

SPECIAL FEATURE

Reducing firearm violence: a research agenda

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In the United States, firearms are involved in tens of thousands of deaths and injuries each year. The magnitude of this problem prompted the National Academy of Sciences (NAS) to issue a report in 2004 detailing the strengths and limitations of existing research on the relationship between firearms and violence. In response, a multidisciplinary group of experts in the field of firearms and violence formed the National Research Collaborative on Firearm Violence. The Collaborative met for 2 days in June 2005 to (1) critically review the main findings of the NAS report and (2) define a research agenda that could fill research and data gaps and inform policy that reduces gun-related crime, deaths and injuries. This article summarizes the Collaborative's conclusions and identifies priorities for research and funding.

cause-and-effect relationships between firearms and violence. Further, methodological problems hamper efforts to evaluate policies and to gain consensus on effective strategies to lower gun crime and violence.

As researchers, we may agree or disagree with aspects of the report's conclusions, and still accept the challenge to build the empirical foundation of the violence-prevention field. With funding from the Joyce Foundation, we formed the National Research Collaborative on Firearm Violence, which met for 2 days in June 2005. Coordinated by the Firearm & Injury Center (FICAP) at the University of Pennsylvania, the Collaborative includes 27 researchers who attended a 2-day meeting in Philadelphia, Pennsylvania, USA and invitations to 23 others who could not attend. The Collaborative comprises scientists and practitioners from many disciplines—including criminologists, economists, epidemiologists, lawyers, nurses, physicians and political scientists—most with an enduring track record in the violence-prevention field. Our goal is to identify ways to fill the gaps between data and research to inform policy that reduces gun-related crime, deaths and injuries.

Members of the Collaborative reviewed the NAS report in detail, and formed six workgroups structured around the report's major findings. Table 1 summarizes the major NAS recommendations (the full report can be viewed at <http://nap.edu/books/0309091241/html>). Each workgroup discussed one or more chapters of the report, including firearms and suicide, deterrence and defense, restricting access, firearm injury prevention programs, and criminal justice interventions. Additionally, the entire collaborative addressed the need for better data and better access to data on firearm violence. Each discussion focused on three points: (1) important questions within each topic; (2) accuracy and comprehensiveness of the NAS recommendations, and other evidence to be considered; and (3) next steps to move the science forward.

The workgroup leaders summarized each group's discussions before the entire Collaborative, which discussed and refined them. Areas of agreement and disagreement were clarified, although no attempt was made to reach

Recent reports have highlighted the global impact of non-conflict-related firearm violence.^{1,2} One study estimated that the global burden of firearm mortality is between 196 000 and 229 000 annually.² The US has the highest rate of firearm violence among industrialized democracies, with firearms accounting for the majority of homicides and suicides. In 2003, nearly 30 000 people in the US died from gunshot wounds, including 16 859 by suicide and 11 599 by homicide.³ More than 65 000 people sustained non-fatal gunshot injuries.⁴ The Federal Bureau of Investigation (FBI) estimates that in 2003, firearms were used in 67% of murders, 42% of robberies and 19% of assaults reported to police.⁵ These statistics describe the significant impact of firearm-related violence, but do not specify the effects of firearms on violence. How many deaths, injuries and crimes would have occurred if a gun were not present at the site of the crime? How often is a gun used to deter crime or avert injury? What interventions can reduce firearm-related violence?

To inform policy makers about the existing evidence, a distinguished committee of the National Academy of Sciences (NAS) issued a landmark report in December 2004, *Firearms and violence: a critical review*.⁶ The report assessed the strengths and limitations of the existing research on gun violence, and recommended ways to improve the empirical basis for policy discussions.⁷

The report indicates that considerable gaps in research and data make it difficult to draw

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Abbreviations: CDC, Centers for Disease Control and Prevention; FBI, Federal Bureau of Investigation; NAS, National Academy of Sciences; NIBRS, National Incident-Based Reporting System

Table 1 National Academy of Sciences' recommendations

Chapter	Recommendations
Firearms and suicide	The committee cannot determine whether these associations (between gun ownership, criminal violence and suicide) demonstrate causal relationships. The committee recommends support of further individual-level studies of the link between firearms and both lethal and non-lethal suicidal behavior
Deterrence and defense	Accurate measurement on the extent of defensive gun use is the first step for beginning serious dialogue on the efficacy of defensive gun use at preventing injury and crime. For such measurement, the committee recommends that a research program be established to (1) clearly define what is being measured, (2) understand inaccurate response in the national gun use surveys, and (3) apply known methods or develop new methods to reduce reporting errors to the extent possible
Restricting access to firearms	It is simply not known whether it is actually possible to shut down illegal pipelines of guns to criminals nor the costs of doing so...the committee recommends that work be started to think carefully about possible research and data designs to address these issues
Firearm-injury-prevention programs	In light of the lack of evidence, the committee recommends that firearm-violence-prevention programs should be based on general preventive theory, that government programs should incorporate evaluation into implementation efforts, and that a sustained body of empirical research be developed to study the effects of different safety technologies on violence and crime
Criminal justice interventions	The committee recommends that a sustained, systematic research program be conducted to assess the effect of targeted policing and sentencing aimed at firearms offenders

complete consensus. The entire group then focused its recommendations and identified research priorities, as summarized in the following.

DATA AND DATA ACCESS

The NAS report noted that inadequate data and inadequate access to existing data, are among the most critical barriers to understanding gun violence. The report recommended that the federal government support a systematic program of data collection on firearms and violence, including emerging data systems on violent events such as the National Violent Death Reporting Systemⁱ and the National Incident-Based Reporting System (NIBRS).ⁱⁱ The report also noted the need for better data on firearm markets, ownership and use.

The workgroup strongly agreed with the NAS report, and identified data sources that remain unutilized or underutilized for research. It noted that more data are not necessarily better data—for example, the NIBRS might be more useful if it were redesigned to collect key data on a sample of violent incidents, rather than attempting large-scale data collection on all incidents.

The workgroup acknowledged that some gun owners and dealers have concerns about confidentiality and the use of data in the public domain. Recently, these concerns prompted broad statutory and funding restrictions to data that had previously

ⁱNVRDS is a state-based monitoring system of all violent deaths. Since 2002, the Centers for Disease Control and Prevention (CDC) has funded 17 states to implement National Violent Death Reporting System.

ⁱⁱNIBRS represents a modernization of the FBI's Uniform Crime Reporting summary system. Participating law enforcement agencies report data to the FBI on criminal incidents involving 46 specific offenses, with detailed information on the incident, victim(s), offender(s) and arrests. About 23 states, fully or partially, participate in NIBRS. Federal grant funds to help localities and states implement NIBRS have been unavailable since 2001.

been used in research, such as gun-tracing data (which track the sales history of guns recovered by police).ⁱⁱⁱ Tracing data enable law enforcement to determine the first retail seller and purchaser of guns used in crimes. The data are vital to understand how criminals obtain guns and are critical in evaluating policies designed to reduce the access of guns to criminals.

With safeguards, the Collaborative believes that qualified researchers should have access to data that have clear research purposes (such as date of death, often withheld in mortality data sources). The Collaborative makes the following recommendations:

- Federal agencies, such as the Department of Justice and the Department of Health and Human Services, should develop protocols that allow researchers access to data while protecting legitimate concerns about confidentiality. Successful models already exist. For example, the Committee on Vital and Health Statistics (Department of Health and Human Services' public advisory body) is well versed in developing protocols to protect health-related information. Members of the Collaborative are willing to work with regulatory and law enforcement agencies to develop these protocols.
- With protocols in place, Congress should restore access to gun-tracing data. At a minimum, Congress should authorize the Bureau of Alcohol, Tobacco, Firearms, and Explosives to resume sharing the trace data with researchers. In addition, it should restore funding for the Youth Crime Gun Interdiction Initiative of the ATF. Youth Crime Gun Interdiction Initiative funded participating cities to comprehensively trace crime guns and improve information about illegal sources of firearms. More than 60 cities participated in the program before it ended in 2005.

FIREARMS AND SUICIDE

The NAS report reviewed a wealth of observational studies linking suicide and firearms at aggregate levels, and found a clear association between firearms and gun suicide. It concluded, however, that the evidence did not credibly demonstrate that the association was causal, because of data and methodological limitations.

The NAS report also described many case-control studies of firearms and suicide but again concluded that data and methodological problems seriously limit the application of these studies. The report recommended further individual-level, longitudinal studies of the link between firearms and suicide.

The workgroup acknowledged the challenges of establishing causality, but believed that the accumulated evidence supports a causal relationship between firearm availability and suicide. The magnitude of the statistical associations between firearm availability and suicide, the consistency of findings over multiple studies in different populations, and the reality that a firearm greatly increases the risk that a suicide attempt will be lethal, all point to a causal connection. Nevertheless, significant questions remain about the interplay between impulsivity, suicidal intent and the substitution of means used to attempt suicide.

The Collaborative recommends the following steps to improve understanding of the relationship between firearms and suicide:

ⁱⁱⁱThe 2005 Consolidated Appropriation Act (PL 108-447) prohibited federal funds from being used "to disclose part or all of the contents of the Firearms Trace System database maintained by the National Trace Center of the Bureau of Alcohol, Tobacco, Firearms, and Explosives" except to law enforcement officials.

- Form interdisciplinary methodological teams to address and better model the causality and reverse causality between exposure to firearms and suicide. The key question is whether possession of a firearm directly increases the risk of suicide, or whether suicidal intent increases the risk of gun possession.
- Continue to collect and analyze national surveys that measure exposure to firearms and suicide (eg, CDC's Behavioral Risk Factor Surveillance System annual survey).
- Conduct prospective, longitudinal studies that have sufficient statistical power to analyze exposure to firearms and suicide (eg, the planned National Children's Study, which will follow more than 100 000 children from birth until the age of 21 years).
- Use qualitative research techniques to more fully understand statistically determined causal mechanisms of suicide, including exposure to firearms.

DETERRENCE AND DEFENSE

The NAS report considered the defensive and deterrent effects of firearms. To what extent do firearms allow individuals to defend themselves against criminals and deter crime? The report concluded that no accurate measurement of defensive gun use upon which to base policy discussions exists. It considered the effects of "right-to-carry" laws that allow qualified adults to carry concealed handguns, and found contradictory results in existing studies. The NAS report recommended that new methods and analytic techniques be used to understand the net social costs or benefits of defensive gun use and concealed weapons.

The workgroup agreed that existing evidence was unlikely to provide answers to these issues, and recommends the following approaches:

- Reframe the research question about "defensive gun use", which is poorly defined and understood. Researchers should ask about gun use within a broader array of strategies designed to defend against or deter crime, such as avoiding particular areas or installing burglar alarms. The central policy question is: under what circumstances are these strategies more or less effective than obtaining guns for self-defense?
- Measure all instances of non-sporting gun use, instead of relying on individual perceptions of whether the use was in self-defense. Other sources, such as data from the criminal justice system and video technology, should be used to validate and supplement self-reported gun use.
- Explore the effects of passage of "right-to-carry" laws on social norms and behavior. Understanding where, by whom, and by how much these laws actually prompt gun-carrying behavior and change criminals' perceptions, may help clarify the existing contradictory results.

RESTRICTING ACCESS

The NAS report reviewed interventions to reduce access to firearms by criminals and others not legally qualified to purchase a gun. These interventions include tough regulation of federal firearm licensees, one-gun-a-month laws, gun buy-back programs, and enforcement of laws against illegal buyers or sellers. It concluded that efforts to shut down the pipeline to illegal markets are based on speculation rather than research. Existing evidence does not answer critical questions about whether the illegal pipeline can be shut down, the costs of

doing so, and whether criminals substitute one source or type of gun with another.

The workgroup agreed that criminal diversion of firearms after the point of sale is a huge problem, but believed that the report conflated illegal access with illegal use. The group suggested a multilevel research strategy to better understand how certain "high-risk" users (eg, felons, people convicted of misdemeanors, people about to be sentenced) acquire guns, whether or not they are proscribed purchasers. Researchers should:

- Investigate why and how high-risk users obtain and use handguns. Promising research strategies include qualitative studies of trafficking investigations, ethnographic studies of violent neighborhoods, end-to-end tracing of samples of crime guns and quantitative analyses of tracing and law enforcement data from network, spatial and temporal perspectives.
- Study how laws restricting access are implemented and enforced. This is a critical but usually omitted step in evaluating the effects of laws.
- Study comprehensive regulatory, enforcement and public education strategies rather than discrete policies that, by themselves, may be insufficient to reduce the availability and acquisition of firearms.

FIREARM-INJURY-PREVENTION PROGRAMS AND TECHNOLOGY

The NAS report reviewed the evidence on widely disseminated prevention programs, especially those directed at youth, and found that few had been adequately evaluated for their effects on attitudes or behavior. The report also touched on a variety of safety innovations, (eg, locking technology and "smart gun" features) found little evidence on their efficacy or cost-effectiveness, and noted that some technologies may have dangerous unintended consequences. The NAS report recommended that firearm-injury-prevention programs be based on general prevention theory, and that evaluation be incorporated as programs are implemented.

The workgroup agreed with most of the report's assessments about injury-prevention programs, and debated whether the evidence about the utility of certain technologies such as personalized weapons was persuasive. The workgroup recommends the following steps:

- Use pilot studies and qualitative techniques to understand the determinants of individual behavior, especially among adolescents. The roles of social norms, networks, and neighborhood conditions need to be more fully understood, so that interventions target appropriate behaviors.
- Broaden the scope of prevention research beyond the individual gun owner or user. Prevention research should investigate the actions and motivations of people representing all entities connected to firearms, including gun manufacturers, gun retailers and community members, to study determinants of their behaviors regarding guns, and to inform theory-based prevention programs.
- Develop and evaluate interventions that target both environmental-level and individual-level factors related to gun ownership and use.
- Conduct pilot studies to evaluate the efficacy of firearm technologies, including non-lethal technologies, and their potential for use in particular markets. This research might be carried out in countries that already have greater use of these technologies (eg, Australia or South Africa).

CRIMINAL JUSTICE INTERVENTIONS

The NAS report reviewed the effectiveness of criminal justice interventions such as gun courts, enhanced sentences for criminal firearm use, and problem-oriented policing. The report found that a number of policing strategies and sentencing enhancements had shown some success, but criticized their quasi-experimental study designs. It recommended that a sustained, systematic research program be conducted, using more rigorous methods such as randomized experiments or pooled time-series cross-sectional studies.

The workgroup believed that the evidence for certain interventions, such as problem-oriented policing strategies in Boston and Indianapolis, USA, was limited but compelling. Although many questions about the mechanisms by which the interventions reduce gun violence remain unanswered, the success of individual programs argues for replication in other communities. Further, the group believed that the nature of many community-level interventions precludes randomization, thereby making the NAS recommendations to conduct randomized trials impractical.

The Collaborative suggests a research strategy that can disentangle the effects of different aspects of the most successful and most sustainable criminal justice interventions, and recommends the following approaches:

- Conduct qualitative studies with offenders to better understand how risk perception and group norms affect gun-related behavior.
- Create innovative and rigorous study designs and identify standards of evidence that are suitable to evaluate evolving programs and community-based research. For example, complementing area-level studies with offender-level data may allow a more detailed examination of crime displacement and deterrence.
- Define and measure intermediate outcomes (eg, attitudes or behavior of criminals and criminal justice professionals) to evaluate progress toward the goal of reducing gun injury and death.

OVERARCHING THEMES

Over the course of 2 days, the Collaborative discussed how to build upon the NAS report and move the field forward. Several themes emerged that span the individual discussion topics. These themes and each workgroup's recommendations, form a research agenda for reducing firearm violence. The themes include:

- *The centrality of data collection, data quality, and data access.* It is tempting to call for more data to answer almost any scientific question. But in the case of firearms and violence, we lack basic data on gun ownership, storage, use and markets. We lack access to gun-tracing data that can help illuminate the pathway from manufacture to criminal use. We lack reliable, valid data that would clarify the protective, defensive and deterrent effects of firearms. Standards for conducting research with sensitive information work well in other fields and should be applied to research on firearms.
- *The importance of qualitative research.* At their core, questions about the link between firearms and violence involve human decisions, motivation and behavior. Ultimately, interventions to reduce firearm violence must target the factors that influence individual, group or institutional behavior. Qualitative techniques, such as ethnographic study of select

populations, provide a level of detail beyond statistical analyses and a window into social processes. Research that combines quantitative and qualitative techniques offers the best opportunity to understand the complex web-of-causation that underlies gun violence.

- *The necessity of partnerships between university-based researchers and community-based professionals in law enforcement, criminal justice and public health.* Many of the Collaborative's recommendations require a convergence of language, ideas and methods between researchers and "practitioners". Investing in these partnerships is critical to building the empirical basis for policy decisions. Although these partnerships present practical challenges, the benefits far outweigh the challenges in terms of framing questions jointly, sharing resources and developing evidence-based interventions.
- *The need for formative research and pilot studies.* Many interventions to reduce gun violence have been developed in the absence of a clear understanding of the target audience's attitudes, beliefs, motivations, knowledge and behaviors. Moving the science forward requires formative research and pilot studies that inform the development, implementation and evolution of these interventions. In short, researchers and practitioners must "do their homework". A relatively small investment in formative research and pilot studies could have a large payoff in improving the design and effectiveness of interventions to reduce gun violence.
- *The need for increased research funding.* The NAS report noted the critical need for increased funding of research, particularly by the federal government.⁶ Funding for research on firearms and violence is severely limited in the US, with the bulk of support provided by a few private foundations.⁸ Federal funding has fallen victim to politically contentious issues of "gun control" and debates about Second Amendment rights. Since 1997, the CDC has operated under statutory restrictions on firearm research.¹⁴ A recent review found that the National Institutes of Health had funded just three major grants for researches on firearm injury in the last 30 years (1973–2002).⁹ The National Institute of Justice funds just a handful of studies on firearms and violence each year.⁵ The above-outlined research agenda will require a sustained investment of federal dollars and partnerships with foundations. Practically speaking, it will require that the US reframe firearm injury research as a public health issue (as the World Health Organization and many countries have done). By focusing on improving the empirical basis for policy, the NAS report and ongoing efforts of the Collaborative efforts may help overcome political barriers to federal funding. The level of support should reflect both the magnitude of the problem, and the promise this research agenda holds for reducing the impact of firearm-related violence in the US.

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ivGuidelines state that the CDC will not fund "activities designed to affect the passage of specific Federal, State, or local legislation intended to restrict or control the purchase or use of firearms."

vAccording to NIH online statistics, it funded two grants in 2002, three each in 2003 and in 2004, which were devoted to research on firearms and violence.

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