

CHAPTER 1

A Public Health Perspective on Gun Violence Prevention

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Gun violence is a public health problem. Each year in the United States, tens of thousands of people are killed by gunfire and many more are seriously injured with resulting disabilities.¹ Among the victims of gun violence are curious young children who encounter loaded guns and do not understand the damage they can cause; depressed teenagers who commit suicide; victims of domestic abuse; and the casualties of many other violent crimes. For some population groups, death by gunfire is the number one cause of death. It has been estimated that the lifetime medical costs of gun violence that occurred in the single year of 1994 was approximately \$2.3 billion,² a huge sum of money that could be better spent on solving other societal ills. Whether measured by mortality or morbidity statistics, by cost to society, or by sheer grief and disruption to the population, the toll of gun violence is too high, and it places the public's safety at unacceptable levels of risk. Interventions are needed to address this public health problem.

Although guns and gun violence have long been a part of American life,³ it is only in the past few decades that guns and gun-related injuries have come to be seen as a public health issue. In the past, gun-related homicides were viewed as a problem to be solved by law enforcement and the criminal justice system. Gun-related suicides were problems belonging to the discipline of mental health. The comparatively small numbers of unintended gun deaths were seen as within the province of hunter safety courses or other educational programs for accident prevention.

With the blossoming of the field of injury prevention within the disci-

pline of public health, a field that only came into general recognition in the 1970s, researchers, practitioners, and advocates began to recognize the toll that guns take on the public's health. Instead of having a fractionated view of gun deaths by separately considering homicides, suicides, and unintended gun deaths, articles began to appear in health journals that aggregated all gun deaths.⁴ When gun deaths were combined, based on the reasoning that all of the deaths involve the same vehicle (i.e., a gun), it was realized that guns form the second leading cause of injury death in the United States, surpassed only by motor vehicle-related deaths.⁵ As previously noted, for some segments of the population such as young African American males, gun-related deaths are the leading cause of deaths overall.⁶

The aggregation of all gun deaths, simple as that sounds, is an idea that is quintessential to the public health method of thought and therefore an idea that was dormant until those in the field of public health addressed their attention to guns as a health problem. Public health has a tradition of looking beyond the individuals inflicted with injury or disease. The physical and social environments in which human damage occurs, and, importantly, the vehicles or vectors that deliver the agents of injury or disease, are all considered part of the causation of morbidity and mortality and therefore possibly part of the solution to reducing the incidence of morbidity and mortality.

Public health researchers and practitioners recognize that changing the behaviors of people involved in the causation of injury and disease is a potentially effective approach but one that is difficult to achieve. Changing the man-made products that are associated with injury and disease can sometimes be more easily accomplished than changing the behaviors of those who use the products. This has been the case with automobiles. After many years of trying to raise the skills of the driving public, it was realized that cars and highways could be redesigned so that, when the foreseeable crash occurs, the vehicle occupants do not have to suffer fatal injuries. Seatbelts, energy-absorbing steering columns, air bags, and breakaway road signs have all helped to save hundreds of thousands of lives that otherwise would have been lost in crashes.⁷

Similarly, although gun injuries are often the result of troublesome behaviors involving rage, depression, and carelessness, and are compounded by social ills such as poverty and discrimination, there may be

interventions available to reduce gun-related deaths that do not focus solely on modifying individuals' behaviors. But most gun policies prior to the past two decades addressed individuals' behaviors, and often those individuals were already in possession of guns, resulting in reactive rather than preventive policy strategies. The initial recognition that guns were involved in a great many deaths in the United States fell short of the formulation of sound prevention policies to address this public health risk.

In 1980, an article was published in the *Journal of Public Health Policy* that suggested for the first time that gun policy might be more effective if it focused less on the behaviors of shooters and more on the product itself.⁸ The article (and other articles following it)⁹ postulated setting policy priorities categorized according to a fictional life span of a gun. The suggestion was made that the manufacture of a gun is analogous to its birth and that other milestones in the life span of the gun include its sale, possession, and use. Most policy was directed toward the end of this life span—the use of the gun. The suggestion was made that for policy to be most effective, with effectiveness being defined as producing a reduction in the incidence of gun-related deaths and injuries, the focus of policy should be shifted backward in time along this fictional life span. The most effective policies might be those that regulate the design and marketing of guns.

This public health perspective on gun violence prevention achieved rapid and widespread acceptance within the health and medical communities. *Healthy People*, the U.S. surgeon general's report on the nation's ten-year health goals to be achieved by 1990, recognized that firearms were claiming tens of thousands of lives each year. In discussing health protection strategies, the report stated: "Measures that could reduce the risk of firearm deaths and injuries range from encouraging safer storage and use to a ban on private ownership."¹⁰ The public health literature on the epidemiology of gun violence and the policies to reduce it blossomed in such leading medical journals as the *Journal of the American Medical Association* and the *New England Journal of Medicine*. The descriptive epidemiology of gun violence was fully explored, and some hypothesis-testing research on topics such as the risks of gun ownership was reported. Additionally, the new literature began to include scientific evaluations of policies designed to reduce the incidence of gun violence.

By 1988, James Mercy and Vernon Houk of the federal Centers for

Disease Control and Prevention (CDC), in a call for continued scientific investigation of firearms as a public health problem, delineated four steps needed “for further research and the development of effective strategies to prevent firearm injuries.”¹¹ These steps involved the determination of the size, characteristics, and cost of the problem; the determination of the number, type, and distribution of firearms in the United States; the further development of hypothesis-testing epidemiologic research; and the rigorous evaluation of regulations and other interventions that affect the risk of firearm injury. More studies followed these suggestions, and by the early 1990s a body of evidence existed indicating that firearms were a leading public health problem and that policies to address the problem were both needed and feasible.

Around the same time, however, a concerted attack against the public health community’s efforts to reduce gun violence was mounted. In a 1995 article by Don Kates and colleagues, published in the *Tennessee Law Review*, it was suggested that the public health literature on gun violence was created by academics who “prostitute scholarship, systematically inventing, misinterpreting, selecting, or otherwise manipulating data to validate preordained political conclusions.”¹² In addition, the National Rifle Association (NRA) was critical of efforts to frame gun violence as a public health issue and led the campaign to end gun violence prevention research funded by the CDC.¹³ In 1992, Congress established the National Center for Injury Prevention and Control (NCIPC) in the CDC with the mission to reduce injury-related morbidity and mortality. Unhappy with the findings of firearms-related research funded by the NCIPC, in 1995, when Republicans controlled the House of Representatives, the NRA tried to influence the congressional agenda on funding of the NCIPC. The NRA claimed, among other things, that the NCIPC’s injury prevention research was duplicative of that conducted by other federal agencies and driven by political goals. Although the NCIPC survived, in June 1996 the House Appropriations Committee approved an amendment that cut over two million dollars from the NCIPC’s budget, the exact amount the CDC spent on gun violence prevention research. The Senate ultimately restored the cut funding, but the funding was earmarked for other injury research. The CDC was also prohibited, and continues to be prohibited, from using federal funds “to advocate or promote gun control.” Clearly, the public health approach to gun violence

had triggered a powerful, negative response by organizations and individuals traditionally viewed as pro-gun.

The public health perspective we describe in this chapter recognizes gun injury as a significant source of morbidity and mortality and promotes policy interventions aimed at gun design and marketing as the preferred strategy for reducing gun death and injury. In the first section of the chapter, we use federal data to define the scope of gun injury and death in the United States and describe gun death trends over time. A review of analyses that consider the societal cost of gun violence concludes this measurement section. In the second section we then examine several interventions that focus on gun design, sale, and possession and explain the preference for interventions aimed at the design and marketing levels. In the concluding section to this chapter we briefly discuss the public health tools available for realizing the design and marketing interventions previously described.

Measuring the Toll of Gun Injury and Death

Epidemiology of Firearm Death and Injury

The epidemiology of firearm-related morbidity and mortality provides a foundation on which to consider gun violence prevention strategies. Data in this section were obtained from the National Center for Injury Control and Prevention (WISCARS, see note 1). Understanding the nature and extent of a problem is the first step in the public health approach to problem solving. The extent of this understanding is determined by the quality and scope of available data about the issue. Vital statistics records provide information about the number of gun homicides, suicides, and unintentional gun deaths that occur in the United States. The CDC offers online access to these data in aggregate. Basic demographic information about the deceased is available on the CDC's web site. With few exceptions, these demographic data are complete, providing a reliable, basic description of the population killed by gunfire. Vital statistics data provide no useful information about the guns used to kill¹⁴ and do not include information about perpetrators of gun homicides or, when applicable, unintentional gun deaths. National estimates

of nonfatal gun injuries are available through the CDC web site beginning with the year 2000. The data are the result of a national injury surveillance system that collects information from a sample of hospital emergency departments. These data are also limited in that they do not include information about the gun.

In an effort to address the shortcomings of existing surveillance efforts, the National Violent Injury Statistics System (NVISS) was developed in 1999. This initiative currently includes a small number of pilot sites, and there are plans to implement the system nationally. Once in place, NVISS will provide detailed information about the weapons used to commit violent injuries and offer researchers and policymakers valuable information for prevention initiatives.

In the following examination of gun-related death and injury we review trend data for a twenty-year period (1981–2000) and highlight information available from the latest government statistics. We frame the trend analysis using the most recent twenty years of available data in part because the beginning of the time period roughly coincides with the history of public health's involvement in this issue.

Between 1981 and 2000, more than 675,000 people were killed by gunfire in the United States. Approximately 83,000 of the people who lost their lives were younger than twenty years old. More than half of the 675,000 gun deaths were suicides, 42 percent were homicides, and 4 percent were unintentionally inflicted. The unacceptable toll of 675,000 deaths exists even though by the year 2000 the gun death rate in this country declined to its lowest point in over twenty years.

People of all ages, races, and both genders are represented in these numbers. However, the burden associated with gun deaths and injuries falls disproportionately on certain subgroups within the population. In 2000, young adults between the ages of twenty and twenty-four were killed by gunfire at a rate of 21 per 100,000—the highest rate among the age groups and more than double the total population rate of 10 per 100,000. Gun death rates among African Americans that year were twice the rate for whites. In 2000, men were six times more likely to die by gunfire than were women.

That African Americans suffer disproportionately high firearm death rates is a well-established and often cited fact of gun-related death and injury in the United States. In 2000, just as in 1981, firearm death rates among African Americans exceeded the rates for all other Americans. Total population data for these two years suggest a difference between

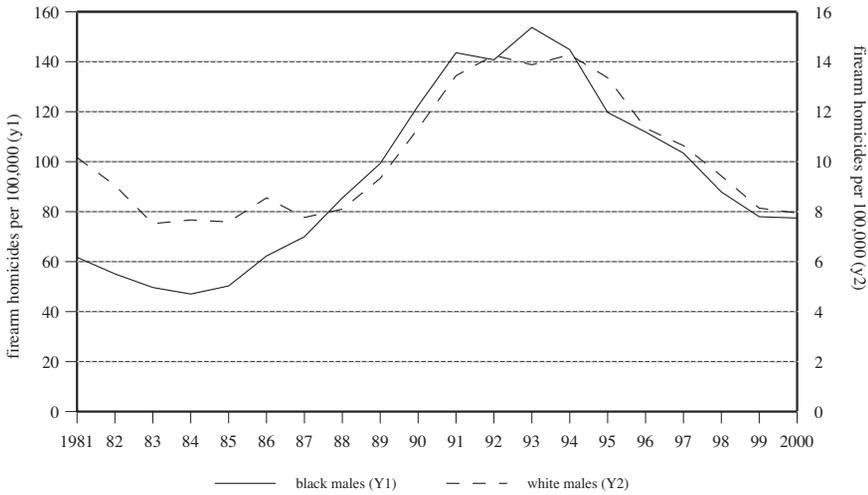


Fig. 1. Firearm homicide among 15–24 year old males, United States (1981–2000). Please note the difference in scale on the two axes. The y1 axis depicting the black male rate is 10 times larger than the y2 axis depicting the white male rate. (Data from CDC/National Center for Injury Prevention and Control.)

the rate of firearm death in 1981 (15 per 100,000) and 2000 (10 per 100,000), but that difference does not reveal changes in certain subpopulation statistics that signal a troubling development in firearm violence and further strengthen the case for public health involvement in prevention efforts.

The most significant changes over the past twenty years have been the sharp increases and subsequent decreases in gun deaths among adolescent and young adult males. Between 1985 and 1993, the rate of gun deaths among fifteen- to nineteen-year-old males more than doubled and the rate among twenty- to twenty-four-year-old males increased from 35 to 59 deaths per 100,000. Most of this change is attributable to rapid increases in gun homicide; however, gun suicide within these age groups also rose. While the upward trend in gun homicide among male youth is evident in each racial category, the numbers are most pronounced among African Americans. Gun homicides increased 250 percent between 1985 and 1993 among fifteen- to nineteen-year-old African American males and 180 percent among those between the ages of twenty and twenty-four. In 1993, African American males between the ages of fifteen and nineteen were being killed by guns at a rate of 131 per 100,000; among white males of the same age the rate was 13.

The high rates of 1993 marked the peak of this gun homicide trend.

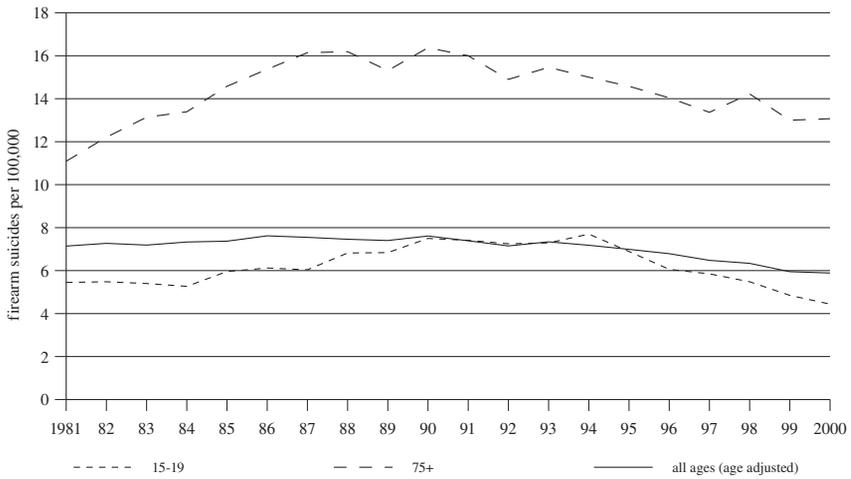


Fig. 2. Firearm suicide among select age groups, United States (1981–2000). (Data from CDC/National Center for Injury Prevention and Control.)

With these numbers, the realization that guns had become a threat to the lives of our youth began to take root, and the traditional public health commitment to vulnerable populations, such as youth, further strengthened the resolve of many public health professionals to commit resources to reversing this trend. In the years that followed the 1993 peak, gun homicide rates declined. While gun homicide rates remain lower in the current decade relative to the 1990s, 43 percent of all young African American males who died in 2000 were victims of gun homicide. Among young white males, 7 percent of all deaths in 2000 were the result of a firearm homicide.¹⁵

Other trends in gun mortality over the past twenty years are less well publicized. While suicide is often associated with teens, the highest rates of gun suicide in this country occur among our population's oldest. Between 1981 and 1990, gun suicide among those age seventy-five and older rose 46 percent. This increase was driven by the white male rate, which in 2000 numbered 36 per 100,000. By comparison, the gun suicide rate for the whole U.S. population was 6 per 100,000 that year. The rate of unintentional gun death over the past twenty years has steadily decreased. In 1981 the rate of unintentional gun death was 0.8 per 100,000; by 2000 the rate had declined to almost one-third of that num-

ber. Unintentional gun deaths, like gun homicides, are most numerous among young males.

Nonfatal gunshot wounds treated in emergency departments, another important component of the epidemiologic data, were estimated to number 75,000 in 2000. For every gun homicide, an estimated four people are shot during nonfatal gun assaults; for every five people who commit suicide with a gun, one person attempts suicide with a gun and survives; and for every unintentional gun death, another thirty people are estimated to survive unintentional gun shootings.

An argument is sometimes made with respect to gun suicides and homicides that, if the gun had not been available, a different weapon or method would have been used with the same result. The research, though, does not support this position, and, in fact, strong evidence exists indicating that the choice of weapon affects the outcome of both self-inflicted and intentional violence.¹⁶ Suicidal persons choose a method that is both acceptable to them and available. If the method of choice is not available, substitution of another means of killing themselves sometimes, but not always, occurs, but the substituted method may be less likely to result in a completed suicide.¹⁷ Attempted suicide by a firearm has a very high case fatality rate, meaning that most attempts will result in death, whereas attempts of suicide by other means have a substantially lower case fatality rate.¹⁸ For example, ingestion of poison may leave time for lifesaving medical intervention, but a gunshot to the head is often immediately fatal. With respect to homicides, guns also make it easier to kill, turning, for example, what might have been a fistfight between angry youth into a homicide irrespective of intent to kill.¹⁹

The previous accounting of the death and injury associated with firearms provides insight into the cost of an armed society. The toll of gunfire highlights the need for the complementary problem-solving

TABLE 1. Gun Deaths and Nonfatal Gun Injuries in the United States, 2000

	Gun Deaths	Nonfatal Gun Injuries
Assault	11,071	49,431
Self-inflicted	16,586	3,016
Unintentional	776	23,237

tools and preventive orientation of public health in order to realize a future where guns are far less prominent vehicles of human suffering.

Economic Costs of Gun Violence

The economic burden of gun violence entails far more than the cost of victims' medical expenses or lost productivity, which represent only a fraction of the total societal cost.²⁰ The true burden of gun violence also reflects the public and private expenditures taken to reduce the risk of gun injury and death and includes the fear of victimization that remains even after risk-reducing efforts have been made. Society as a whole pays through a reduced standard of living for everyone.

The most obvious expenditure to reduce the risk of gun injury and death is tax increases to prevent gun-related crime. Taxes pay for enhanced security—such as metal detectors and security personnel—at schools, airports, and other public places, amounting to hundreds of millions of dollars per year. Taxes pay to protect law enforcement, including as much as one hundred million dollars each year on bulletproof vests alone. Taxes also pay for prosecuting and punishing criminal offenders. Assaults in which a gun is used tend to be more deadly than other assaults, and homicides are more expensive to investigate, prosecute, and punish than robberies and assaults. It has been estimated that gun violence increases the costs of administering the criminal justice system by over two billion dollars a year.

Gun violence also affects where people choose to live, work, attend school, and travel. Urban flight has been shown to be sensitive to homicide rates, and guns increase the likelihood that a violent crime will turn deadly. Many people would rather live in a safe neighborhood than enjoy an easy commute or access to urban cultural amenities. Those who cannot afford to move may take precautions such as sleeping on the floor to avoid bullets coming through windows or spending as little time as possible outside, further reducing their quality of life.

One way to translate the reduction in the standard of living caused by the threat of gun injury and death into specific dollar estimates is through the “willingness-to-pay” approach. Specifically, what would people in the United States be willing to pay to reduce the risk of gun-related

injury? The willingness-to-pay approach has been used in public health to evaluate a variety of public health initiatives. Compared with the cost-of-injury approach, which looks at the traditional costs to victims of gun violence such as medical expenses and lost productivity, the willingness-to-pay approach looks at more difficult-to-measure societal costs from the threat of gun violence and the expenditures to reduce the risk of gun-related injury.

Willingness-to-pay can be estimated through the contingent valuation (CV) method, which infers what people are willing to pay for goods not bought and sold on the market (e.g., improved health and safety) using hypothetical market scenarios. Using the CV method, as part of a 1998 nationally representative telephone survey of 1,204 adults, respondents were asked if they would be willing to pay an additional fifty, one hundred, or two hundred dollars in taxes each year for a program that would make it more difficult for criminals and delinquents to obtain guns if that program would reduce gun injuries by 30 percent. Because the amount of the tax increase presented to each respondent was determined randomly, about one-third of the sample provided answers for each of the three dollar amounts. Depending on whether the response to this question was positive or negative, a follow-up question was asked, either doubling or halving (respectively) the initial dollar amount.

Analyzing the results, Cook and Ludwig found that 76 percent of respondents would pay an additional fifty dollars of taxes for a program to reduce crime-related gunshot injuries by 30 percent, 69 percent an additional one hundred dollars, and 64 percent an additional two hundred dollars. By extrapolating the data to all U.S. households, the researchers determined that people would be willing to pay more than twenty billion dollars in increased taxes to reduce crime-related gun injuries by 30 percent.

A Public Health Perspective on Strategies to Reduce Gun Injury

We suggested earlier that, from a public health perspective, the most effective strategies to reduce gun injury and death are those that target the design and marketing of a gun—at the birth of the fictional life span. This next section explores that proposition in more detail, raising some of the main issues that arise along the different stages of a gun's life.

Issues regarding Design

Two of the principles that help define the discipline of public health are as follows: (1) preventing damage to humans by injury and disease is preferable to repairing damage after it has occurred; and (2) prevention is best accomplished by protection that is provided automatically on a population basis and does not require each individual to always act carefully. This is why we fluoridate water supplies to reduce the incidence of dental caries rather than ask each individual to remember to consume a certain amount of fluorine each day. We regulate the design of products for safety, such as specifying certain dimensions for baby cribs to reduce the risk to infants of strangulation rather than asking parents to choose their cribs carefully and always to monitor their sleeping babies. Applying this approach to the area of gun violence, it is considered more effective and therefore preferable to address the design of guns before they get into the hands of millions of people rather than rely upon our ability to control the behaviors of those millions so that they always act prudently once the guns are in their hands.

Safe design can be mandated by government regulations. For most consumer products, the nation's Consumer Product Safety Commission (CPSC) has the responsibility to protect the public from unsafe designs. But regarding guns, the CPSC has been expressly forbidden by Congress to regulate design safety.²¹ In fact, no federal agency comprehensively regulates the safe design of firearms, despite the fact that guns are the second leading cause of injury deaths in the United States. Guns, and particularly handguns, could be designed more safely by the use of existing, inexpensive technologies, resulting in a saving of lives. Gun manufacturers have been reluctant to use some of these technologies and have been adamant in their opposition to any regulations that would require safer guns.²²

Two examples of existing technologies that would likely save lives if they were used uniformly on all handguns are loaded chamber indicators and magazine safety devices.²³ A loaded chamber indicator lets the person holding a gun know whether there is a bullet in the chamber, just like a camera lets the user know if it is loaded with film. Its purpose is to help prevent an unintentional discharge of the gun, which has been known to result in death. A magazine safety prevents a pistol from being fired if the

magazine or clip, in which the ammunition is stored, has been removed from the pistol. Again, deaths have resulted from people believing a gun was unloaded and then pulling the trigger. A magazine safety is important because some people think that, once they remove the magazine, all of the ammunition has been removed; however, often a bullet remains in the chamber of the gun, and if the trigger is pulled on a pistol without a magazine safety, that bullet will be discharged. In a 1997 nationally representative survey, over one-third of respondents either erroneously believed that a pistol could not be fired with its ammunition magazine removed (20.3 percent) or did not know (14.5 percent). Of this one-third, 28 percent lived in homes with guns.²⁴

The technologies for loaded chamber indicators and magazine safeties have existed since the early twentieth century, and the cost of these safety devices is minimal.²⁵ But the vast majority of pistol models presently being sold do not include these safety devices.²⁶ Some manufacturers provide the safety devices on some of their models but not others. This is akin to a car manufacturer offering seatbelts on some models but not others—a behavior that would be illegal, due to federal safety regulations for motor vehicles.

Another important design feature that would materially enhance the safety of guns is the use of technology that discriminates between authorized users of a gun and unauthorized users.²⁷ Every year, many die from homicides, suicides, or unintended deaths when a gun is operated by an unauthorized user. This could be a criminal who stole a gun or bought a stolen gun from another, a depressed teenager using the gun for suicide, or a curious young child who does not understand the dangers presented by guns. Many of these deaths could be averted if the gun was made so that it was personalized or operable only by certain authorized users. Personalization of guns can be accomplished by the use of locks built into the gun itself or by technologies that recognize the biometrics of the authorized users.²⁸ A few gun makers, such as Taurus, now offer some forms of personalization based on internal locking devices,²⁹ but most newly made handguns are as easily operated by a thief or young child as by the owner.

Cook and Ludwig analyzed the cost-effectiveness of personalized technology and found that the benefits associated with requiring personalized technology on new guns should more than outweigh the costs.³⁰

Issues regarding Sales

While the preferred intervention from a public health perspective is to produce a safer product, interventions aimed further along the life span of a gun—such as at the point of sale—can also help to reduce injuries and death from gunfire. To understand the potential of interventions at this level, it is first important to understand a little about the market for guns.

In the mid-1990s, it was estimated that 200 million guns were privately owned in the United States, including more than 60 million handguns. Each year, about 4.5 million new guns and about the same number of used guns are sold, and about five hundred thousand guns are stolen. The gun market involves sales through federally licensed dealers (primary market) or through largely unregulated transactions between private individuals (secondary market). About 60 percent of all transactions (including new and used guns) are conducted through the primary market.³¹

In 2001, there were almost sixty-four thousand federally licensed gun dealers.³² The license allows the dealer to buy an unlimited number of guns from manufacturers, distributors, and dealers in other states. Licensed gun dealers must keep records of gun sales, conduct background checks on prospective buyers, and allow inspections by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF).³³

Licensed dealers are an important source of guns for criminals and youth.³⁴ One study that looked at the willingness of gun dealers to participate in illegal straw purchases (i.e., a transaction where the gun dealer sells a gun to an authorized buyer knowing that the buyer intends to immediately transfer the gun to a prohibited user) found that more than half of the gun dealers were willing to sell a handgun under a straw purchase scheme.³⁵ Although other studies looking at crime gun traces suggest that the majority of dealers are law abiding,³⁶ only a few corrupt dealers can divert large numbers of guns through off-the-record sales to gun traffickers.³⁷ Even law-abiding dealers can unwittingly help prohibited users obtain guns if they unknowingly engage in a straw purchase.

In the secondary market, guns are sold and traded between unlicensed individuals. These transactions can be legal or illegal and may involve family members, friends, drug dealers, or gun traffickers. Most criminals

and youth obtain their guns in the secondary market because, under federal law, unlicensed sellers and private individuals do not have to conduct background checks or keep records of the transaction. Although some states do regulate the secondary market, enforcement of these laws is believed to be minimal.

EFFECTIVENESS OF CONTROLLING SALES BY LICENSED DEALERS

The most far-reaching intervention at the dealer level is to establish an outright ban on the sale of a particular type of gun, usually those that are considered the most dangerous and with the least utility. One study found that Maryland's ban of so-called Saturday Night Special handguns reduced gun homicide rates by 6.8 percent to 11.5 percent, amounting to forty fewer homicides per year than would have been expected without the ban.³⁸ The short-term effect of the 1994 federal law banning certain assault weapons and large-capacity magazines may have slightly reduced gun homicides even though the potential effect of the ban is limited because assault weapons are used in relatively few crimes.³⁹

More commonly, however, the goal at the dealer level is to prevent guns from ending up in the hands of criminals, youths, and other prohibited users. But there is no assurance that once a gun is sold to an authorized user it will remain in legitimate hands. For example, the most common and most lethal method for adolescents in the United States to commit suicide is shooting themselves with a gun, and often the source of those guns is the victim's home or the home of a relative or friend.⁴⁰ Many guns are also stolen from residences. In a 2001 nationally representative survey, 12 percent of the respondents who personally owned a gun had at least one gun stolen from them.⁴¹ Government studies also show that theft from retail outlets as well as from residences is an important source of guns for criminals.⁴² Thus, even if all guns were sold only to authorized users, there would still be gun injury and death related to those sales, although the level of gun violence under such a scenario would presumably be lower than current rates.

Despite these limitations, controlling the sale of guns at the dealer level can make it more difficult for criminals and other prohibited users to obtain guns, potentially reducing gun injury and death. One way to curtail the flow of guns to prohibited users is to limit the number of guns a potential buyer can purchase. Three states (California, Maryland, and

Virginia) prohibit individuals from purchasing more than one handgun and/or other gun within a thirty-day period. Without these so-called one-gun-a-month laws, a corrupt buyer could legally purchase from a gun dealer an unlimited amount of guns and illegally resell them to prohibited users. In an evaluation of Virginia's one-gun-a-month law, Weil and Knox documented that, relative to other southeastern states, guns first sold in Virginia were less likely to be recovered in crimes following the law's effective date, suggesting that the restriction disrupted the illegal interstate transfer of guns.⁴³

Another way to analyze the potential of interventions aimed at the dealer level is to measure the association between the denial of handgun purchases and the risk of subsequent criminal activity. A California study comparing handgun purchasers who had a felony arrest with those who were denied a purchase because of a felony conviction found that those who were allowed to purchase a gun were at a greater risk for subsequent criminal offenses involving a gun or violence.⁴⁴ A similar study found that denial of a handgun purchase to potential buyers with a violent misdemeanor conviction was also associated with a reduced risk of subsequent arrest for a violent or gun-related crime.⁴⁵

More generally, restraints on sales from licensed dealers should also increase prices in the secondary market, deterring some criminals and youth from buying guns in the secondary market as well.⁴⁶

CHALLENGES TO REDUCING GUN VIOLENCE THROUGH SALES LEVEL INTERVENTIONS

Although interventions aimed at retail sales are promising, there are several challenges that limit their potential. The major challenge is the thriving and largely unregulated secondary market. A prospective buyer who cannot buy a gun from a licensed dealer can look to many other potential sources.

Certain federal laws can also limit the effectiveness of interventions on the dealer level. Licensing and registration have been suggested as interventions that could reduce gun injury and death, although some disagree with this approach.⁴⁷ In general, licensing requires that the prospective gun buyer obtain a license before purchasing a gun. Licensing can entail background checks, gun safety training, and other requirements, potentially weeding out high-risk individuals. Registration gen-

erally requires a gun owner to provide his or her name and contact information, the serial number of the gun, and the gun's description to a central authority that stores the information. Registration makes tracing the ownership of guns recovered in crimes easier, potentially dissuading some legitimate owners from transferring their weapons to prohibited users. An analysis of the relationship between state licensing and/or registration laws and guns recovered in crime suggests that the combination of licensing and registration makes it more difficult for criminals and youths to obtain guns.⁴⁸ Only a few states have both laws, and because the Firearms Owners' Protection Act of 1986 prohibits a national gun registry,⁴⁹ this intervention cannot be implemented on a national level without a change in current law.

The Firearms Owners' Protection Act also undermines the federal government's ability to assure dealer compliance with federal gun laws by limiting warrantless inspections of a dealer to one per year, by weakening the penalties for most recording-keeping offenses from felonies to misdemeanors, and by establishing high standards of proof for suspected violations of federal gun law.

Another challenge is implementation. In fiscal year 1998, there were approximately two hundred full-time equivalent field inspectors for tens of thousands of Federal Firearms Licensees (FFLs). Using 1998 data and assuming a licensee population of one hundred thousand, the ATF estimated that it would take twenty-six hundred full-time inspectors to make one annual inspection of all licensed retail dealers. In 2000 and 2001, the percent of FFLs inspected was less than 4 percent (3.5 percent and 3.6 percent, respectively). Thus, even if federal law allowed the ATF more than one warrantless search per year, the ATF does not even have the personnel to conduct one search of every FFL each year because of too few ATF field inspectors. Another example of an implementation problem concerns the Brady Handgun Violence Prevention Act of 1993 (the Brady Act). A government review found that the National Instant Criminal Background Check System Index database used for conducting background checks has relatively few records for most of the categories that would disqualify prospective gun purchasers (e.g., mentally incompetent adjudications, fugitive status, restraining orders), thus undermining the law's potential effectiveness.

None of these challenges are insurmountable—for example, all sales on the secondary market could be regulated, federal law could be

changed to allow ATF more flexibility, and Congress could allocate sufficient resources to ensure that existing laws can be fully implemented.

A PUBLIC HEALTH APPROACH TO CONTROLLING SALES:
FOCUSING ON MANUFACTURERS

If preventing the retail sale of guns to prohibited users can limit the availability of guns to criminals and youths and reduce gun injury and death, the question arises of what are the best ways to accomplish that goal. From a public health perspective, an intervention aimed at tens of thousands of dealers is more difficult to implement than an intervention aimed at the relatively few manufacturers. Gun manufacturers could be required to engage in practices that would make it nearly impossible or extremely difficult for corrupt or irresponsible dealers to stay in business—such as not selling their products to dealers who fail to implement adequate security measures to prevent theft or weed out corrupt employees or who conduct business at gun shows where background checks are not performed on all sales. Manufacturers in other industries follow their products throughout the distribution chain to the point of sale.⁵⁹ There is no reason why gun manufacturers could not do the same.

Issues regarding Possession

Often the most difficult place to intervene to reduce injuries caused by a consumer product from the standpoint of effectiveness is with the user of the product—at the end of the product's life span. Teaching millions of individuals to use a product safely tends to be far less effective than designing a safer product. Over time, the benefits of educational programs aimed at changing behavior tend to wane and people return to prior unsafe behavior. But once a product is designed safely, barring manufacturer defects, it should remain safe for the duration of its use. A safe design also protects the user from a momentary lapse in attention, whether while driving a car or handling a product like a gun. Because guns are so lethal, safe design becomes even more important. The fact that it is difficult to change people's behavior does not mean it cannot be

done or that it is not an important component of public health initiatives. For example, child access prevention laws that carry felony penalties may encourage some people to store their guns safely.⁵¹ But public health seeks to advance the interventions that are most effective, and the most effective way to reduce injury caused by consumer products is to produce a safe product.

STORAGE PRACTICES

A gun in the home should be stored locked and unloaded, with the ammunition stored separately in a different locked location, making the gun inaccessible to children, suicidal adolescents, burglars, and other prohibited users. But survey findings consistently demonstrate that many gun owners store their guns unsafely, often both loaded and unlocked and accessible to children. An estimated one in three handguns—over 20 million—as well as one in six long guns are stored loaded and unlocked.⁵² National survey data reveal that, among homes with children and guns, 9 percent kept guns both loaded and unlocked and 4 percent kept guns unloaded, unlocked, and stored with ammunition.⁵³ Thus, 13 percent of these homes—about 1.4 million homes where 2.6 million children resided—stored guns unsafely. There is reason to suspect that the number of guns stored unsafely may be even higher because the household member who responds to the survey may not be the gun owner.⁵⁴

Several studies suggest that firearms training is not necessarily associated with safe storage practices and may be associated with unsafe practices.⁵⁵ More favorable results were reported in a study evaluating a community-based program that used a high-profile, multimedia, public education campaign; individually tailored gun safety counseling; and a gun lock distribution component.⁵⁶ The findings suggest, though, that gun safety training alone does not promote safer storage practices and that little is known about the long-term effect of the intervention or whether this program would show similar results in a different population.

MISCONCEPTIONS OF RISK

Many gun owners—especially handgun owners—report that they own a gun for protection. This concern for protection may account for unsafe

storage practices because some people may want easy access to their weapon.⁵⁷ But rather than offering protection as some have claimed, several studies evaluating the protective effect of home ownership found that keeping a gun in the home increases the risk of gun-related homicide, suicide, and fatal unintentional injury. For example, using a matched case-control design, Wiebe found that having a gun in the home almost quadrupled the risk of a fatal unintentional shooting,⁵⁸ increased the risk of gun suicide by nearly seventeen times, and raised the risk of gun homicide by 72 percent.⁵⁹ Wiebe's findings support previous research that suggests that, instead of providing protection, a gun in the home increases the risk of death⁶⁰ and support other studies finding an association between handgun purchases and an increased risk of dying from violence.⁶¹

Many parents, including those who own guns, assume that their child will behave safely with guns. Webster and colleagues found that, in a convenience sample from three pediatric practices in Maryland, almost half of the gun owners (46 percent) believed that children age six or younger could distinguish between a real and toy gun compared to 10 percent of non-gun owners.⁶² Fourteen percent of gun owners also believed that children under twelve years old could be trusted with a loaded gun compared to 3 percent of non-gun owners. In a survey of parents of children between the ages of four and twelve at selected pediatric ambulatory care centers in Atlanta, Farah, Simon, and Kellermann found that 74 percent of gun-owning parents and 52 percent of non-gun-owning parents believed that their child could distinguish between a real and toy gun.⁶³ A large percentage of parents trusted their child with a loaded gun, including 35 percent of the parents who kept at least one gun loaded, 23 percent of gun-owning parents, and 14 percent of non-gun-owning parents. A significant portion of parents (14 percent of gun owners and 10 percent of non-gun owners) trusted their child between the age of four and seven with a loaded gun.

BEHAVIORAL APPROACHES

Although some parents may believe that telling their child not to play with guns will prevent injury,⁶⁴ educational approaches do not appear to be effective. Hardy and colleagues found that, in a matched case-control

study of four- to six-year-olds in two urban daycare centers, an intervention that included a thirty-minute presentation and instruction from a police officer had no effect on modifying the children's gun-playing behavior.⁶⁵ In a later randomized control study of four- to seven-year-olds involving a more intensive five-day gun safety program, Hardy also found that the intervention did not affect the likelihood that a child would play with a gun.⁶⁶ Another study evaluating the effectiveness of two gun safety programs—the NRA's Eddie Eagle GunSafe Program (mainly educational) and a behavioral skills training program (BTM) (instruction, modeling, rehearsal, and praise/corrective feedback)—found that, while both programs effectively taught the four- and five-year-old participants to reproduce verbally gun-safety skills, neither program effectively taught the children to use those skills in a simulated situation.⁶⁷ With respect to the children exposed to the Eddie Eagle GunSafe Program, they also could not demonstrate the gun-safety skills in a role-play scenario, leading the authors to conclude that education alone does not ensure that the child can actually perform the skills. Even gun safety instruction targeting older children may not work. In a study to determine how boys between the ages of eight and twelve reacted when they discovered a real handgun while playing, more than 90 percent of the boys who handled the gun or pulled the trigger had received some form of gun safety instruction.⁶⁸

With the apparent misconception about the risks of keeping a gun in the home and the effectiveness of behavior-oriented approaches, it is not surprising that each year a large number of unintentional shootings occur. Most occur when someone—including a child—has been “playing” with a gun or has been involved in routine activities such as cleaning, loading, and handling the gun. For example, in a California study of fatal unintentional shootings among children, the most common circumstance surrounding the shooting was when a child had been playing with a gun.⁶⁹ In another study examining both fatal and nonfatal unintentional shootings of youth (ages zero to nineteen) over a six-year period, where the circumstances of the injury were known, the victim had been playing with a gun 57 percent of the time.⁷⁰ And in a national study of people treated in U.S. hospital emergency departments, where data were available, about half of the injuries involved routine gun-related activities and an additional 8 percent occurred when someone was playing with a gun.⁷¹

The research is no more encouraging with respect to adolescent suicides. Several case-control studies have found a significant association between the presence of a gun in the home and the risk of adolescent suicide.⁷² Because of this risk, experts recommend that guns be removed from the homes of suicidal adolescents.⁷³ Yet, one study found that, even after a suicide attempt, 23 percent of the families kept a firearm with ammunition in the home.⁷⁴ In other studies, even some parents of suicidal adolescents and adolescents at risk of suicide, who were counseled to remove guns from their homes or to lock them up, did not do so.⁷⁵

Conclusion

The commitment of public health is to determine, through scientific investigation, the risks to the public's well-being and the best ways to reduce those risks. Once the risks and the effective prevention strategies are identified, public health seeks to implement those strategies through policies, educational programs, and advocacy. Some risks are easier to identify than others. For example, it took substantial efforts over a long period of time to prove the causal connections between tobacco products and certain diseases such as lung cancer. With guns, the causal connection between being shot and being at risk of death is readily apparent. The design interventions discussed in this chapter address the undisputed causal connection between guns (a manufactured product designed to inflict injury) and gun injury independent of a relationship between population level availability and violence. An individual with a bullet wound suffers that injury, on the most basic level, as a result of a gun having been successfully discharged. Similarly, distribution strategies are designed to limit gun access to agreed-upon high-risk users, such as convicted felons and youth, irrespective of general availability. The proper intervention for reducing the nation's toll of gun-related deaths, however, is a subject of considerable controversy. There are some (generally not working in the field of public health) who argue that more guns would mean fewer gun-related deaths.⁷⁶ Although beyond the scope of this chapter, this assertion has been met with substantial criticism, mostly regarding the research methodology used in reaching this conclusion.⁷⁷ The weight of public health research finds that the high prevalence of guns in the United States is associated with this country's

high gun death rate⁷⁸ and that changing the current practices of gun design and distribution could likely reduce the gun violence problems we face.

How can the current practices of gun design and distribution be changed? Here too the discipline of public health can provide lessons of success. Several decades ago, it was recognized that changes in motor vehicle design would decrease the unacceptable number of highway fatalities occurring in the United States. Specifically, the introduction of air bags into cars was believed to be able to reduce the number of car crash deaths by thousands per year. But the effort to get air bags in cars through legislation and regulation was unsuccessful. Car makers fought government mandates for air bags so fiercely that in 1983 the U.S. Supreme Court stated, "For nearly a decade, the automobile industry waged the regulatory equivalent of war against the airbag."⁷⁹

Ultimately, litigation played a strong role in introducing air bags into cars. Public health advocates urged trial lawyers to sue car makers for their failure to offer existing, lifesaving technology to the public. In response to this call for action, a lawsuit was brought against Ford Motor Company for its failure to offer an air bag as an option to a young woman who was seriously injured in a frontal crash. Ten days into the trial of the case, Ford settled it by the payment of \$1.8 million.⁸⁰ Many air bag lawsuits followed, and then Ford began to offer air bags in its new cars as an option.

Whereas the strong automotive industry had been able to thwart legislation and regulation to protect the public's health, it could not so easily do so regarding litigation. Similarly, the pro-gun-lobbying forces have been able to control, to a great extent, gun legislation and regulation at the federal and state levels. It is for this reason that public health practitioners and advocates turned to litigation as a tool for reducing the toll of gun violence on this nation's well-being.