



## Editorial

### Editorial: Gun Violence—Risk, Consequences, and Prevention

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Firearm injury is one of the leading causes of death in the United States (1). Firearm-related homicide was the leading cause of death for black men aged 15–34 years in 2012, whereas firearm-related suicide was the second leading cause of death for white males aged 10–34 years (1). In 2013, there were 32,888 individuals in the United States who died from a firearm-related injury, including 21,175 suicides, which is the equivalent of 1 death by firearm every 16 minutes (2). Most firearm-related violent deaths are the result of suicide; 60.5% of deaths from firearm-related violence were due to suicide in 2002–2012 (3). Firearm injuries accounted for \$229 billion spent on costs associated with health care, criminal justice, loss of income, pain, suffering, and lost quality of life in 2013 (4). The current volume of *Epidemiologic Reviews* provides a comprehensive summary of the evidence on the epidemiology of firearm violence, including sources of firearm violence and approaches to preventing it. The papers in this volume span 3 themes, with many articles addressing more than 1.

The first and central issue addressed in this volume is the link between access to firearms and violence. In individual-level and ecologic studies, investigators have consistently found a relationship between firearm availability and firearm-related injury; however, these results have often been questioned because of lack of control for confounding and an inability to establish the directionality of the relationship. Zeoli et al. (5) conducted a narrative review on access to firearms and the risk of intimate partner violence. Tracy et al. (6) reviewed the evidence on the associations of exposure to gun violence in one's social network with carrying a firearm and violent behaviors. Santaella-Tenorio et al. (7) examined the literature on the impact that laws aimed at restricting firearm access had on the number of firearm homicides, suicides, and deaths from unintentional injury. The most notable paper in which this issue was addressed was by Miller et al. (8), who assessed whether the consistent relationship between household firearm availability and suicide might be explained by unmeasured confounding. They found that for an unmeasured confounder to completely explain the observed associations, it would have to be as strongly associated with suicide as was the strongest psychiatric risk factors and be more imbalanced across homes with and without firearms than are

any known suicide risk factors. Their paper highlights the importance of quantifying bias and testing whether it is likely to explain the associations observed in the literature. Such an empirical assessment raises the discourse about the contribution of firearm availability to morbidity and mortality and provides a strong foundation for policy (8).

Second, this issue of *Epidemiologic Reviews* includes papers in which investigators considered firearm violence as part of a correlated set of risky behaviors, including substance use and belonging to deviant social networks. In 3 papers (9–11), authors reviewed the evidence on the relationship between substance use and firearm violence. Although it has been widely assumed that there is a causal relationship between substance abuse and firearm-related activities, the evidence on this association is still inconclusive. McGinty et al. (9) examined the relationship between use of controlled substances and violence, and Branas et al. (10) conducted a review and meta-analysis of the research on the relationship between alcohol use and firearms. Chen and Wu (11) took a broader approach and presented a narrative review on the relationships between use of different types of substances (i.e., alcohol, tobacco, marijuana, cocaine/crack) and firearm-related activities (i.e., firearm access, firearm carrying, unsafe firearm handling, and firearm violence). The reviews revealed a positive association between substance use and firearm-related activities, although the associations often disappeared or decreased after adjustment for psychiatric disorders, especially antisocial personality disorder. The relationship between the use of controlled substances and firearm-related suicide was the most robust to confounding. Following on the notion of correlated risk behaviors, Tracy et al. examined the evidence on the transmission of firearm violence through social networks (6). They found support for the idea that the risk of weapon-related violence increases through close connection with someone who has perpetrated or been a victim of weapon-related violence. However, there were only 3 studies in which formal network analysis techniques were applied to examine the structure of social networks and their influence on firearm violence, and they all focused on co-offending networks.

The third key theme was related to approaches to the prevention of firearm violence, ranging from individual-level

interventions in the health care setting or the home to state- or national-level legislation. One of the leading approaches to the prevention of firearm-related injuries has been the promotion of safe storage practices. Rowhani-Rahbar et al. (12) reviewed randomized and quasi-experimental controlled studies of the effectiveness of community- or clinic-based firearm storage interventions. The critical element that differentiated studies that showed improvement in safe storage practices was the provision of a free firearm storage device. The health care setting has also been proposed as a key site at which to implement interventions to prevent firearm violence. Roszko et al. (13) reviewed such prevention efforts, including clinician attitudes and adoption of practices to encourage firearm safety among patients. Screening and counseling to increase safety is performed by only a minority of clinicians, potentially because of a lack of guidelines and lack of training. Roszko et al. provided a thoughtful discussion of the types of research questions we need to ask in this area.

Two reviews focused on the impact of firearm legislation on firearm-related violence. Zeoli et al. reviewed the evidence on interventions to reduce firearm-related intimate partner violence, including state statutes to prohibit access to firearms by perpetrators (5). Statutes that restricted firearm purchase and possession by individuals with a restraining order for domestic violence showed a promising impact on reducing fatal intimate partner violence. Santaella-Tenorio et al. broadened the search to the global level and reviewed evidence across 10 countries on the impact that legislation targeting firearm access had on firearm-related mortality (7). The simultaneous implementation of laws that targeted several firearms restrictions was associated with reduced rates of firearm deaths. However, lack of information about implementation of the laws limits the conclusions that can be drawn about the effectiveness of these interventions.

This body of work presents the state-of-the-art evidence on the risks and consequences of firearm-related violence, as well as ways to prevent it. At the same time, the reviews presented in the current issue of *Epidemiologic Reviews* highlight important gaps and priorities for future research. First, there is a clear need for prospective studies focused on the causes and consequences of firearm violence; because of the current gap in knowledge, authors of these reviews often had to take a broader view of violence and extrapolate the data to firearm violence. Second, we need research on the structure of social networks and the transmission of firearm violence across different types of populations. Such studies should carefully address issues of social selection of network ties versus transmission of firearm-related behaviors across networks. Third, more firearm-related deaths are due to suicide than any other cause, yet there are relatively few prospective studies focusing on the causes of and ways to prevent firearm-related suicide. This seems like a clear research priority. Fourth, we have few data on the effectiveness of interventions to reduce firearm access and to prevent firearm violence. Randomized controlled trials and prospective quasi-experimental studies are needed to identify the types of interventions that work best for different populations and in different settings. Finally, the reviews were often focused on US research. Although this country's domestic firearms situation is indeed quite distinct from those of other countries, we can also learn useful lessons from reviewing evidence on the causes of and

effective ways to prevent firearm violence in other countries. In particular, we are missing data on firearm violence in regions that bear the biggest burden from firearm violence, such as Latin America and Africa (14). We hope the present volume of *Epidemiologic Reviews* can serve as a springboard to galvanize future research in this area and to ultimately reduce unnecessary deaths and disability from firearm violence.

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