



## Editorial

# The role of epidemiology in firearm violence prevention: a Policy Brief

Amy B Davis, James A Gaudino,<sup>1</sup> Colin L Soskolne<sup>2</sup> and Wael K Al-Delaimy<sup>3\*</sup>; International Network for Epidemiology in Policy (Formerly known as IJPC-SE)<sup>†</sup>

<sup>1</sup>School of Public Health, Oregon Health & Sciences University and Portland State University (SPH OHSU-PSU), 840 SW Gaines St #230, Portland, OR 97239, USA, <sup>2</sup>University of Alberta School of Public Health, 3–300 Edmonton Clinic Health Academy, 11405–87 Ave, Edmonton, AB T6G 1C9, Canada, <sup>3</sup>Department of Family Medicine and Public Health, University of California, San Diego, La Jolla, CA 92093-0628, USA

\*Corresponding author. Department of Family Medicine and Public Health, University of California, San Diego, La Jolla, CA 92093-0628, USA. E-mail: waldelaimy@ucsd.edu

<sup>†</sup>Details of the endorsing member organizations are shown in the Appendix.

## Introduction

Firearm violence has reached pandemic levels, with some countries experiencing high injury and death rates from privately owned guns and firearms (hereinafter collectively referred to as ‘firearms’).<sup>1–6</sup> Significant factors in the increase in deaths and injuries from privately held firearms include the ease of obtaining these arms and, most importantly, the growing lethality of these weapons.<sup>7,8</sup>

Society cannot be satisfied with reactive responses only in treating victims’ physical and psychological wounds after these occurrences; more must be done proactively to prevent firearm violence and address societal circumstances that either facilitate or impede it. Where they exist, well-intended policies fail to adequately protect people from firearm violence, often because they mainly focus on the purchase and illegal uses of guns while neglecting underlying social determinants of the violent uses of firearms.

Laws intended to curb firearm violence are often not enforced, are inadequate or do not address local societal factors of crime, mental well-being, poverty or low education in the relevant communities.<sup>9,10</sup> These considerations point to the need for a multi-sectoral approach in which the public health sciences would play a pivotal role in preventing harms relating to firearm violence with a greater

focus on its causes.<sup>11</sup> Evidence-based multicomponent interventions, often shown by systematic reviews to be the most effective to address complex, community-level health issues, are needed but are not well-defined to address firearm violence.<sup>12</sup> To both advance understanding of and to guide community-level public health services and actions needed to prevent firearm violence, decision-makers need to rely more on surveillance, research and programme evaluation by public health organizations, schools and universities.<sup>3</sup>

Epidemiologists have unique interdisciplinary tools for addressing the contributors and barriers to preventing and mitigating injury, including firearm violence.<sup>13</sup> These include quantitative, qualitative and social epidemiological methods. Interventions to prevent and mitigate the problem are currently under-developed, under-funded and under-utilized, particularly in the USA.<sup>14</sup> The problem could be addressed by putting in place a robust evidence base to inform policy decisions. Additionally, public health can create, scale up and evaluate interventions designed to address social and behavioural factors associated with firearm violence. We call on governments, community leaders and community members to take meaningful action to support public health in addressing the problem of firearm violence.

## Public health relevance of violence associated with privately owned firearms

Violence perpetrated with privately owned firearms is indicative of underlying social disharmony and thus is a social disease. It contributes substantially to injury, death and disability worldwide and accounts for untold millions of dollars of direct and indirect health care and other costs.<sup>1,15,16</sup> Firearm ownership itself is associated with increased morbidity and mortality.<sup>17,18</sup> In the USA in 2014, for example, privately owned firearms were responsible for 33 599 deaths, of which 63% were suicides, 34% homicides and 2% unintentional shootings; US firearm violence accounts for over 100 000 fatal and non-fatal injuries annually.<sup>15</sup> There are limited data globally on firearm violence, but firearm homicide is pandemic.

The World Health Organization (WHO) reports that in 2012 there were 474 000 homicides worldwide, and that one in every two of those homicides was committed with a firearm.<sup>19</sup> Firearm homicide rates vary by global region. For example, the WHO reports that in 2014 firearm homicides accounted for 75% of all homicides in low- and middle-income countries in the Americas region, but for just 25% of homicides in low- and middle-income countries in the European region.<sup>19</sup>

Among high-income countries in 2015, the USA ranks highest with 10 times the number of firearm homicides as compared with the combined number of deaths for the next four highest countries by gross domestic product (GDP): China, Japan, Germany and the UK.<sup>5</sup> Research into these global differences in firearm homicide rates could shed light on the association between private firearm ownership and related injuries and deaths within and across countries. In addition, other hypotheses must be examined to fully address the underlying determinants of firearm violence. Ultimately, accurate information is essential for informing public health policies that seek to prevent and mitigate the harms of firearms.<sup>10,20</sup>

With technical advances and mass marketing over time, greater numbers of private individuals now own more firearms per capita, including more lethal weapons. Ranking highest worldwide, US citizens and residents own an estimated 357 million firearms, up from 259 million in 2000.<sup>21</sup> According to a 2015 report by the US Department of Justice, US firearm manufacturers increased annual production from 5.6 million firearms in 2009, to 10.9 million in 2013.<sup>22</sup> During that same period, exports of US firearms went from 195 000 to 393 000.<sup>20</sup> In fact, the global manufacture and distribution of firearms has become one of humankind's largest multinational activities, with more than 1000 companies in 100 countries producing firearms and ammunition.<sup>23</sup> It is estimated that trade in firearms

and ammunition involves every country in the world, and exports have been valued at US \$5.8 billion per year.<sup>24</sup> Associated injuries and premature death have thus become an international problem.

Firearm violence perpetrated by private firearm owners is increasingly recognized as a major threat to public health and safety around the world.<sup>6,20,25–29</sup> Firearm violence prevention thus has been identified as an appropriate focus for public health because it is largely preventable.<sup>1,25,26,30,31</sup> Nevertheless, insufficient funding for research relating to firearm violence prevention, with the consequent unavailability of information, continues to be a barrier to progress in preventing firearm violence.<sup>32–34</sup> There is a clear gap in knowledge relating to firearm violence due to a failure to collect and make data available and sometimes due to direct efforts to thwart research into firearm injury prevention.

In the USA, both research and the public health systems' capacity to address firearm violence has been long thwarted because of federally mandated restrictions on funding for firearm-related research and other policy barriers, in place from 1996–present.<sup>35,36</sup> Although state and local governments have not been prevented from conducting or funding surveillance, community interventions and research, the lack of US federal funding and public health leadership has, in practice, essentially frozen US public health work across the discipline for 22 years.

Public health professionals in many countries remain uninvolved in firearm violence prevention and mitigation work for the communities they serve and support. Insufficient funding by governments for core public health surveillance, research and programme evaluation has led to an absence of data and, consequently, to public inattention. Other barriers include fears by policy leaders of potential retaliation by industry, and societal confusion about which sectors should be involved in addressing firearm violence.<sup>34</sup> Although the World Health Organization (WHO) first declared firearm violence a major public health issue in 1996,<sup>37</sup> global firearm-related morbidity and mortality data remain sparse.<sup>19,38</sup> Studies conducted in countries that track firearm-related morbidity and mortality repeatedly show that firearms contribute significantly to both the scope and lethality of injuries, both intentional and unintentional.<sup>15,19,38</sup> It is clear that additional uniformly collected data monitoring, research and evaluation of interventions are needed to fully understand the scale and scope of the problem, and which multilevel interventions are effective.<sup>26</sup>

## Critique of current policy options

Criminal laws and civil laws that address firearm ownership are necessary, but are insufficient to address firearm

violence.<sup>10</sup> Criminal laws seek to deter and punish crimes of violence yet do not address the underlying social and behavioural factors associated with violent crime and its precursors. Criminal laws are also inadequate to address self-directed firearm violence, for which substantial evidence exists to support the strong association between firearms and completed suicides.<sup>10</sup> Civil laws seek to regulate firearm ownership through background checks, licensing and magazine capacity limits; they are often insufficient in scope to address community-level issues, are vulnerable to loopholes and fail to address problems such as unlicensed firearms already in circulation. Therefore, public health interventions addressing the range of primordial, primary, secondary and tertiary prevention options, supported by evidence derived from epidemiological and social science research, has greater potential to substantially contribute to community health and safety.

Epidemiologists, as public health methodology scientists, should be meaningfully engaged and incentivized to do more to help prevent firearm-related injury and death by producing evidence to address its causes.<sup>13</sup> Through the mechanism of a Policy Brief, we, the International Network for Epidemiology in Policy (INEP), seek to ensure that those engaged in policy formulation have ready access to information to inform policy decisions, better guided through needed evidence from both epidemiological and social sciences research.

## Policy recommendations

The INEP calls on:

- national and local governments to collect and make epidemiological and other scientific data relating to firearm-related morbidity and mortality publicly available for research;
- the WHO and other global public health and human rights organizations to continue to encourage all member countries to collect and disseminate epidemiological and other scientific data about firearm-related deaths, injuries, disabilities and associated costs, and to repeal any restrictions on collecting such data;
- national and local governments, private organizations and non-profit organizations to prioritize research funding specifically aimed at assessing the scale and scope of firearm violence, and promote the development and evaluation of firearm violence prevention interventions through improved understanding of upstream determinants derivable from epidemiological and other scientific disciplines;
- epidemiologists to engage in multidisciplinary firearm violence prevention research and, in designing and evaluating primary, secondary and tertiary prevention and mitigation

strategies, to apply evidence-based injury prevention approaches to address and evaluate the multilevel factors of the hosts, agents and vehicles, and their related physical, social and environmental factors; and

- public health educators to harness the epidemiological and other scientific evidence regarding the harms of firearm violence and incorporate this issue in the curriculum; they also should address how students of epidemiology can work with public health professionals and engage with relevant stakeholders (i.e. policy makers, public health practitioners and the general public).

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## Appendix

The *International Network for Epidemiology in Policy* (INEP), formerly known as the *International Joint Policy Committee of the Societies of Epidemiology* (IJPC-SE), is a consortium of 23 national and international member societies and associations of epidemiology, spanning six

continents, which works at the nexus of research and policy [www.ijpc-se.org]. It is the single-largest voice on epidemiology at the interface of research and policy. Eighteen member organizations have endorsed the Policy Brief on the role of epidemiology in firearm violence prevention.

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### Endorsing INEP member organizations and continent

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1. American Academy of Pediatrics	North America
2. American College of Epidemiology (ACE)	North America
3. American Public Health Association, Epidemiology Section (APHA-Epi)	North America
4. Australasian Epidemiological Association (AEA)	Australia
5. Brazilian Association of Public Health (ABRASCO)	South America
6. Cameroon Society of Epidemiology (CaSE)	Africa
7. Canadian Society for Epidemiology and Biostatistics (CSEB)	North America
8. Collegium Ramazzini (CR)	International
9. German Society for Epidemiology (DGEpi)	Europe
10. International Epidemiological Association (IEA)	International
11. International Society for Children's Health and the Environment (ISCHE)	International
12. International Society for Environmental Epidemiology (ISEE)	International
13. National Association of County & City Health Officials – Epidemiology Workgroup (NACCHO)	North America
14. Public Health Association of South Africa (PHASA)	Africa
15. Romanian Society of Epidemiology (RSE)	Europe
16. Royal Society for Public Health (RSPH)	Europe
17. Society for the Analysis of African American Public Health Issues (SAAPHI)	North America
18. Spanish Society of Epidemiology (SEE)	Europe

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