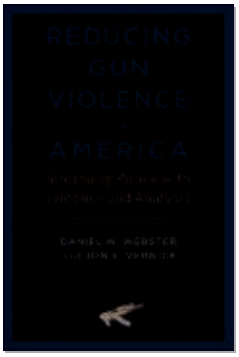
Reducing Gun Violence in America

Webster, Daniel W., Vernick, Jon S., Bloomberg, Michael R.



Published by Johns Hopkins University Press

13

Personalized Guns

Using Technology to Save Lives

Stephen P. Teret and Adam D. Mernit

Gunfire took the lives of 31,672 Americans in 2010.[1] Death by gunfire occurs in homes, workplaces, shopping malls, churches, schools, and on the streets, and to Americans of all ages. Often, when possible solutions to this compelling public health problem are considered, conversations focus on troubled individuals who are at risk for becoming shooters, mental health interventions for these individuals, and securing the safety of vulnerable places such as schools. Little attention is paid to modifying the gun itself, which is the vehicle that causes the human damage, such as changing the design of guns so that they are inoperable by unauthorized users—that is, making all guns personalized. But product-oriented interventions have been highly effective with other public health problems, such as motor vehicle–related deaths.[2] In fact, the impressive reductions in highway fatalities are more attributable to

Stephen P. Teret, JD, MPH, is a professor in the Department of Health Policy and Management and director of the Center for Law and the Public's Health at the Johns Hopkins Bloomberg School of Public Health. Adam D. Mernit is an undergraduate senior in public health studies at Johns Hopkins University.

changes in the design of cars than to enhancing the driving skill of hundreds of millions of motorists.

This essay explores the topic of personalized guns, sometimes called smart guns or childproof guns. The definition we use for a personalized firearm is a gun that, by design integral to the gun itself as opposed to an external locking device, can be fired only by the authorized user or users. Our argument is that if all newly manufactured guns were personalized guns, there would be a meaningful reduction in gun deaths. This is not to imply that other efforts to regulate the sale, carrying, and use of guns should be ignored. Rather, changing the design of guns so that they are personalized would complement other policy interventions to reduce gun violence.

The Need for Personalized Guns

Of the 31,672 persons killed by firearms in 2010 in the United States, 61 percent were suicides, 35 percent were homicides, and most of the remaining deaths were unintentional or accidental deaths.[3] How many of these gun deaths would be averted if guns were personalized is difficult to assess, but it is reasonable to assume that there would be substantial saving of lives.

Perhaps the most understandable saving of lives would occur in the unintentional or accidental category of gun deaths, which in 2010 accounted for 606 fatalities, 9 percent of which were of young people aged zero to 19 years.[4] Although these unintended deaths are far fewer in number than gun suicides and homicides, when they occur to children, they are seen as particularly tragic. Children find guns in their homes, often handguns kept loaded for protection, and are able to fire them, shooting themselves, their siblings, and playmates. Wintemute et al.[5] examined the circumstances of 88 deaths involving children shooting children and concluded that changes in gun design, particularly of handguns, would be useful in preventing such deaths.

The National Rifle Association (NRA) has long argued that the way to prevent accidental gun deaths of children is to educate them about gun safety. In pursuit of this goal, the NRA has developed its Eddie Eagle GunSafe Program, for children in pre-K through third grades. It states that since the inception of the program, 18 million children have been trained.[6] The effectiveness of training young children in gun safety has been studied, and doubt has been cast as to whether such training is useful.[7]

Vernick et al.[8] studied a series (N=117) of unintentional, undetermined intent, and negligent homicide gun deaths that occurred in Maryland and Milwaukee County, Wisconsin, from 1991 to 1998. The purpose of the study was to assess what portion of these deaths would likely have been prevented if the guns used were personalized and, separately, if the guns had other safety devices (loaded chamber indicators and magazine disconnect devices). Most (81%) of these deaths occurred with a handgun, roughly half being revolvers and half being pistols. Using specific criteria to address preventability, the researchers determined that 37 percent of the deaths would have been preventable if the guns involved were personalized.

Unintentional deaths are not the only type of gun death that could be affected by a change to personalized guns. Children and teenagers also use guns found in the home to commit suicide. In 2010, 748 youths between the ages of 10 and 19 committed suicide with a firearm.[9] Such deaths, often stemming from depression, would be less likely if the gun in the home were inoperable by the young person. Some have argued that the depressed teenager would just find another means of committing suicide, but other forms of suicide attempts (e.g., poisoning) have lower case fatality rates. The lethality of self-inflicted gunshots leaves little opportunity for medical intervention.

Stolen guns are used in crime and therefore figure prominently in homicides and assaultive injuries involving firearms. Cook and colleagues,[10] using data from the National Crime Victimization Survey (NCVS), noted that there are nearly 350,000 incidents of firearm theft from private citizens annually. Further, there are approximately 1.5 firearms taken during each of these burglaries, resulting in about half a million gun thefts each year. NCVS and FBI data show that the majority of the guns stolen are handguns.[11] These guns would be inoperable to criminals if they had been made as personalized guns.

A Brief History of Personalized Guns

Danger from the unauthorized use of guns has long been recognized. Roy G. Jinks's *History of Smith & Wesson*[12] tells the story of D. B. Wesson, one of the founding partners of the renowned gun-making firm, learning in the early 1880s of an incident in which a child was hurt while playing with a Smith & Wesson revolver that discharged. Wesson asked his son, Joe, to design a revolver that a young child could not operate, and in 1886, Smith & Wesson began to sell a gun it believed to be childproof. The revolver employed what is now

known as a grip safety—a metallic lever on the back of the gun that must be pressed inward in order for the gun to fire. In its marketing materials for this gun, Smith & Wesson stated that "no ordinary child under eight can possibly discharge it." The concern that Smith & Wesson had for the safety of children more than 125 years ago has not carried through to present times. Smith & Wesson stopped using its childproofing technology many decades ago, and neither it nor other leading gun makers have developed and put into widespread operation newer technologies to protect the public from unauthorized gun use.

Ninety years later, however, a minor gun maker was still concerned with the danger of unauthorized use; he applied for and received a U.S. patent for a combination lock built into a carbine, a long gun. The U.S. patent was issued to Gerald Fox on May 29, 1973, Patent Number 3,735,519. The Fox Carbine featured a three-digit combination lock. The advertisement for this gun noted that "accidental and unauthorized firing is prevented by a patented, built-in combination lock safety."[13]

During the 1980s and 1990s, there was increasing interest in personalizing guns. In 1984, a Massachusetts inventor was granted a patent for a device called a "personalized safety method and apparatus for a hand held weapon." It was described as "responsive to the palm or fingerprint of one or more individuals. The safety device is activated by heat sensed when the device is hand held. The pattern of the palm or fingerprint is stored in the firearm and must match the user's in order for the blocking safety mechanism to allow the weapon to fire.[14] The renewed attention to gun personalization coincided both with advancements in electronic technologies and highly publicized mass shootings.

In 1992, faculty at the Johns Hopkins Bloomberg School of Public Health, with a $2,000 grant, commissioned a team of undergraduate students at the university's School of Engineering to create a prototype of a personalized handgun. Using an existing revolver purchased for this purpose, the students employed touch memory technology, which worked through contact between a semiconductor memory chip and a reader embedded within the grip of the gun. The chip stored a serial number, which was placed on a ring worn by the authorized gun user. When the ring came in contact with the reader on the gun, an electronic current moved a blocking mechanism that kept the gun from being able to fire.

Other technologies, such as radio frequency identification and magnetic encoding, were used in experiments to develop a personalized gun.

On May 12, 2000, President Bill Clinton announced that the United States Justice Department, through its National Institute of Justice, would provide two grants of $300,000 each to Smith & Wesson and FN Manufacturing, Inc., for research and development of personalized gun technology. The press release from the White House stated: "Smart gun technologies have the potential to limit a gun's use to its proper adult owner—and could prevent accidental shooting deaths of children, deter gun theft, and stop criminals from seizing and using the guns of police officers against them."[15]

Work by Colt's on personalized, or smart gun, technology resulted in a prototype handgun that used radio frequency identification. Colt's viewed its smart gun as a major growth prospect for the corporation. But Colt's did not want the progress it was making on personalized guns to be widely known. Colt's formed a new company, iColt, to pursue the technology, and it hoped for additional funding from the federal government. In June 1999, a memo was prepared by Colt's, noting that remarkable progress was being made on personalization technology. The memo further stated that "Colt's is working in Washington to help put $20 million to $40 million in the federal budget for research on 'smart gun' technology. Depending on how the press reports the current state of the 'smart gun,' it could be perceived by Congress that further research dollars are not needed." This memo was uncovered during discovery in a lawsuit against Colt's.[16] Shortly after the memo was written, and during substantial litigation against Colt's and other gun makers, Colt's discontinued its work on personalized guns, and so did most of the major manufacturers in the gun industry.

Modern Personalized Gun Technology

Personalized firearms presently exist. Armatix GmbH, a German company, has produced the iP1 Pistol, which is a personalized .22 caliber handgun that works like a conventional pistol except that it is digital and battery operated, which allows for software flexibility depending on the needs of the consumer.[17] The handgun is sold with an Active RFID Wrist Watch (designated by Armatix as iW1), which uses radio frequencies to activate the handgun, making it operable. The watch uses a personal identification number (PIN) that must be entered in order to unlock the electromechanical firing pin lock, making the gun operable by the owner.[18] Microchips in both the iW1 watch and the iP1 pistol communicate with each other. If the watch is not within a specified distance

from the pistol, the gun is inoperable, rendering it useless. If the gun is first unlocked by its authorized user but then is taken beyond the distance where it can communicate with the watch, the gun will lock itself and be inoperable until the authorized user gets the watch and the gun back together.

A system of colored lights on the gun is used to convey the firearm's status to the user. A green light indicates that the firearm is in sync with the iW1 watch and is operable by the user. A red light indicates a "safe mode" in which the gun is locked and has not been made active by the authorized user. Additionally, a blue light indicates a "safe mode" in which the gun's magazine has been removed.[19] This feature ensures that the user knows that the magazine containing the ammunition is removed, that the gun is inoperable, and that, even if there is a round in the chamber, it cannot be fired. The gun can be fired only if the light indicator is green.

The Armatix personalized handgun is now being sold on a limited edition basis throughout much of Western Europe, and Armatix has been granted permission from the United States Bureau of Alcohol, Tobacco, Firearms and Explosives to sell the firearm in the United States. The limited, collector's edition is selling in Europe for 7,000 Euro (about US$10,000). Planned sales in the United States will be for a significantly lower cost, and once the pistol is selling in greater numbers, economies of scale will further reduce the cost, bringing it within the price range of many gun buyers.

TriggerSmart, a Limited Liability Irish company, is using radio frequency identification (RFID) technology in the development of its personalized pistol. TriggerSmart realized that a past issue with wireless personalization technology has been that both the firearm and the transmitter used to communicate with the firearm required batteries. This raised questions of reliability and functionality.[20] The TriggerSmart high-frequency RFID system incorporates technology that is commonly used in identification cards and in library books to establish communication between the firearm and a bracelet in order to authenticate a user.[21] The firearm's battery, antenna, and electronic interface are built into the handgrip of the gun. Once the radio frequency tags in the bracelet fall within a distance where it can communicate with the antenna in the handgrip, the gun enters an "instant on" phase and can be fired.[22]

The moment that the radio frequency tags comes out of contact, breaking communication, the firing pin locks and the gun cannot be fired. There is no battery in the bracelet component of the system, which addresses concerns over reliability and functionality. The company claims that this system is use-

ful because the closer the tags in the bracelet are to the antenna in the firearm, the less battery power is used, offering a dependable power source that will last for extended periods of time.

The New Jersey Institute of Technology, in the United States, has been working for years on a biometric version of a personalized gun. Their product employs "grip recognition." The handgun, after some period of use by its owner, recognizes the palm configuration of the owner and will work only when held by that authorized user.

Achieving Personalized Guns

The federal government of the United States does not comprehensively regulate firearms with regard to their safe design. The U.S. Consumer Product Safety Commission, which is the federal agency that protects the public from unsafe consumer products, has expressly been forbidden by Congress to address the safety of guns.[23] Thus, gun makers are, under federal law, able to choose the design of their products without regard to safety and to ignore the lifesaving potential of personalized guns.

With other products, a manufacturer's failure to design its product in a safe, feasible manner that could prevent foreseeable injuries would likely result in liability. The threat of litigation has provided a strong incentive to the makers of most products to utilize safety technology.[24] It was argued that the same exposure to liability would force gun makers to adopt personalization.[25] But, on October 26, 2005, President George W. Bush signed into law the Protection of Lawful Commerce in Arms Act (15 U.S.C. §§ 7901–7903), which provides to gun makers far-reaching immunity from product liability litigation.

As awareness of the need for personalized handguns increased, there was also more interest in state legislative efforts that would require personalized handguns. To aid in this process, a model law entitled "A Model Handgun Safety Standard Act" was developed by the Johns Hopkins Center for Gun Policy and Research. This model legislation could be used by states or municipalities to require that all handguns manufactured or sold within their jurisdiction after a certain date be personalized. Legislation patterned after the model law was passed in New Jersey in 2002 (New Jersey Statutes, Title: 2C; Chapter 58; Sections 2C:58-2.2 et seq.) The New Jersey law provides that once a personalized gun is introduced for sale in the state and is recognized by the New Jersey attorney general as complying with the statutory definition

of a personalized or childproof gun, then three years later all new handguns sold in New Jersey must be personalized.

In addition to state legislation, there are several actions that Congress could take to introduce personalized guns into the marketplace. These actions, stated in increasing order of effectiveness, in our opinion, are:

1. Provide funds, through the National Institute of Justice or another agency, for research and development of personalized gun technology. But, because of prior difficulties involving gun manufacturers' use of such funds, the work of the gun makers must be closely monitored.
2. Use the federal government's purchasing power to create a market for personalized guns.
3. Provide states with financial incentives to enact personalized or childproof gun laws, much as Congress has done with other areas of public safety, such as raising the drinking age.
4. Amend the Consumer Product Safety Act to give the Consumer Product Safety Commission (CPSC) jurisdiction over firearms as consumer products. Also, mandate the CPSC to promulgate a standard regarding childproof guns.
5. Enact technology-forcing legislation mandating that all newly manufactured or imported firearms be personalized, starting three years from the effective date of the legislation.
6. Amend the Protection of Lawful Commerce in Arms Act, permitting litigation against firearms manufacturers for injuries sustained by an unauthorized use of a recently manufactured firearm that was not personalized but also providing a safe haven of immunity if the firearm had been personalized.

Conclusion

Personalized guns are an idea whose time has come. The technology is now available to make guns a safer consumer product. To require all guns to be personalized does not interfere with Second Amendment rights—one can still keep and bear arms, but the arms would be designed in such a manner as to reduce the likelihood of being involved in mayhem.

Based on the longstanding behaviors of the gun industry, it would be naïve to expect them to voluntarily adopt even lifesaving technology. This means

that legislation, regulation, and perhaps litigation are needed to provide the public with safer guns.

NOTES

1. CDC Web-based Injury Statistics Query and Reporting System (WISQARS): http://www.cdc.gov/injury/wisqars/index.html.

2. Lund AK, Ferguson SA. Driver Fatalities in 1985–1993 Cars with Airbags. J Trauma. 1995; 38:469–475.

3. CDC Web-based Injury Statistics Query and Reporting System (WISQARS): http://www.cdc.gov/injury/wisqars/index.html.

4. CDC Web-based Injury Statistics Query and Reporting System (WISQARS): http://www.cdc.gov/injury/wisqars/index.html.

5. Wintemute GJ, Teret SP, Kraus JF, Wright MA, Bradfield G. When Children Shoot Children: 88 Unintended Deaths in California. JAMA. 1987;257(22):3107–3109.

6. http://www.nra.org/Article.aspx?id=1353.

7. Hardy, M. Teaching Firearm Safety to Children: Failure of a Program. J. Developmental & Behavioral Pediatrics. 2002;23(2):71–76.

8. Vernick JS, O'Brien M, Hepburn LM, et al. Unintentional and Undetermined Firearm Related Deaths: A Preventable Death Analysis for Three Safety Devices. Injury Prevention. 2003; 9:307–311.

9. CDC Web-based Injury Statistics Query and Reporting System (WISQARS): http://www.cdc.gov/injury/wisqars/index.html.

10. Cook PJ, Molliconi S, Cole TB. Regulating Gun Markets. J Crim L Criminology. 1995;86:59–91.

11. Zawitz MW. Guns Used in Crime: Firearms, Crime and Criminal Justice: Selected Findings. Washington, DC: U.S. Dept. of Justice; Bureau of Justice Statistics, NCJ-160093. 1996.

12. Jinks RG. *History of Smith & Wesson.* North Hollywood, CA: Beinfeld Publishing. 1977.

13. http://forums.vwvortex.com/showthread.php?5127428-the-DEMRO-Fox-Carbine-a-really-really-really-dumb-gun-design.

14. Shaw FA. Personalized Safety Method and Apparatus for a Hand Held Weapon. U.S. Patent 4,467,545: Aug. 28, 1984.

15. http://clinton4.nara.gov/WH/New/html/20000531_4.html.

16. Ivey, C. Judge Orders Release of Colt's Smart Gun Research. San Jose *Mercury News,* Apr. 18, 2003; www.mercurynews.com.

17. Armatix iP1 product description at http://www.armatix.de/iP1-Pistol.779.0.html?&L=1.

18. Armatix iW1 product description at http://www.armatix.de/iP1-Pistol779.0.html?&L=1.

19. Armatix iP1 product description at http://www.armatix.de/iP1-Pistol.779.0.html?&L=1.

20. Pers. comm., Robert McNamara, Jan. 6, 2013.

21. Pers. comm., Robert McNamara, Jan. 6, 2013.
22. Pers. comm., Robert McNamara, Jan. 6, 2013.
23. Pub. L. 94-284, §3(e), May 11, 1976, 90 Stat. 504 (1976).
24. Teret SP. Litigating for the Public's Health. Am J Public Health 1986;76:1027–1029.
25. Teret SP, Culross P. Product-oriented Approaches to Reduce Youth Gun Violence. The Future of Children, 2002;12(2):119–131.