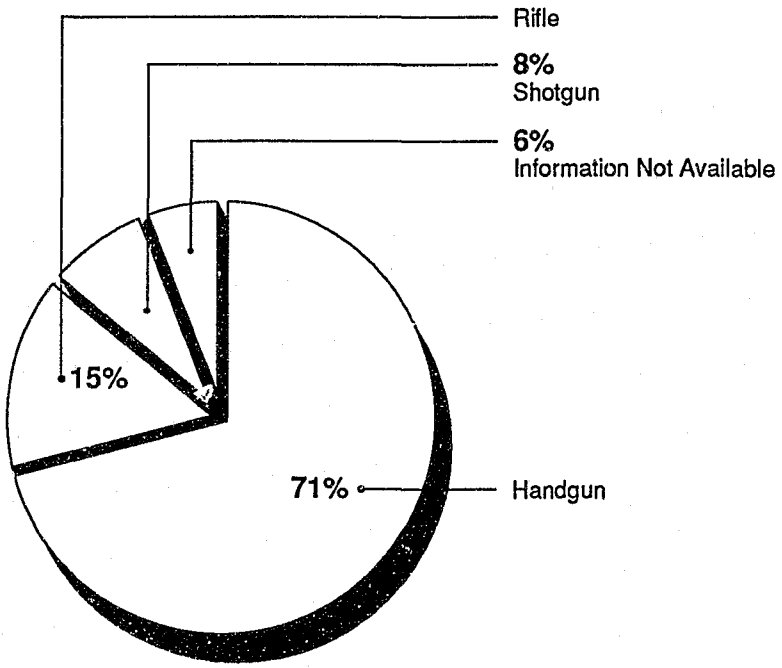
Figure 2.4: Location of Firearm Accidents Resulting in Death[a]



[a]"Other" includes public streets, sidewalks, alleys, public parks, workplaces, and firing ranges.

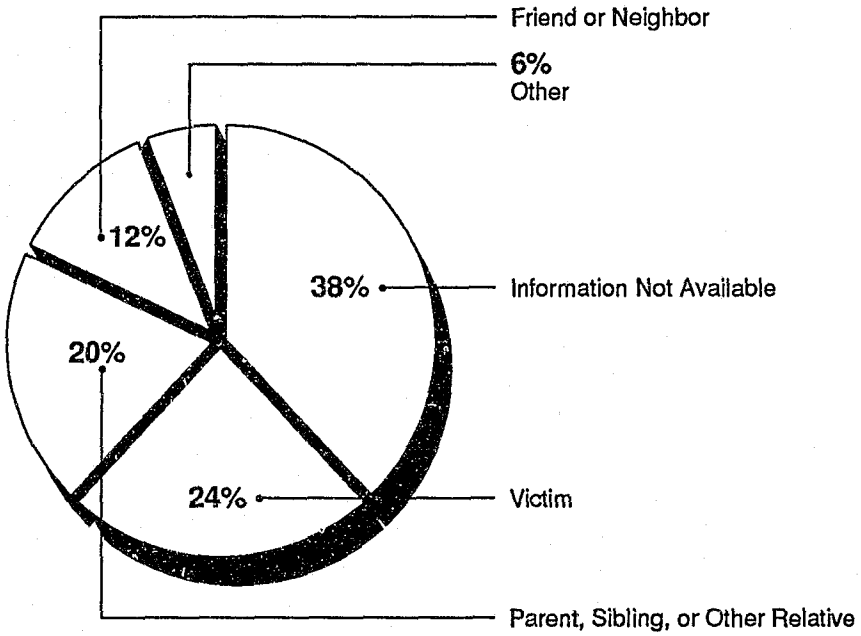
A handgun was the weapon involved in the majority of deaths, as shown in figure 2.5.

Figure 2.5: Type of Weapon Involved in Accidents



And over 4 out of 10 victims died by their own (or their family's) firearm, as shown in figure 2.6.

Figure 2.6: Ownership of Weapons Involved in Accidents



Estimates of Preventable Deaths

Nationwide, in 1988, according to the National Center for Health Statistics, 1,501 deaths resulted from accidental firearm discharges. From our sample, we can project that about 458 (plus or minus 89) of these deaths could have been prevented by either a child-proof device or a loading indicator device.[1] Specifically, 113 (plus or minus 64) could have been prevented with a child-proof device, and 345 (plus or minus 99) with a loading indicator device. Of the remaining deaths, 767 (plus or minus 125) could not have been prevented with these devices. Although we can project that over 400 deaths could have been prevented with these devices, it is likely that many additional deaths could have been prevented had good gun-handling practices been exercised, such as locking up and storing firearms unloaded and refraining from horseplay and the use of alcohol when handling firearms.

In addition to the lives that could be saved, there are medical expenses and other economic costs to society that could be avoided were these deaths to be prevented. The costs associated with shootings are quite

[1]Because our sample was randomly selected, our results are projectable to the country as a whole. All samples, however, are subject to sampling errors, which define the upper and lower bounds of the estimate calculated. All sampling errors for the estimates in this chapter were calculated at the 95-percent confidence level. (See appendix I for the sampling plan and the error for each estimate.)

high. If 458 deaths were averted, this would avoid costs estimated to exceed $170 million. (See appendix II for further discussion of the costs of firearm injuries and deaths.)

Accidental Injuries and Deaths From Firearms

As we stated in chapter 1, data on the number of fatalities are available, but there is little information on the number of injuries caused by accidental shootings. This chapter reports on our examination of the universe of injuries and deaths caused by accidental firearm discharges. We first describe the methodology we used to determine the ratio of injuries to deaths. Next, we provide our findings on the accidental shooting cases in our sample. We conclude with a discussion of the estimates of injuries from accidental firearm discharges nationwide.

Methodology

We examined firearm accidents involving injuries, but no deaths, in order to develop some information about the frequency of such accidents and the relative proportion of injuries to deaths. As we noted in chapter 1, our examination of these accidents is based on a sample of 10 urban police departments. The lack of data on accidental shootings in many police departments limited our study.

As we sought data on firearm accidents from city police departments, we found that the sophistication of police department recordkeeping systems varied widely, as did the extent of data maintained on cases involving accidental firearms discharges. Because police department record systems are essentially designed to track crimes and not accidents, many police departments do not maintain records on accidental shootings unless they result in death. And those that do maintain records on accidental shootings often include these records in a large "miscellaneous" category that makes their retrieval and review very labor intensive and time consuming. In contrast, some police departments maintain records by code, with a different code for each type of event they investigate, including firearm accidents. Other departments group their reports into sufficiently narrow categories (for example, "accidents" and "assaults") that the manual retrieval and review of the reports is feasible.

We identified 10 urban area police departments that maintained accessible records on accidental shootings and were willing to provide the case file information. To identify these police departments, we began with a list of jurisdictions suggested as having good data bases by several national law enforcement organizations. We contacted every police department suggested as well as others to which those departments referred us. The 10 cities included in our study were Tucson, Arizona; San Jose, California; Denver, Colorado; Atlanta, Georgia; Louisville, Kentucky; St. Paul, Minnesota; Albuquerque, New Mexico; Columbia,

South Carolina; Dallas, Texas; and Salt Lake City, Utah. The 1986 area populations ranged from 93,000 to over 1 million.

We obtained information from the 10 police departments on all the reported accidental shootings in their jurisdictions in 1988 and 1989. In most states (including 8 of the 10 states where cities in our study are located), hospitals and physicians are required by law to report gunshot injuries to the police. Two of the states where our cities are located, New Mexico and Kentucky, have no such statewide legal requirement. However, according to police officials in the 2 cities studied in those two states, Albuquerque and Louisville, medical professionals report cases involving gunshot injuries as a common practice. As a result, we are confident that the majority of accidental injuries from firearms in our 10 sampled cities are captured in our study.

Such reporting requirements were not the sole reason we sought data from police departments rather than from hospitals, the most common source of injury information. We learned that hospital records typically do not include information about whether a firearm injury was accidentally or intentionally inflicted, and thus we could not separate accidents from suicide or homicide attempts.

At the 10 police departments, we examined a total of 532 cases of accidental firearms discharges that resulted in either injury or death in 1988 and 1989.[1] Whereas we could project from our sample of medical examiners and coroners the nationwide number of accidental deaths from firearms that could have been prevented, we cannot do so for injuries. Because our sample of the 10 urban police departments is not representative, we cannot generalize our results either regionwide or nationwide. Nevertheless, as there has been a dearth of data on accidental injuries from firearms, we believe that our data will contribute to the national base of knowledge on accidental injuries from firearms. Knowledge about the number of injuries that occur each year is important for understanding the size of the public health problem, a key element in any consideration of the need to find solutions to the problem.

Findings

Of the 532 accidental firearm discharge cases we examined, 527 resulted in injuries, and 5 resulted in deaths. This is a ratio of 105 to 1 of injuries

[1]Not included in the 532 cases were shootings involving BB pistols or pellet guns and three cases with injuries where handguns loaded with blanks were intentionally fired. We also excluded cases of accidental firearms discharges where no one was injured and cases where the victim refused to cooperate with the police in providing any information about how the shooting occurred or who was involved.

to deaths. Table 3.1 shows the numbers of injuries and deaths from accidental firearm discharges in the 10 cities.

Table 3.1: Deaths and Injuries From Accidental Firearm Discharges, 1988 and 1989

City and state	Population[a]	Death	Injury	Total
Albuquerque, N. Mex.	366,750	1	48	49
Atlanta, Ga.	421,910	1	80	81
Columbia, S.C.	93,020	0	12	12
Dallas, Tex.	1,003,520	1	248	249
Denver, Colo.	505,000	2	15	17
Louisville, Ky.	286,470	0	34	34
St. Paul, Minn.	263,680	0	2	2
Salt Lake City, Utah.	158,440	0	12	12[b]
San Jose, Calif.	712,080	0	19	19
Tucson, Ariz.	358,850	0	57	57
Total	**4,169,720**	**5**	**527**	**532**

[a]1986 population.

[b]Does not include first three quarters of 1988.

The reasons for the wide variation in the cities' numbers of deaths and injuries, inconsistent with their population sizes, are unknown. To some extent, the variation may stem from differences in the police departments' recordkeeping systems. As we stated above, some departments had very sophisticated computerized systems that allowed for easier (and presumably more accurate) retrieval of cases. For example, Dallas, the city in our sample with the highest number of accidental shootings, had one of the most sophisticated recordkeeping systems.

Another reason for the wide variation may be differences in patterns of gun ownership. There are higher rates of gun ownership in the South and some parts of the West than in the North, for example. This may, in part, account for the low number of accidents in St. Paul and the higher numbers in Dallas, Atlanta, and Tucson. We have no ready explanation for why San Jose, the second largest city in our sample, had many fewer instances of accidental shootings than did Dallas, the largest city we studied.

At the least, however, the numbers of injuries are conservative. According to several police officials, some cases undoubtedly are not reported, although it is impossible to know how many. If some accidental shootings go unreported and uninvestigated, this is far more likely to happen in cases involving only injuries and no deaths. This

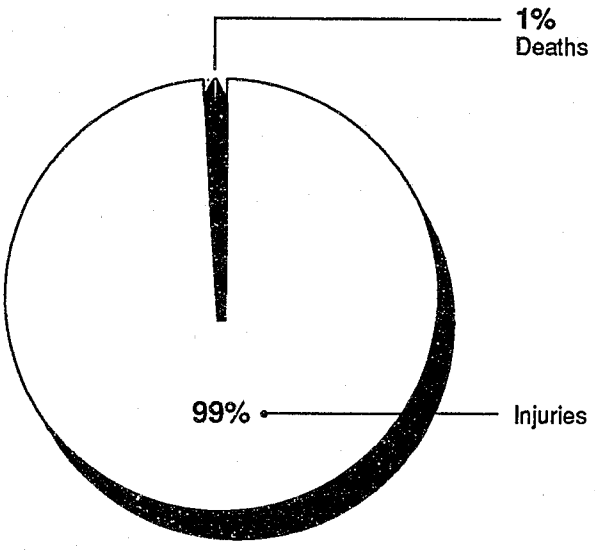
means that the reported numbers of deaths should be very accurate while the numbers of injuries may be underreported.

The characteristics of the accidental injury cases we reviewed were similar to those of the preventable and other death cases discussed in chapter 2. That is, the vast majority (90 percent) of the shooters were male, and almost half of all shooters were between the ages of 13 and 24. Most of the injuries were self-inflicted; most were caused by a handgun. In about two thirds of the cases, the accident occurred in or near a private residence.

The following case typifies the circumstances surrounding many of the accidental shootings in our sample. A 14-year-old youth was handling a .38 caliber handgun in his front yard. He assumed it to be unloaded and pulled the trigger, shooting himself in the foot.

Figure 3.1 shows, for the 532 cases we reviewed, that 99 percent of the accidental firearms discharges resulted in injuries rather than deaths. As already noted, we estimate that the ratio of injuries to fatalities is 105 to 1, based on the cases we reviewed in 10 cities.

Figure 3.1: Proportion of Injuries and Deaths Caused by Accidental Firearm Discharges



Implications

As we stated in chapter 1, we know that the number of deaths nationwide resulting from accidental firearm discharges was 1,501 in 1988, the most recent year for which totals are available. Given the cases we reviewed in 10 cities, we derived an estimate of the ratio of injuries to deaths of 105 to 1. Were we to apply this estimate to the nation, using the known number of deaths, we would estimate that there were approximately 157,600 injuries from accidental firearm discharges each year. However, because the sample of cities on which the ratio is based was not randomly selected, we cannot generalize to the nation as a whole.

There are a number of potential sources of bias in the data. First, the data most likely underestimate the actual number of injuries because of the general lack of reporting of accidental shootings. This source of bias would mean that the true ratio of injuries to deaths would be even higher than what we found.

There are also potential biases that would indicate the true ratio nationwide could be lower than that in our sample (that is, nationwide there could be fewer than 105 injuries for every death). Our sample of jurisdictions, driven by data availability, was entirely urban, and this could bias an estimate of the proportion of accidents that were survivable. There are at least three factors directly related to the survivability of a shooting that could vary between urban and rural settings: the caliber of the firearm (.22, .45, and so on), the type of firearm (handgun, long gun, or shotgun), and the quality of medical treatment received. The caliber of the firearm could bias the estimate, since caliber is positively associated with lethality. If lower-caliber firearms are more common in urban shootings (which we do not know), then urban victims could have a greater likelihood of surviving, thus inflating the ratio of injuries to deaths. The type of firearm could bias the estimate, since rifles, more common in rural hunting situations, are more lethal, even when caliber is held constant, because the bullet is fired with greater velocity. Thus, if rural victims are more likely to be shot with rifles, a higher proportion of rural shootings would likely result in death. Finally, the quality of medical treatment could bias the estimate, since urban dwellers are generally closer to emergency care, resulting in urban gunshot victims being more likely to survive potentially fatal injuries.

One frequent source of bias from nonrandom samples, that the locations selected were somehow "unique" or different from average, we do not believe to be a problem for this study. There is no reason to expect that the most important factor in whether an accidental shooting proves

fatal or not—where the bullet strikes the victim—should differ in any way from one locale to the next. Since these are accidental shootings, and not intentional, having a bullet strike a vital organ should largely be a random occurrence, regardless of whether the shooting is in an urban area or a rural one, a large city or a small one.

Even though we cannot validly project the proportion of injuries to deaths resulting nationally from accidental firearm discharges, there are some indications that the data from our sample are reasonable. As mentioned above, the characteristics of the cases in this sample are very similar to those from the representative sample of deaths we described in chapter 2. In addition, the figures seem in line with the injury-to-death ratios for other types of accidents. When the 105 to 1 ratio of injuries to deaths caused by accidental firearms discharges is compared with similar data for other types of accidents, our data appear consistent. For example, according to the National Safety Council, similar proportions of injuries to deaths exist nationwide for all accidents (94 to 1), accidents occurring in the workplace (162 to 1), and accidents occurring in the home (151 to 1).[2]

[2]These numbers are for "disabling injuries." A disabling injury is defined as an injury causing death, permanent disability, or any degree of temporary total disability beyond the day of the accident.

Implications

The Size of the Problem

As we stated in chapter 1, the number of deaths from accidental shootings has been generally declining over the last several years. This would seem to indicate that the problem is not large and has leveled off. However, what is missing from this picture is any sense of the number of injuries resulting from accidental shootings. Without this information, we cannot judge how big a public health problem firearm accidents really are.

From the declining number of deaths, we cannot determine if the total number of accidental shootings is declining (and declining at the same rate) or if the same number of people are accidentally shot each year but better trauma care is saving the lives of an increasing proportion of the victims.

Our report presents data on the number of injuries associated with every death. Although we cannot project to the country as a whole, were there actually to be the same ratio nationwide as in the 10 cities we studied, that would mean there are approximately 157,600 such injuries each year.

That number, because of methodological limitations discussed in chapter 3, must be viewed as a gross estimate. However, the number does give some sense of the size of the problem. It seems obvious that the total number of accidental shootings is many times the number of fatalities. This is in line with other causes of accidental death and injury. For example, as mentioned in chapter 3, the ratio of workplace injuries to deaths is 162 to 1, while accidents in the home have an injury to death ratio of 151 to 1. Thus, a ratio of tens of injuries for each death seems reasonable for accidental shootings.

Even if one excluded Dallas, the city in our sample with the largest number of injuries, there would remain 279 injuries and 4 deaths (that is, a ratio of 70 to 1), still a large relative proportion of injuries to deaths. If one were to reduce by half the ratio of injuries to deaths that we found, that would still result in a projection of approximately 78,800 injuries annually from accidental shootings in the United States. If one were to reduce it even further, to account for any possible bias, it seems likely, and reasonable, that the resulting projection would still be tens of thousands of such injuries each year. If the true ratio of injuries to deaths nationwide were only one tenth of the ratio in the cities we studied, it would mean there are over 15,000 injuries from accidental shootings each year.

In addition to the tragedy of these shootings, occurring as they primarily do among young people, there is the issue of costs. As mentioned in chapter 2, the costs associated with gunshot wounds are quite high. Thus, the economic effect of thousands of accidental shootings could be significant. Even if the true number of accidental shootings is smaller than the ratio from the 10 cities studied would indicate, the costs would still be substantial. If there were 1,500 deaths and some 12,000 hospitalizations (less than one tenth the number of injuries estimated from our sample of cities) every year, that would translate into an estimated lifetime cost, each year, of close to $1 billion.[1] (See appendix II for further discussion of the costs of firearms injuries and deaths.)

It seems clear that thousands of individuals and families are affected by these accidents each year. We turn now to a discussion of approaches that are available for reducing the number of such shootings.

Approaches to Reducing Accidental Shootings

Many of the accidental shootings each year are preventable. Of the fatal shootings we examined, we estimate that 31 percent could have been prevented by two technological modifications to firearms. Undoubtedly, additional fatalities were preventable among cases in which there was insufficient information for us to make a determination. Many nonfatal shootings are obviously also preventable.

Different approaches could be taken to try to reduce the number of accidental shootings. These include mandating modifications to firearms, requiring training in gun safety, and enacting statutes to penalize gun owners who are negligent in their handling or storage of weapons.

Mandated Modifications to Firearms

Our research has demonstrated that lives could be saved and injuries prevented if all guns were equipped with either a child-proof safety or a loading indicator or both. There are clearly instances in which such devices would prevent tragedy. Our projections are that, at current accident rates, some 458 lives could be saved each year if all firearms had both these safety devices.

[1]The lifetime cost of an accident is defined as the present discounted value of costs occurring in all future years. Costs include actual dollar expenditures related to illness or injury, including amounts spent for hospital and nursing home care, physician and other medical professional services, drugs and appliances, and rehabilitation. Estimates also include life years lost and the indirect cost associated with loss of earnings because of short- and long-term disability and premature death from injury. The estimated costs are derived from data for all shootings, not just unintentional shootings.

Gun manufacturers could choose to modify their firearms to include child-proof safeties or loading indicators, motivated by a desire to promote greater welfare or to avoid potential litigation or by pressure from consumers demanding firearms with such features. However, if a guarantee were needed that all firearms have these safety devices, this would have to be mandated by legislative action of the Congress. Current statutes place firearms outside the jurisdiction of the Consumer Product Safety Commission, and the Bureau of Alcohol, Tobacco, and Firearms is not empowered to control these design aspects of guns. Thus, regulatory action to require modifications could not be taken without specific new legislation.

A child-proof safety that automatically engaged and that came as a built-in part of the firearm could protect young children from adults' carelessness in storing loaded weapons where children can have access to them. Just as passive seat belts that automatically engage have been required in automobiles to protect the occupants without requiring that specific actions be taken each time the vehicle is used, child-proof safety devices on firearms could provide protection in the absence of specific behavior to secure the firearms. Child-proof safeties on firearms could prevent over 100 instances annually in which children fatally shoot someone, often themselves or another child.

Likewise, loading indicators could potentially prevent over 300 deaths resulting from accidental shootings each year among adolescents and adults. Our research demonstrates that, even more than child-proof safeties, this modification could potentially prevent many injuries and deaths. Such a device might also take the "fun" out of such games as Russian roulette.

Our projections of the number of lives saved that could be attributable to these safety devices require that two conditions be met. First, all firearms would have to be equipped with these devices. And second, all other relevant conditions would remain unchanged. That is, there would be no increase in gun safety awareness or education in safe gun-handling practices, because such changes could also save lives.

There are potential problems in implementing any requirement for firearms to be equipped with these safety devices. First, there may be technological difficulties to overcome in designing child-proof safeties and loading indicators for the myriad firearms on the market. In addition, there are possible logistical difficulties:

- loading indicator devices would require that users (including unintended users, such as adolescents) be educated to understand their use and to recognize the indication that the firearms were loaded;
- there are possible objections to the desirability of having onlookers be able to readily judge if a firearm is loaded (for example, if a weapon is being used for protection); and
- this type of child-proof safety would only prevent very young children from firing the gun and would likely not be effective against use by older children or adolescents.

Beyond the logistics of implementing the modifications, there is the question of effectiveness. Our projections for the number of lives that could be saved each year assumes that all firearms are equipped with these safety devices. But any changes of this type would presumably be mandated only for new firearms entering the market.

While over 4 million firearms are manufactured in the United States each year, there are an estimated 200 million firearms already in the market. Approximately 50 percent of U.S. households report owning one or more firearms. This represents an enormous pool of weapons that would not be affected by design modifications. Furthermore, firearms, unlike many consumer products, have a long period of use. It is not uncommon for firearms to be passed from one generation to the next, so it cannot be expected that within a decade, for example, the majority of old-style firearms would be out of use. To affect this pool of weapons, owners would have to be required to modify all their firearms, to equip them with the two safety devices.

Other Approaches

Other options are available, including many devices currently on the market, designed to prevent a firearm from being used by any unauthorized person. These include locking storage cases, trigger guards, combination locks that can be built into the weapon, and a variety of other mechanisms for securing firearms of different types. In addition, there is the simple expedient of keeping firearms unloaded, with ammunition stored separately.

However, all these approaches require some positive action on the part of the user to ensure that the firearms are not accessible to children or other unauthorized users. Passive restraints in automobiles were required when data showed that many passengers were not using seat belts that required buckling. The current number of accidents with firearms is testament to the fact that gun users frequently do not take the

available safety steps. It is not known if education in proper safety procedures would be sufficient to ensure that appropriate precautions would be taken. And requiring that all purchasers of firearms take gun safety training would necessitate some form of registration and monitoring of gun owners.

We know of no ready replacements on the market for a loading indicator. The necessary alternative is proper education in the use and handling of firearms. All users need to be trained to immediately inspect a weapon to determine if it is loaded before handling it further. As we stated in chapter 2, a majority of the accidents we examined involved some violation of safe gun-handling standards. Unfortunately, as our research has shown, many fatal accidents involve users who are not the owners of the firearms. Thus, firearm training aimed at owners will not prevent many of these accidents if others are allowed access to a loaded weapon.

Some states have adopted an approach aimed at encouraging owners to take proper precautions in storing their firearms. Both Florida and Connecticut have recently enacted statutes to hold adults guilty of criminal negligence if they allow minors to gain access to loaded firearms that are subsequently involved in accidental shootings. Penalties include fines and possible imprisonment. Other states (including Wisconsin and Virginia) have considered, but not passed, similar statutes.

Conclusion and Recommendation

The number of individuals being injured and killed each year in accidental shootings is substantial. Whereas the problem may have been viewed as small when only the number of deaths was known, we now know that the overall problem is likely to be very large, with many thousands of individuals being injured each year.

We have demonstrated the potential effectiveness of two technologies—child-proof safeties and loading indicators—for preventing some of these accidents, thereby reducing the number of deaths and injuries. However, there remain obstacles to realizing this promise. How these mechanisms might be implemented is not immediately clear.

These mechanisms are not the only approaches available, however. There are other approaches (for example, training gun owners or limiting access to firearms) that may be equally or more effective.

The human, economic, and public health costs of these shootings to the victims, their families, and society are considerable. The magnitude of the problem requires that all possible efforts be made to reduce the number of accidental shootings.

The Consumer Product Safety Commission, the primary federal agency with responsibility for product safety, is currently not allowed to take any action that might restrict the availability of firearms to the consumer. We recommend that the Consumer Product Safety Act be amended to clearly establish that the Consumer Product Safety Commission can regulate the risk of injury associated with firearms. Suggested legislative language for implementing our recommendation is provided in appendix III.

Sampling and Estimation Methodology

The study design involved collecting data from two separate samples. One sample was used to examine the preventability of accidental shootings by child-proof safeties and loading indicator mechanisms. A second sample was used to examine the prevalence of nonfatal injuries from accidental shootings. We discuss each sample in turn.

Sample for Examining Preventability

To determine the percentage of accidental deaths from firearms that could have been prevented by either of the two types of devices, we examined data from medical examiners and coroners in a random sample of jurisdictions from across the United States. In each jurisdiction, we contacted state vital records offices and the coroners or medical examiners and asked if there had been any deaths from accidental shootings in 1988 or 1989, the most recent years for which data were available at the time of our study.

We collected information only for shooting deaths classified as accidental. For jurisdictions using the ICD-9 coding system, we limited the data collection to fatalities coded under the E922 category ("accident caused by firearm missile").[1] Thus, we excluded deaths involving firearms that were classified as suicides or homicides or could not be classified.

The sampling frame was the 3,139 counties and independent cities listed by the Bureau of the Census.[2] We divided these jurisdictions into two strata on the basis of population: an urban stratum (population greater than or equal to 50,000) and a rural stratum (fewer than 50,000 residents). We then selected a random sample of jurisdictions within each stratum. We selected 60 urban jurisdictions and 50 rural jurisdictions, for a total of 110 counties and independent cities. Data were not obtained for either year in 3 jurisdictions. One year's data were unavailable in an additional 4 jurisdictions.

From the data we collected, we computed sampling errors for the major findings on preventability presented in chapter 2. We present our estimates in table I.1, along with the sampling error for each estimate. When added to and subtracted from the estimates, the sampling errors provide the 95-percent confidence interval for each finding.

[1]U.S. Department of Health and Human Services, The International Classifications of Diseases, 9th Revision, Clinical Modification, 2nd ed. (Washington, D.C.: 1980).

[2]U.S. Department of Commerce, County and City Data Book (Washington, D.C.: 1988).

Table I.1: Estimates and Sampling Errors for Findings on Preventability[a]

Variable	Estimate	Sampling error
Preventable by a child-proof device	7.5%	4.2%
Preventable by a loading indicator device	23.0	6.6
Total preventable by either device	30.5	5.9
Nonpreventable by either device	51.1	8.3
Preventability could not be determined	16.7	7.3

[a]Figures represent percent of accidental deaths.

For a check on the accuracy of our sample, we used our data to generate an estimate of the expected number of accidental deaths in a year. Using these data, we estimate that 1,581 deaths from accidental shootings (plus or minus 696) would be expected in a year. This estimate compares favorably with the known number of 1,501 deaths in 1988.

We also computed estimates and sampling errors for the other variables presented in chapter 2 (sex and age of shooters, percentage of self-inflicted shootings, location of accident, type of weapon, and ownership of weapon). These estimates are available upon request.

Sample for Examining Injuries

We employed a snowball sampling technique to identify police jurisdictions where the needed information was retrievable. We began by asking experts on police departments (from the National Institute of Justice, the National Criminal Justice Reference Service, the Police Executive Research Forum, and the Police Management Association) to list any departments with records systems that might contain information on accidental shootings in an accessible form. We contacted every police department suggested in order to determine the feasibility of obtaining the needed case records. In addition, at each department, we asked for referrals to other departments where the needed information might be obtained. This process of contacting departments and asking for referrals was continued until the list of new department names was exhausted.

We identified 10 urban area police departments that maintained accessible records on accidental shootings and that were willing to provide the case file information. The 10 cities included in our study were Tucson, Arizona; San Jose, California; Denver, Colorado; Atlanta, Georgia; Louisville, Kentucky; St. Paul, Minnesota; Albuquerque, New Mexico; Columbia, South Carolina; Dallas, Texas; and Salt Lake City, Utah. Because this was a convenience sample of departments, the results from these 10 cities cannot be generalized to the country as a whole.

Costs of Firearm Injuries

The specific information needed to develop a precise estimate of the costs of unintentional firearm injuries and deaths is not available. However, the information that is available shows that the total costs associated with gunshot wounds are likely to be quite high.

One recent study estimates the average lifetime cost of different types of injuries, defined as the present discounted value of costs occurring in all future years.[1] Costs are enumerated as actual dollar expenditures related to illness or injury, including amounts spent for hospital and nursing home care, physician and other medical professional services, drugs and appliances, and rehabilitation. The cost estimates also include life years lost and the indirect cost associated with loss of earnings from short- and long-term disability and premature death from injury.

Using this approach, the average lifetime cost of a firearm injury (including both fatal and nonfatal injuries) is estimated to be $53,831.[2] This can be broken down into estimated costs for firearm injuries of different levels of severity. For those that do not require hospitalization, the estimated per person cost is $458, while injuries requiring hospitalization are estimated to cost $33,159 per person. And the average lifetime cost of a firearm fatality is $373,520, the highest of any cause of injury.

We know from national mortality data that about 1,500 people die each year in the United States from accidental shootings. Based on data from the National Hospital Discharge Survey, it is estimated that in excess of 65,000 persons are hospitalized every year with injuries resulting from firearms. However, it is not known how many of these firearm injuries are unintentional. One study of hospitalizations over the course of a year at one regional trauma center found that 18.8 percent of the firearm-related injuries were unintentional.[3] Applying this 18.8-percent figure to the 65,129 firearm-related hospitalizations nationwide yields an estimate of 12,244 annual hospitalizations from unintentional

[1]Dorothy P. Rice et al., Cost of Injury in the United States: A Report to Congress (San Francisco, Calif.: Institute for Health and Aging, University of California, and Injury Prevention Center, The Johns Hopkins University, 1989).

[2]Rice's cost estimates are in 1985 dollars.

[3]Michael J. Martin et al., "The Cost of Hospitalization for Firearm Injuries," Journal of the American Medical Association, 260:20 (November 25, 1988), 3048-50. The 18.8-percent figure was computed omitting cases that could not be categorized as either intentional or unintentional.

firearm injuries. There are no reliable estimates of the number of persons each year who suffer firearm-related injuries that do not require hospitalization.

The estimates from the study on costs can be combined with the incidence data to derive a rough estimate of the overall costs associated with the unintentional firearm injuries and deaths occurring in a single year. The average lifetime costs associated with 1,500 deaths would be over $500 million (that is, 1,500 times $373,520 equals $560,280,000). For 12,244 hospitalizations, the average lifetime cost would be over $400 million (that is, 12,244 times $33,159 equals $405,998,796). So, omitting any costs associated with injuries not requiring hospitalization, the estimated lifetime costs for accidental shootings is close to $1 billion ($966,278,796) every year.

The estimated costs associated with shootings can also be used to value the savings that would be associated with specific types of prevention. In chapter 2, we estimated that some 458 deaths might be prevented each year if all firearms were equipped with child-proof safeties and loading indicators. If 458 deaths were averted, this would avoid lifetime costs estimated to exceed $170 million.

The estimates above are based on one approach to estimating the costs of firearm injuries and deaths. Different federal agencies have used different dollar amounts for the value of life, ranging from several hundred thousand dollars to several million dollars. If higher figures are considered in the calculations, the estimated costs of accidental shootings can increase dramatically. For example, one frequently used value is $2 million.[4] Applying the $2 million figure to the 1,500 deaths that occur each year yields an estimated annual value of life lost through accidental shootings of $3 billion. Applying this value to our projection of 458 deaths that might be averted would yield estimated annual savings of over $900 million. Higher assigned values for each life would result in higher estimated savings.

[4]Clayton P. Gillette and Thomas D. Hopkins, Federal Agency Valuations of Human Life (Washington, D.C.: Administrative Conference of the United States, 1988).

Suggested Legislative Language

This appendix suggests legislative language that would implement the revisions we recommend to clearly establish that the Consumer Product Safety Commission can regulate the risk of injury associated with firearms. The legislative language should read as follows:

Section 3(a) of the Consumer Product Safety Act (15 USC 2052) is amended by striking out subparagraph (a)(1)(E) and redesignating subparagraphs (F) through (I) as subparagraphs (E) through (H), respectively.

Section 8 of the Consumer Product Safety Act (15 USC 2057) is amended by adding at the end thereof the following sentence:

This section shall not apply in the Commission's regulation of the risk of injury associated with firearms.

Section 3 of the Consumer Product Safety Commission Improvements Act of 1976 (15 USC 2080 note) is amended by striking out subparagraph (d)(2) and subparagraph (e) and inserting in lieu thereof:

(e) the Consumer Product Safety Commission has authority to regulate the risk of injury associated with firearms.

Section 3 of the Consumer Product Safety Commission Improvements Act of 1976 (15 USC 2080) is further amended by striking out "(1)" in subparagraph (d).

Major Contributors to This Report

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