

1 J.S. Roche et al.

2 Challenges, Successes, and the Future of Firearm Injury Prevention

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6 Perspective

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11 Jessica S. Roche¹, Patrick M. Carter^{1,2,3,4,5}, April M. Zeoli^{1,4,5}, Rebecca M. Cunningham^{1,2,3,4} and Marc A.
12 Zimmerman^{1,2,4,5}

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15 ¹University of Michigan Institute for Firearm Prevention

16 ²University of Michigan Injury Prevention Center

17 ³University of Michigan School of Medicine

18 ⁴University of Michigan School of Public Health

19 ⁵Michigan Youth Violence Prevention Center, University of Michigan School of Public Health

20
21 * Address correspondence to: Jessica S. Roche, University of Michigan, 1109 Geddes Ave., Ann Arbor,
22 MI 48109 (email: jroche@umich.edu).

23
24 **Policy Points**

- 25
- 26 • Firearm injury is a leading cause of death in the United States, with fatality rates increasing 34.9% over the past decade (2010-2020).
 - 27 • Firearm injury is preventable through multifaceted evidence-based approaches.
 - 28 • Reviewing past challenges and successes in the field of firearm injury prevention can
29 highlight the future directions needed in the field.

30 Adequate funding, rigorous and comprehensive data availability and access, larger pools of diverse
31 and scientifically trained researchers and practitioners, robust evidence-based programming and

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32 policy implementation, and a reduction in stigma, polarization, and politicization of the science are
33 all needed to move the field forward.

34

35

36 **Keywords**

37 firearm, violence, suicide, injury

38

39 **Scope of the Problem**

40 Firearm injuries constitute a major US public health crisis that requires urgent attention. Fatality
41 rates have increased 34.9% over the past decade (2010-2020), with firearms responsible for over
42 400,000 deaths and an estimated 1.2 million emergency department visits for nonfatal injuries
43 during this time.¹⁻⁴ In 2017, firearm deaths surpassed motor vehicle crash deaths for the first time in
44 a generation^{3,4} and remain even higher today.³ Firearms were responsible for 45,222 fatalities in
45 2020, the highest absolute number of annual deaths ever recorded by the Centers for Disease
46 Control and Prevention (CDC) and second only to opioid overdoses as an injury-related cause of
47 death,¹ and in 2020 firearms became the leading cause of death for children and teens.⁵ Although
48 such injuries result from many causes, the overwhelming majority (98%) result from intentional
49 forms of firearm violence such as nonpartner/partner homicides and assaults, self-inflicted firearm
50 suicides, police violence, and active shooter incidents (e.g., school shootings).^{1,6} It should be noted
51 that although active shooter incidents, such as mass shootings and school shootings, are devastating
52 and receive the majority of national attention, they only make up a small fraction of the deaths and
53 injuries occurring from firearms.⁷ Most deaths from firearms are self-inflicted firearm suicides.¹
54 Additionally, long-term morbidity from firearm injuries is substantial, with 70% of adults reporting
55 substantially worse physical health and function five years postinjury⁸ and 50% of children requiring
56 disability and/or rehabilitative care on inpatient hospital discharge⁹ because of a firearm injury.
57 Furthermore, individuals who survive an initial firearm injury are at elevated risk for repeat firearm
58 injuries (some of which are fatal),¹⁰⁻¹³ substance use disorders,¹⁴ mental health issues (e.g., anxiety,
59 PTSD),¹⁵ and criminal justice system involvement.^{12,16}

60

61 The effects of firearm violence extend beyond the victims of firearm injuries to
62 include those who witness a shooting or experience the injury or death of family and friends,
63 yet we know relatively little about this secondhand experience and its sequelae.

63

64 Communities are also affected by firearm violence because events such as mass shootings
65 and firearm homicides and assaults can affect the collective communitywide sense of safety
66 and security,¹⁷⁻¹⁹ and firearm-related suicides can leave communities and family members
dealing with long-term mental health sequelae.²⁰⁻²⁴ The economic costs of firearm injuries

67 are high, estimated at \$229 billion annually^{1,25-27} when including acute and long-term medical costs
68 and disability care, lost work and productivity, and costs for criminal justice proceedings.
69 Importantly, these estimated costs do not include the costs associated with the efforts of witnesses,
70 friends, families, and communities to recover from this type of violence.

71

72 *Disparities*

73 Although firearm fatalities affect all US communities, disparities exist by age, race/ethnicity, sex, and
74 rurality.²⁸ Firearm injuries are the leading cause of death for youth (ages 10-24; 63% firearm
75 homicides), with high-school-aged teens (ages 14-17) more likely to die from a firearm injury than
76 any other leading cause of death.^{3,5,6} Suicide is the second leading cause of injury-related death
77 among older adults (age 65+), with firearms responsible for >70% of completed suicides.^{1,29} Firearm
78 suicide is also particularly prevalent among veterans and active-duty military members,²⁹ with rates
79 that are 1.5 times higher than the general population.³⁰ Racial differences in firearm injuries and
80 death are stark. Black youth experience firearm homicide rates 17 times higher than White youth
81 and are twice as likely to be hospitalized for nonfatal firearm injury.³¹ However, White and Native
82 American/Alaskan Native populations experience firearm suicide rates 2.6 and 1.8 times higher than
83 other racial/ethnic groups, respectively.¹ Sex differences in firearm fatality are also notable.
84 Although firearm fatality risk is six times higher for men, women are overrepresented among
85 intimate partner homicides, with more than half resulting from firearms.³²⁻³⁴ Finally, US cities are
86 disproportionately affected by firearm homicide, whereas rural settings are disproportionately
87 affected by firearm suicides.³⁵⁻³⁷

88 Researchers have identified that although multiple firearm violence risk factors exist across
89 all ecological levels, disparities are largely associated with underlying structural factors at the
90 community and/or societal level.^{28,38,39} Firearm homicide is largely concentrated within urban
91 communities with a legacy of severe racial segregation, redlining,⁴⁰⁻⁴² and economic disinvestment.⁴³
92 Disinvestment in urban communities of color is also associated with a lack of available evidence-
93 based prevention services.⁴⁴⁻⁴⁶ Parallel structural factors contribute to elevated rural and military
94 firearm suicide rates,⁴⁷ including economic distress and lack of economic opportunity, inadequate
95 availability of and access to mental health and social services, and elevated rates of access at high-
96 risk times. These disparities have only been widening in recent years, and although the reasons for
97 the increase in firearm deaths and injuries and the widening disparities are still unknown and likely
98 multifaceted and complex, there are some proposed explanations for this. These include increased
99 stressors during the COVID-19 pandemic such as increased social isolation, economic hardships,
100 mental stress, and changes and disruptions in services and education, in addition to increased
101 firearm purchasing and access to firearms and increased strains in community-law enforcement
102 relations that have been reflected in protests over lethal police force.⁴⁸ Current data do not show
103 this trend in increased deaths and injuries dissipating (data are from the final Multiple Cause of

104 Death Files, 2018-2020, and from provisional data for years 2021-2022, as compiled from
105 data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative
106 Program),⁴⁹ and there is little evidence that these numbers will revert back to prepandemic
107 levels⁵ without evidence-based solutions.

108

109 *Injuries Are Preventable*

110 Past successes in other fields of injury prevention can be used as a guide for reducing and preventing
111 injuries and deaths from firearms. Injuries have been shown to be preventable using comprehensive,
112 multifaceted approaches.⁵⁰⁻⁵⁶ The most apt guide for firearm injury prevention is the success seen in
113 reducing motor vehicle crash deaths.^{6,50,52,53,55-58} Motor vehicle death rates per mile of driving have
114 decreased by over 90%⁵⁸ over the past 50 years, all while the number of cars and miles driven has
115 increased.⁵⁶ This success is due to multidisciplinary approaches to reducing motor vehicle crash
116 injuries and deaths that included implementing a combination of behavioral (e.g., child car seats),
117 engineering (e.g., collapsible safety columns, air bags), policy (e.g., primary seat belt laws, drunk
118 driving legislation, licensing, speed limits, graduated drivers licenses), and cultural norm (e.g.,
119 Mothers Against Drunk Driving) interventions to reduce the burden of injuries and deaths.⁵⁰⁻⁵⁸ The
120 application of scientific methods from multiple disciplines helped to spur this reduction in motor
121 vehicle death rates while the number of cars and miles driven increased. Similar approaches are now
122 being applied to the science of firearm injury prevention.

123

124 *US Cultural Context*

125 At the outset, it is important to acknowledge the controversial nature of this topic area. However, it
126 is also important to note that firearm injury prevention research is not focused on a debate about
127 the constitutional right to private firearm ownership, which was affirmed in *District of Columbia v*
128 *Heller* (554 US 570 [2008]). Rather, the field seeks to understand the key risk and protective factors
129 associated with firearm injury, as well as the mechanisms across the spectrum of approaches
130 (behavioral, policy, education) that can effectively reduce firearm injury and death. We recognize
131 that firearm ownership is a part of the fabric of US culture,⁵⁹⁻⁶² that there are many complexities
132 around its history and deeply problematic policies and practices around race, and that the vast
133 majority of individuals and families that own firearms are law-abiding and responsible citizens.
134 Although the burden of firearm injuries and deaths is substantial, these events are preventable, and
135 the application of injury prevention science and methods to make progress in reducing injury
136 outcomes is consistent with a respect for the rights of law-abiding citizens to own and maintain
137 firearms responsibly and legally. This paper seeks to highlight solutions and approaches to firearm
138 injury that can occur in this cultural context.

139

140 *Purpose of This Paper*

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141 Researchers and practitioners generally agree that bringing multidisciplinary teams and methods
142 together to address firearm injury prevention is vital to reduce the epidemic of firearm injury and
143 death in the United States.^{6,38,58,59,63} Yet, several major challenges hamper this field of research and
144 its potential to staunch the firearm injury epidemic. We provide a brief overview of five challenges
145 for firearm injury prevention that have had a significant detrimental effect on advances in the field.
146 We also provide a brief review of the successes in the field of firearm injury prevention to date and
147 suggest future directions for this field. The five challenges we focus on include inadequate funding; a
148 lack of comprehensive data availability and access; limited evidence-based programming and
149 policies that are scientifically designed and tested; limited diverse and scientifically trained
150 researchers and practitioners; and the stigma, polarization, and politicization of this field of study.

151

152 **Five Challenges and Successes in the Field of Firearm Injury Prevention**

153 The challenges build on and are interconnected with one another, creating a perfect storm of
154 barriers and further limiting successes in all areas of firearm injury prevention. However, although
155 the challenges in the field are immense and interrelated, there are successes that also inform future
156 directions for the field.

157

158 *Funding*

159 *The Challenge of Inadequate Funding for Research.* Despite firearm injury being a
160 leading cause of death with widespread effects on societal well-being, past policies regarding
161 research funding for firearm injury prevention have resulted in a severe lag in evidence-based
162 solutions and policies to address firearm injury and death and have stalled the growth of the field.⁶³⁻
163 ⁷⁰ Firearm injury prevention research receives only 1.6% of the predicted federal funding
164 commensurate with other leading causes of mortality and morbidity for all age groups⁶⁵ and only
165 3.3% of the predicted federal funding spending for pediatric populations.⁶³ This deficit has led to not
166 only a lack of research, publications, and evidence-based solutions to this health problem but also a
167 limited field of trainees and researchers in this space.⁶³⁻⁶⁹

168 Firearm injuries were first recognized as a public health problem in the 1980s, after the
169 release of several studies applying the public health approach to firearm injury.⁷¹⁻⁷⁵ This led many
170 professional organizations to call for firearm injuries to receive both further research and federal
171 funding for that research.⁷⁶⁻⁷⁹ Yet, after multiple studies in the 1990s indicated that a firearm present
172 in the home increased risk for suicide and homicide,⁸⁰⁻⁸³ Congress passed legislation (called the
173 Dickey Amendment) that reallocated the CDC's firearm research funding to other injury-related
174 topics and prohibited the use of research money to "advocate or promote gun control."⁸⁴ Similar
175 restrictions were applied to National Institutes of Health (NIH) funding in 2011.^{85,86} The effect of
176 these measures were far-reaching. Although firearm research was not banned (research is separate
177 from advocacy), federal funding for the field of firearm injury prevention was extremely limited.

178 Only three major NIH awards focused on the prevention of firearm injury were awarded
179 between 1973 and 2012,⁶⁸ compared with over 300 awards for diphtheria, polio, cholera,
180 and rabies, which together account for less than 0.07% of the fatalities seen by firearms in
181 the United States during the same period.^{87,88} CDC funding for firearm-related research fell
182 by 96% from 1997 to 2012.⁶⁵ The National Institute of Justice continued to fund firearm
183 violence prevention research; however, the National Institute of Justice has a comparatively
184 smaller research budget than the NIH and CDC have. These policies that caused a lack of
185 federal funding for research have stifled our knowledge about the risk and promotive factors
186 associated with firearm injury and evidence-based solutions for our communities most
187 affected by firearm injury.^{64-66,89,90}

188 *Successes in the Firearm Injury Prevention Research Funding Landscape.* Even though
189 funding for firearm injury prevention research and programming has been inadequate to address the
190 burden of firearm injury and death, there have been some successes, including funding from private
191 sources and increased federal funding in recent years. Local and state governments, foundations,
192 and academic institutions have filled some of the deficit left by the decades of limited federal
193 funding.⁶⁵ Gurrey and colleagues found that over 50% of firearm research publications published
194 between January 2000 and December 2019 were funded by philanthropic sources.⁶⁵ Although this
195 funding has helped to advance the field of firearm injury prevention in the absence of federal
196 efforts, it cannot fill the gap left by the absence of federal funding to address firearm injury on a
197 societal level. Fortunately, this gap is closing, in part because of the 2018 update to the language in
198 the CDC appropriations bill that allows for the CDC to conduct research on the causes of gun
199 violence⁹¹ and the \$25 million spending bill for the CDC and NIH that supported studies of firearm
200 injury prevention.⁹² This is in addition to funding that has been available from the Department of
201 Justice and has allowed for expanding the range of topics that are addressed and broadens the
202 disciplines attracted to the field.

203

204 *Data Access and Availability*

205 *Challenge: Lack of Comprehensive Data Access and Availability to Conduct Necessary*
206 *Research and Evaluate Effective Policies.* The lack of comprehensive data access and
207 availability to conduct the necessary research and evaluate effective policies needed to address the
208 burden of firearm injury is another major challenge to the field of firearm injury prevention. One of
209 the key approaches in the scientific method is having appropriate data to evaluate policies,
210 outcomes of interest, causal factors, and potential points of intervention.⁹³ The field of firearm injury
211 prevention has not had adequate access to relevant administrative data because of the data not
212 being collected, existing data not being available to researchers,³⁸ or data being available to

213 researchers that is not comprehensive or has many flaws. For example, we do not currently have a
214 reliable source for rates of nonfatal firearm injuries; thus, evaluations of policies and interventions
215 to prevent these injuries are limited through the lack of data available.^{94,95} Those limitations hamper
216 the understanding of the effects of policies and interventions, ultimately delaying their
217 improvement. Additionally, the lack of comprehensive administrative data on firearms transactions
218 means that some policies may be made impotent and ineffective or, at the least, less effective, when
219 enacted. For example, when domestic violence restraining orders are issued with firearm-
220 relinquishing orders accompanying them (i.e., the perpetrator of domestic violence must hand over
221 all firearms to law enforcement until the order is lifted), without having a registry of firearms sales,
222 law enforcement and survivors must rely on the perpetrator to honor the order and be truthful
223 about the number of firearms they own.⁹⁶⁻⁹⁸ Without accurate data, policies meant to prevent
224 firearm injury may be ineffective not only because of the inability to evaluate their effect but also
225 the inability to implement them fully.

226 Limited research in the field has also limited the number of data sets that researchers may
227 share and make publicly available so that other researchers may apply their skills and knowledge in
228 different ways than the original intent of a particular study. An expert panel convened by the
229 National Opinion Research Center (NORC) suggested that the creation and curation of firearm data
230 and databases is necessary and can be immensely helpful for the field to address the gaps in data
231 and enhance creative solutions.⁹⁹

232 This lack of data results in many unanswered research questions in the field of firearm injury
233 prevention that are critical to understand so that we can begin to develop an evidence base to
234 inform prevention and test solutions and policies. Some of these unanswered questions include (a)
235 understanding how many people are injured by a firearm every year in the United States; (b)
236 understanding the root causes of firearm injury and death³⁹; (c) understanding the variability in
237 outcome variables (e.g., homicides, violent crime, suicide) that limits comparisons between distinct
238 community strategies (e.g., land use/zoning, vacant lot remediation, safe storage) or similar
239 strategies applied within different community settings (e.g., schools, neighborhoods, churches); (d)
240 testing intervention efficacy for the most severe violence typologies^{38,39,100-106}; (e) research questions
241 regarding subpopulations, communities, or settings where interventions may be most effective (i.e.,
242 moderator analyses) and which intervention components explain why and how a particular
243 community-based intervention works (i.e., mediator analysis)^{38,101,107}; and (f) the effect of policy
244 interventions such as licensure requirements, firearm restrictions, and gun trafficking laws.¹⁰⁸⁻¹¹⁴
245 Additionally, the lack of data has limited the range of questions that can be studied because they
246 represent a small number of disciplines and paradigms, limited application of different perspectives
247 (i.e., disciplines, paradigms) for analysis and interpretation of the data, and limited types of data
248 collected (e.g., survey, case study, interview, experimental).¹¹⁵⁻¹¹⁸

249 *Success in Firearm Injury Data Availability and Access.* In addition to the successes
250 seen in funding, there have been successes in firearm injury data access and availability. As
251 rates of firearm injury deaths have increased and more attention has been paid to the
252 prevention of this issue, several professional organizations have developed and released
253 best-practice statements and consensus agendas around firearm injury^{38,79,119-123} that
254 highlight key areas for which more data are needed.¹²⁴ Additionally, as more federal funding
255 has become available, more comprehensive reviews of scientific articles on this topic have
256 arisen.^{39,103-106,124,125} The NORC expert panel report also identified key relevant databases and
257 the need to develop a data infrastructure that can be harmonized with local data to inform
258 solutions and policies.⁹⁹ These reviews and consensus agendas have aided our knowledge in
259 the field of firearm injury prevention and provide a roadmap for the kinds of data needed to
260 build firearm science.

261 An additional success in this area has been the creation of academic research
262 centers and institutes solely dedicated to the study of firearm injury prevention research,
263 which expand the access and availability of data as research is conducted. These include the
264 Johns Hopkins Center for Gun Violence Solutions founded in 1995, followed more recently
265 by the Violence Prevention Research Program at the University of California at Davis, the
266 Harborview Firearm Injury & Policy Research Program at the University of Washington, the
267 Harvard Injury Control Research Center, the Violence Prevention Institute at Tulane
268 University, the New Jersey Gun Violence Research Center at Rutgers University, and the
269 University of Michigan Institute for Firearm Injury Prevention. These academic centers and
270 institutes have pushed the field forward despite the challenges that the field faces, and they
271 have had many successes in expanding the access and availability of data as research has
272 been conducted.

273 Lastly, the creation and curation of firearm data and databases has been immensely
274 helpful for the field and addresses the gaps in data access and availability, although there
275 are still limitations to these data such as representativeness and the ability to link data
276 sets.^{99,126} Everytown for Gun Safety and the National Institute of Justice mass shooting
277 database are welcome signs that data are becoming more available. The Firearm Safety
278 Among Children and Teens (FACTS) Consortium has created a public searchable repository of
279 over 100 databases that include at least some firearm-related variables relevant for the 1- to
280 17-year-old population that are housed with the Intercollegiate Consortium of Political and
281 Social Research. Taken together, although strides have been made in the addressing the
282 challenge of firearm data access and availability, more work is needed to generate the data
283 that will help researchers and policymakers understand the problem and potential solutions
284 moving forward.

285

287 *Challenge: Limited Evidence-Based Programming and Policies that are Scientifically Designed*
288 *and Tested.* In addition to and because of the limited funding and inadequate data available to
289 conduct the research and evaluation needed to advance the field of firearm injury prevention, there
290 have been limited evidence-based programming and policies that have been scientifically designed
291 and rigorously tested.¹⁰⁴⁻¹⁰⁶ Rigorous evaluation of programs and policies is needed to determine
292 whether they have the intended effects.¹²⁷⁻¹²⁹ The need for rigorous study for effective firearm
293 program design and evaluation has long been known.^{38,79,104-106,119-122,130-132} The research-to-practice
294 gap has been a challenge for the field of injury prevention regardless of the topic,^{133,134} but it is
295 especially challenging for the firearm injury prevention community, for which a lack of evidence-
296 based programming exists in the first place. Furthermore, the lack of economic data on existing
297 programs limits the ability to drive the policy changes needed to advance implementation of
298 efficacious programs on a scale that can affect firearm morbidity and mortality broadly across
299 communities.⁸¹

300 In the face of rising rates of firearm injury and death and the lack of evidence-based funding,
301 many organizations and communities have introduced untested programmatic work into their
302 communities, and legislators have introduced policies that evaluations suggest increase harm (such
303 as stand your ground laws),¹³⁵ to begin to address the needs of their community when evidence-
304 based programming is not available.^{38,79,119-122,130,131} Rigorous evaluation is needed to determine what
305 programs and policies are effective at reducing firearm injury and death, what the essential
306 components of these programs for those with limited resources are, and what the unanticipated
307 consequences of the programs to alert practitioners about potential pitfalls are. Broad dissemination
308 of these programs prior to further evidence testing risks credibility for the field at best and at worst
309 could be introducing programs and policies that could actually cause harm. There are many
310 examples in public health of untested programs that were found to be ineffective or harmful after
311 broad implementation and resource allocation, despite best intentions.¹³⁶⁻¹³⁹ The field of firearm
312 injury prevention is likely no different.

313 *Success in Promising Evidence-Based Programming and Policies that are Scientifically*
314 *Designed and Tested.* In addition to the successes seen in funding and data, there have been
315 several successes in developing promising pathways to firearm injury prevention programs and
316 policies. Evidence-based programs that were designed broadly for youth violence,¹⁴⁰ intimate
317 partner violence,¹⁴¹ and/or suicide prevention¹⁴² have demonstrated efficacy in prior research in
318 reducing the antecedents and related upstream violent behaviors but have not been specifically
319 tested with regards to firearm-specific outcomes. More research is needed to test the efficacy of
320 these programs on reducing firearm-specific outcomes. Additionally, evidence-based environmental

321 interventions have been shown to reduce firearm outcomes. Experimental and descriptive studies
322 have established an evidence base for demolitions of rundown buildings, vacant lot remediation,
323 and greening intervention for both antecedents of firearm injury¹⁴³⁻¹⁴⁶ and firearm injury prevention
324 in particular.¹⁴⁷⁻¹⁴⁹ Likewise, laws that strengthen permit-to-purchase and background checks have
325 shown evidence of decreasing firearm homicide rates,¹⁵⁰ as have domestic violence firearm
326 restrictions on decreasing intimate partner homicides. Although there have been many successes in
327 the field of firearm injury prevention in terms of promising programming to address violent
328 behaviors, more work is needed to fully understand the effect of these programs on firearm-specific
329 outcomes.

330

331 *Trainees*

332 *Challenge: Limited Pools of Diverse and Scientifically Trained Researchers and*
333 *Practitioners.* Another critical challenge the field of firearm injury prevention faces is the
334 limited pools of scientifically trained and diverse researchers and practitioners. Without
335 adequate funding for research and without access to relevant data, the field has not been
336 able to attract the number of new researchers and practitioners needed to move the needle
337 on firearm injury prevention. Early-career faculty and students look for career paths that
338 have stable funding streams and momentum and mentors available to help them navigate
339 successful careers.¹⁵¹⁻¹⁵³ Firearm research has not developed the necessary infrastructure or
340 disciplinary and methodological opportunities necessary to nurture and build a field of
341 science on the topic, and, even worse, firearm research became a field that might have a
342 negative effect on one's career trajectory because of the stigma associated with it.
343 Additionally, the availability of senior mentorship is a critical aspect of attracting, training,
344 and retaining junior investigators in any field of science.¹⁵⁴⁻¹⁵⁶ Researchers have documented
345 that fewer than 15 senior investigators had research careers in firearm injury prevention in
346 2015.¹³¹ With few senior researchers, no mid-career scientists, and an absence of robust
347 federal funding, the pipeline of investigators poised to address this leading cause of death
348 was stalled. Relatedly, as the pipeline of investigators in general has stalled, so has the
349 pipeline to attract investigators from diverse backgrounds, including culturally and
350 ethnically/racially diverse, and from different disciplines and focus areas. Cultivating and
351 supporting diverse viewpoints and experiences is paramount to the success of any field of
352 science,¹⁵⁷⁻¹⁶⁰ especially for firearm injury prevention, in which many disparities exist and
353 have gone unaddressed for so long.¹⁶¹ Lastly, comprehensive, evidence-based training is also
354 lacking for trainees.^{162,163} Without systematic, scientific training, the development of the
355 field of firearm injury prevention remains limited and stifled.

356 *Success in Increasing Scientifically Trained Researchers and Practitioners.* Building on
357 the successes in funding, data, and programming and policies, there have been successes in
358 increasing the pool of scientifically trained researchers and practitioners in the field of firearm injury
359 prevention. Namely, the creation of centers and institutes have resulted in an increase in scientific
360 training and mentorship for students and early-career faculty. The Johns Hopkins Center for Gun
361 Violence Solutions, for example, has trained doctoral students and junior researchers in firearm
362 injury prevention research since the 1990s. More recently, recognizing the magnitude and scope of
363 this problem, the Eunice Kennedy Shriver National Institute of Child Health and Human Development
364 funded the FACTS Consortium in 2017 to develop research resources to address this deficit of
365 knowledge, as well as to begin to cultivate training opportunities for young scholars to build
366 research careers in pediatric firearm injury prevention.¹²⁴ The University of Michigan–led consortium
367 included a nascent postdoctoral research training program to expand the scientific workforce, and
368 the University of Michigan Institute for Firearm Injury Prevention recently received a T32 training
369 grant from the NIH to train up to four postdoctoral scholars annually that will continue to feed the
370 pipeline of researchers in the field. The FACTS Consortium has also established a collaborative
371 multidisciplinary national network of more than 30 established and developing faculty experts
372 conducting pediatric firearm injury research that have helped to mentor students and postdoctoral
373 scholars, develop supportive environments for developing students in their home institutions, and
374 ensure a multidisciplinary representation of new empirical research at the annual national
375 conference.^{38,39,103-106} Although this funding and work has created significant forward momentum,
376 there is still an urgent need to build and sustain this early pipeline work.

377

378 *The Stigma, Polarization, and Politicization of the Field*

379 *Challenge: The Stigma, Polarization, and Politicization of the Field.* In addition to the
380 gaps in funding, evidence-based programming and policies, trainees, and data, the stigma,
381 polarization, and politicization of firearm research must also be acknowledged.¹⁶⁴ There are many
382 documented cases of researchers reporting feeling significant pressure to present findings that
383 would be acceptable to certain groups,¹⁶⁵⁻¹⁶⁸ such as gun activist groups, rather than presenting all
384 findings that emerge from scientific study. This tension and pressure have been reported to be more
385 prevalent in the field of firearm injury prevention compared with other fields of study,¹⁶⁹ and the
386 field has been particularly challenged by this. Unbiased and uncompromised scientific findings and
387 results, free and independent from the influence of funders or politics, are seen as a key tenet to
388 research and academic endeavors.¹⁷⁰⁻¹⁷² More research is needed to understand how these
389 experiences influence the field of firearm injury prevention and its growth, as well as methods to
390 overcome these challenges.

391 *Success in Addressing the Stigma, Polarization, and Politicization of the Field of Study.*

392 Lastly, building on the success of funding, data, programming, and training, there is
393 beginning to be a shift in the stigma, polarization, and politicization of the field of firearm injury
394 prevention research. This is seen through the attention the field is getting and the released best-
395 practice statements and consensus agendas around firearm injury.^{38,79,119-123} These consensus
396 agendas have highlighted the push and change in social norms to mobilize the field of firearm injury
397 prevention into one that is seen by all members of our community as a legitimate field of study that
398 can address the urgent need of firearm injuries and death.

400 **Future Directions for the Field of Firearm Injury Prevention**

401 Past successes in injury prevention can be used as a guide for the future field of firearm injury
402 prevention. Injuries have been shown to be preventable using comprehensive, multifaceted
403 approaches,⁵⁰⁻⁵⁶ and the field of firearm injury prevention is no different. The model of bringing
404 multidisciplinary teams and approaches together to address the burden of firearm injury will be a
405 key future direction for the field^{6,38,58,59,63} and overcome the five challenges we have described that
406 has hampered the field.

408 *Funding: Future Directions*

409 Scientific advances in the field of firearm injury prevention have lagged substantially behind those
410 for other injury (e.g., motor vehicle crashes) and medical (e.g., human immunodeficiency virus
411 [HIV]/acquired immunodeficiency syndrome [AIDS], cancer) diseases of similar size and scope
412 because of the lack of federal research funding during the past 30 years.⁶³ Although the recent
413 annual allocation of \$25 million of federal funding⁶⁷ provides an opportunity to develop community
414 prevention strategies and test policies that can address the underlying disparities that exist for
415 firearm violence outcomes, we need to build on this success and the successes of other state and
416 private funding sources by communicating our successes so that policymakers can see benefits of
417 funding in this area in reducing injury. It is also vital to communicate that these successes were
418 made without interfering with their constituents' rights to own firearms. The field needs to make
419 clear that both firearm research and rights can coexist, as motor vehicle research and driving can
420 thrive together. We also need to communicate to practitioners and policymakers when we have
421 developed evidence-based programming to inform best practices and disseminate effective
422 programming. Furthermore, developing evidence-based interventions and policies that are needed
423 for the field typically involves a linear progression through efficacy, effectiveness, and eventually
424 implementation trials that can take years and need community and stakeholder involvement
425 (including law enforcement) to ensure long-term sustainability¹⁷³ and the federal funding

426 investments needed over the next 10 years to appropriately address the burden of firearm injuries
427 and deaths in the United States.

428

429 *Data Access and Availability*

430 Although published empirical research on firearm injury has more than tripled since 2000, the
431 amount of research as measured by the number of articles reporting funding is 30% lower in 2019
432 than in 2000 and only represents about 0.0006% of total published research in PubMed.⁶⁵ One
433 reason for the limited research is that we have limited data with strong study designs, samples, and
434 data collected. It is also critical that future research includes theoretical foundations that guide the
435 research questions, variables that are collected, and samples studied and that use the most rigorous
436 designs necessary to develop or test hypotheses. Theoretically driven data are also needed to help
437 identify modifiable risk and promotive factors needed to focus prevention strategies. These data
438 need to be context and population specific so that they are relevant for the type of firearm violence
439 addressed (e.g., suicide, interpersonal, unintentional) and so that we can begin to build a body of
440 knowledge that is both specific and generalizable. We also need to develop more interdisciplinary
441 collaborations to look beyond our own discipline's theories and better build the databases and data
442 sets that can most adequately inform prevention strategies. These data need to cross socioecological
443 levels to include information from behavior to policy, improve measurement of complicated
444 constructs, and capitalize on advances in technology to provide novel data collection and data
445 methods.³⁸ Additionally, facilitating access to existing and newly collected data in repositories can
446 also eliminate barriers for researchers and expand the number and range of scholars working in this
447 field.¹⁷⁴ We must all make a commitment to sharing data and contributing to data repositories to
448 increase the access and availability of data for researchers.

449

450 *Evidence-Based Programming and Policies: Future Directions*

451 Evidence-based programming and policies have been lacking in the field of firearm injury prevention.
452 We need to test existing violence prevention programs and policies for their effectiveness on firearm
453 violence, with attention to the specific components of the programs and policies to inform the
454 appropriate improvements to make to reduce firearm violence. We also need to conduct evaluations
455 to ensure that current policies are implemented with fidelity. A limitation in evaluating firearm
456 policies is the patchwork of differing ways they are written across states and implemented across
457 jurisdictions. A lack of policy impact may be found when there is, in fact, a lack of policy
458 implementation.

459 We also need to work with local partners and those affected by firearm violence to develop
460 new locally relevant prevention programming. A useful strategy we have used is to work with local

461 partners who have created and implemented local programs to codify their work and
462 develop research designs to test their effectiveness. This approach honors local knowledge,
463 ensures programs are culturally relevant, and helps to sustain programs found to be
464 effective. An assessment of racial equity in firearm policies and programs must also be made
465 in recognition of the burden of firearm homicide falling mainly on Black communities
466 because of structural factors and to ensure that existing policies and programs reduce those
467 disparities rather than enhance inequity.

468 Implementation science can also be applied to understand what components of an
469 intervention are most effective, inform efficient strategies for overcoming challenges in program
470 functioning, and reduce the gap between practice and research. Implementation science approaches
471 also help with coordination across sites to develop best practices for program implementation,⁶⁵⁻⁶⁷
472 documenting and analyzing key procedures for implementation, and establishing toolkits to guide
473 dissemination in other communities.⁶⁵ Finally, another direction for evidence-based programming
474 and policies is to build in cost effectiveness research from the beginning so we can both estimate
475 costs accurately and ensure data collection for different possible benefits of prevention (e.g., health
476 care and service utilization, type of injury and disability).

477

478 *Training: Future Directions*

479 To increase the pipeline of rigorously trained researchers and practitioners, more training awards
480 that include both pre- and postdoctoral researchers are necessary. Courses and evidence-based
481 training curricula that draw on many disciplines focused on firearm injury is another step the field
482 can make to expand the pipeline of trainees and to expose others to the ideas from this field. These
483 courses and training materials can also focus on different aspects of injury, including but not limited
484 to primary, secondary, and tertiary prevention strategies. Training opportunities and courses are
485 necessary at every level of education, including master's and undergraduate students, adult
486 learners, and practitioners. It is especially important to increase the pool of diverse researchers in
487 the field regarding ethnic and racial backgrounds, socioeconomic circumstances, different
488 paradigms, educational backgrounds (i.e., disciplines), and firearm injury focus areas (e.g., suicide,
489 intimate partner, safe storage).

490

491 *Stigma, Polarization, and Politicization: Future Directions*

492 Politicization of the field of firearm injury prevention has been a challenge. As the field grows and
493 the science is more robust and rigorous, more funding is allocated to addressing the burden, and

494 more evidence-based programming and policies are implemented, the stigma and polarization of the
495 field may diminish. The creation of a scientific professional society focused on firearm injury
496 prevention is also an important step in destigmatizing the field as a legitimate and acceptable topic
497 of study while also providing a supportive network of scientists available to share ideas, mentor
498 young scholars, and model careers focused on the topic. Another strategy to reduce stigma and
499 politicization is to develop partnerships with a wide range of stakeholders and those affected by
500 firearm violence to give voice to and respect multiple perspectives on firearm injury prevention.

501

502 **Conclusion**

503 The challenges faced by the field of firearm injury prevention are not new. Almost 30 years ago, Dr.
504 Kellermann wrote on the “Obstacles to firearm and violence research,”¹⁷⁵ and many of those
505 obstacles—inadequate funding, inadequate pool of experienced researchers, critical gaps in
506 available data, fatalistic attitudes about violence prevention, barriers to interdisciplinary research,
507 and opposition from powerful interest groups— remain today; however, progress has been made.
508 With a renewed scientific focus and the availability of federal research funding for firearm injury
509 prevention research, fostering a collaborative multidisciplinary network of scholars focused on
510 testing rigorous, innovative, data-driven solutions is critical to addressing existing barriers to high-
511 quality research and achieving the transformative progress needed to address this public health
512 problem.

513

514 **References**

- 515 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and
516 Reporting System (WISQARS). Updated February 9, 2023. Accessed October 10, 2022.
517 <https://www.cdc.gov/injury/wisqars/index.html>
- 518 2. Gani F, Sakran JV, Canner JK. Emergency department visits for firearm-related injuries in the
519 United States, 2006-14. *Health Aff (Millwood)*. 2017;36(10):1729-1738.
520 doi:10.1377/hlthaff.2017.0625
- 521 3. Goldstick JE, Carter PM, Cunningham RM. Current epidemiological trends in firearm
522 mortality in the United States. *JAMA Psychiatry*. 2021;78(3):241-242.
523 doi:10.1001/jamapsychiatry.2020.2986
- 524 4. Rhee P, Prabhakaran K, Joseph B, et al. Firearm deaths are increasing and endemic in the
525 USA: it is a problem of suicides and not homicides. *World J Surg*. 2021;45(5):1323-1329.
526 doi:10.1007/s00268-020-05938-9

- 527 5. Goldstick JE, Cunningham RM, Carter PM. Current causes of death in children and
528 adolescents in the United States. *N Engl J Med*. 2022;20(386):1955-1956.
529 doi:10.1056/NEJMc2201761
- 530 6. Cunningham RM, Walton MA, Carter PM. The major causes of death in children and
531 adolescents in the United States. *N Engl J Med*. 2018;379(25):2468-2475.
532 doi:10.1056/NEJMs1804754
- 533 7. Federal Bureau of Investigation. *Active Shooter Incidents in the United States in 2020*.
534 2021:1-24. Accessed October 10, 2022. [https://www.fbi.gov/file-repository/active-shooter-](https://www.fbi.gov/file-repository/active-shooter-incidents-in-the-us-2020-070121.pdf/view)
535 [incidents-in-the-us-2020-070121.pdf/view](https://www.fbi.gov/file-repository/active-shooter-incidents-in-the-us-2020-070121.pdf/view)
- 536 8. Vella MA, Warshauer A, Tortorello G, et al. Long-term functional, psychological, emotional,
537 and social outcomes in survivors of firearm injuries. *JAMA Surg*. 2020;155(1):51-59.
538 doi:10.1001/jamasurg.2019.4533
- 539 9. DiScala C, Sege R. Outcomes in children and young adults who are hospitalized for firearms-
540 related injuries. *Pediatrics*. 2004;113(5):1306-1312. doi.org/10.1542/peds.113.5.1306
- 541 10. Cunningham RM, Carter PM, Ranney M, et al. Violent reinjury and mortality among youth
542 seeking emergency department care for assault-related injury: a 2-year prospective cohort study.
543 *JAMA Pediatr*. 2015;169(1):63-70. doi.org/10.1001/jamapediatrics.2014.1900
- 544 11. Carter PM, Walton MA, Roehler DR, et al. Firearm violence among high-risk emergency
545 department youth after an assault injury. *Pediatrics*. 2015;135(5):805-15.
546 doi.org/10.1542/peds.2014-3572
- 547 12. Rowhani-Rahbar A, Zatzick D, Wang J, et al. Firearm-related hospitalization and risk for
548 subsequent violent injury, death, or crime perpetration: a cohort study. *Ann Intern Med*.
549 2015;162(7):492-500. doi.org/10.7326/M14-2362
- 550 13. Fahimi J, Larimer E, Hamud-Ahmed W, et al. Long-term mortality of patients surviving
551 firearm violence. *Inj Prev*. 2016;22(2):129-34. doi:10.1136/injuryprev-2015-041710
- 552 14. Walton M, Epstein-Ngo Q, Carter P, et al. Marijuana use trajectories among drug-using youth
553 presenting to an urban emergency department: violence and social influences. *Drug Alcohol Depend*.
554 2017;173:117-125. doi.org/10.1016/j.drugalcdep.2016.11.040
- 555 15. Garbarino J, Bradshaw CP, Vorrasi JA. Mitigating the effects of gun violence on children and
556 youth. *Future Child*. 2002;12(2):73-86. doi.org/10.2307/1602739
- 557 16. Carter PM, Dora-Laskey AD, Goldstick JE, et al. Arrests among high-risk youth following
558 emergency department treatment for an assault injury. *Am J Prev Med* 2018;55(6):812-821.
559 doi.org/10.1016/j.amepre.2018.07.003
- 560 17. Soni A, Tekin E. *How do mass shootings affect community wellbeing?* National Bureau of
561 Economic Research; 2020. Working Paper 28122. doi:10.3386/w28122

- 562 18. Foreman T, Erby A, Robinson MC, Stevens RL. Application: mass shootings: individual,
563 community, and societal perspectives. In: Summers RW, ed. *Social Psychology: How Other People*
564 *Influence Our Thoughts and Actions*. Vol 1. Greenwood; 2016:189-212.
- 565 19. Patterson JA, Berry B, Forker JL, et al. It can happen here: addressing school safety and
566 security after a mass shooting in a small Kansas town. In: Khosrow-Pour M, Clarke S, Jennex ME,
567 Anttiroiko A-V, eds. *Research Anthology on School Shootings, Peer Victimization, and Solutions for*
568 *Building Safer Educational Institutions*. IGI Global; 2021:451-467. doi:10.4018/978-1-7998-5360-
569 2.ch021
- 570 20. Jordan JR. Bereavement after suicide. *Psychiatr Ann*. 2008;38(10):679-685.
571 doi:10.3928/00485713-20081001-05
- 572 21. Peters K, Cunningham C, Murphy G, Jackson D. Helpful and unhelpful responses after
573 suicide: experiences of bereaved family members. *Int J Ment Health Nurs*. 2016;25(5):418-25.
574 doi:10.1111/inm.12224
- 575 22. Abrutyn S, Mueller AS. Are suicidal behaviors contagious in adolescence? Using longitudinal
576 data to examine suicide suggestion. *Am Sociol Rev*. 2014;79(2):211-227.
577 doi:10.1177/0003122413519445
- 578 23. Pitman A, Osborn D, King M, Erlangsen A. Effects of suicide bereavement on mental health
579 and suicide risk. *Lancet Psychiatry*. 2014;1(1):86-94. doi:10.1016/s2215-0366(14)70224-x
- 580 24. Maple M, Cerel J, Sanford R, Pearce T, Jordan J. Is exposure to suicide beyond kin associated
581 with risk for suicidal behavior? A systematic review of the evidence. *Suicide Life Threat Behav*.
582 2017;47(4):461-474. doi:10.1111/sltb.12308
- 583 25. Peek-Asa C, Butcher B, Cavanaugh JE. Cost of hospitalization for firearm injuries by firearm
584 type, intent, and payer in the United States. *Inj Epidemiol*. 2017;4(1):20. doi:10.1186/s40621-017-
585 0120-0
- 586 26. Quiroz HJ, Casey LC, Parreco JP, et al. Human and economic costs of pediatric firearm injury.
587 *J Pediatr Surg*. 2020;55(5):944-949. doi:10.1016/j.jpedsurg.2020.01.045
- 588 27. Lee J, Lurie J. 16 charts that show the shocking cost of gun violence in America. *Mother*
589 *Jones*. April 15, 2015. Accessed October 10, 2022.
590 <https://www.motherjones.com/politics/2015/04/charts-show-cost-price-gun-violence-america/>
- 591 28. Boeck MA, Strong B, Campbell A. Disparities in firearm injury: consequences of structural
592 violence. *Curr Trauma Rep*. 2020;6(1):10-22. doi:10.1007/s40719-020-00188-5
- 593 29. Pruitt LD, Smolenski DJ, Bush NE, et al. Suicide in the military: understanding rates and risk
594 factors across the United States' Armed Forces. *Mil Med*. 2019;184(suppl 1):432-437.
595 doi:10.1093/milmed/usy296
- 596 30. U.S. Department of Veterans Affairs. Mental health: suicide prevention. Updated January 18,
597 2023. Accessed October 10, 2022. https://www.mentalhealth.va.gov/suicide_prevention/

- 598 31. Cook A, Osler T, Hosmer D, et al. Gunshot wounds resulting in hospitalization in the United
599 States: 2004-2013. *Injury*. 2017;48(3):621-627. doi:10.1016/j.injury.2017.01.044
- 600 32. Zeoli AM, Malinski R, Turchan B. Risks and targeted interventions: firearms in intimate
601 partner violence. *Epidemiol Rev*. 2016;38(1):125-139. doi:10.1093/epirev/mxv007
- 602 33. Zeoli AM, Malinski R, Brenner H. The intersection of firearms and intimate partner homicide
603 in 15 nations. *Trauma Violence Abuse*. 2020;21(1):45-56. doi:10.1177/1524838017738725
- 604 34. Bonomi A, Zeoli AM, Shanahan S, Martin D. Saving lives: working across agencies and
605 individuals to reduce intimate homicide among those at greatest risk. *J Fam Violence*. 2021:1-4.
606 doi:10.1007/s10896-021-00266-5
- 607 35. Nestadt PS, Triplett P, Fowler DR, Mojtabai R. Urban–rural differences in suicide in the state
608 of Maryland: the role of firearms. *Am J Public Health*. 2017;107(10):1548-1553.
609 doi:10.2105/AJPH.2017.303865
- 610 36. Branas CC, Nance ML, Elliott MR, Richmond TS, Schwab CW. Urban-rural shifts in intentional
611 firearm death: different causes, same results. *Am J Public Health*. 2004;94(10):1750-1755.
612 doi:10.2105/ajph.94.10.1750
- 613 37. Goldstick JE, Zeoli A, Mair C, Cunningham RM. US firearm-related mortality: national, state,
614 and population trends, 1999-2017. *Health Aff (Millwood)*. 2019;38(10):1646-1652.
615 doi:10.1377/hlthaff.2019.00258
- 616 38. Cunningham RM, Carter PM, Ranney ML, et al. Prevention of firearm injuries among children
617 and adolescents: consensus-driven research agenda from the Firearm Safety Among Children and
618 Teens (FACTS) Consortium. *JAMA Pediatrics*. 2019;173(8):780-789.
619 doi:10.1001/jamapediatrics.2019.1494
- 620 39. Schmidt CJ, Rupp L, Pizarro JM, Lee DB, Branas CC, Zimmerman MA. Risk and protective
621 factors related to youth firearm violence: a scoping review and directions for future research. *J*
622 *Behav Med*. 2019;42(4):706-723. doi:10.1007/s10865-019-00076-7
- 623 40. Jacoby SF, Dong B, Beard JH, Wiebe DJ, Morrison CN. The enduring impact of historical and
624 structural racism on urban violence in Philadelphia. *Soc Sci Med*. 2018;199:87-95.
625 doi:10.1016/j.socscimed.2017.05.038
- 626 41. Knopov A, Rothman EF, Cronin SW, et al. The role of racial residential segregation in black-
627 white disparities in firearm homicide at the state level in the United States, 1991-2015. *J Natl Med*
628 *Assoc*. 2019;111(1):62-75. doi:10.1016/j.jnma.2018.06.002
- 629 42. Krieger N, Feldman JM, Waterman PD, Chen JT, Coull BA, Hemenway D. Local residential
630 segregation matters: stronger association of census tract compared to conventional city-level
631 measures with fatal and non-fatal assaults (total and firearm related), using the index of
632 concentration at the extremes (ICE) for racial, economic, and racialized economic segregation,
633 Massachusetts (US), 1995-2010. *J Urban Health*. 2017;94(2):244-258. doi:10.1007/s11524-016-0116-
634 z

- 635 43. Carter PM, Cook LJ, Macy ML, et al. Individual and neighborhood characteristics of children
636 seeking emergency department care for firearm injuries within the PECARN network. *Acad Emerg*
637 *Med.* 2017;24(7):803-813. doi:10.1111/acem.13200
- 638 44. Bates J. What one crowdfunding campaign reveals about why it's hard for U.S. cities to
639 address violence. *Time*. October 19, 2020. Accessed October 10, 2022.
640 <https://time.com/5891091/grand-rapids-violence-crowdsourcing-money/>
- 641 45. Hall M, Crowder K, Spring A. Neighborhood foreclosures, racial/ethnic transitions, and
642 residential segregation. *Am Sociol Rev.* 2015;80(3):526-549. doi:10.1177/0003122415581334
- 643 46. US Census Bureau. ACS 2019 (5-year estimates). Social Explorer. Accessed October 10, 2022.
644 https://www.socialexplorer.com/tables/ACS2019_5yr/R12800035
- 645 47. Mohatt NV, Kreisel CJ, Hoffberg AS, Wendleton L, Beehler SJ. A systematic review of factors
646 impacting suicide risk among rural adults in the United States. *J Rural Health.* 2021;37(3):565-575.
647 doi:10.1111/jrh.12532
- 648 48. Kegler SR, Simon TR, Zwald ML, et al. Vital signs: changes in firearm homicide and suicide
649 rates—United States, 2019–2020. *MMWR Morb Mortal Wkly Rep.* 2022;71(19):656-663.
650 doi:10.15585/mmwr.mm7119e1
- 651 49. About provisional mortality statistics, 2018 through last month. Centers for Disease Control
652 and Prevention. Accessed October 10, 2022. <https://wonder.cdc.gov/mcd-icd10-provisional.html>
- 653 50. Hemenway D. *While We Were Sleeping: Success Stories in Injury and Violence Prevention.*
654 University of California Press; 2009.
- 655 51. Watson MC, Errington G. Preventing unintentional injuries in children: successful
656 approaches. *Paediatr Child Health.* 2016;26(5):194-199. doi:10.1016/j.paed.2015.12.006
- 657 52. Dellinger AM, Sleet DA. Preventing traffic injuries: strategies that work. *Am J Lifestyle Med.*
658 2010;4(1):82-89. doi:10.1177/1559827609348694
- 659 53. Gielen AC, Green LW. The impact of policy, environmental, and educational interventions: a
660 synthesis of the evidence from two public health success stories. *Health Educ Behav.* 2015;42(1
661 suppl):20s-34s. doi:10.1177/1090198115570049
- 662 54. Sleet DA, Carlson Gielen A, Diekman S, Ikeda R. Preventing unintentional injury: a review of
663 behavior change theories for primary care. *Am J Lifestyle Med.* 2010;4(1):25-31.
664 doi:10.1177/1559827609349573
- 665 55. Doll L, Haas EN, Bonzo S, Sleet D, Mercy J. *Handbook of Injury and Violence Prevention.*
666 Springer Science & Business Media; 2007.
- 667 56. CDC. Ten great public health achievements--United States, 2001-2010. *MMWR Morb Mortal*
668 *Wkly Rep.* 2011;60(19):619-623.
- 669 57. Mozaffarian D, Hemenway D, Ludwig DS. Curbing gun violence: lessons from public health
670 successes. *JAMA.* 2013;309(6):551-552. doi:10.1001/jama.2013.38

- 671 58. Hemenway D. The public health approach to motor vehicles, tobacco, and alcohol, with
672 applications to firearms policy. *J Public Health Policy*. 2001;22(4):381-402. doi:10.2307/3343157
- 673 59. Hemenway D. *Private Guns, Public Health*. University of Michigan Press; 2010.
- 674 60. Lemieux P. Effect of gun culture and firearm laws on gun violence and mass shootings in the
675 United States: a multi-level quantitative analysis. *Int J Crim Justice Sci*. 2014;9(1):74-93.
- 676 61. Homsler D. *Women and Guns: Politics and the Culture of Firearms in America*. Routledge;
677 2015.
- 678 62. Jones K. *A Cultural History of Firearms in the Age of Empire*. Routledge; 2016.
- 679 63. Cunningham R, Ranney M, Goldstick J, Kamat S, Roche J, Carter P. Federal funding for
680 research on the leading causes of death among children and adolescents. *Health Aff (Millwood)*.
681 2019;38(10):1653-1661. doi:10.1377/hlthaff.2019.00476
- 682 64. Stark DE, Shah NH. Funding and publication of research on gun violence and other leading
683 causes of death. *JAMA*. 2017;317(1):84-85. doi:10.1001/jama.2016.16215
- 684 65. Gurrey SJ, McCauley H, Benson M, et al. Firearm-related research articles in health sciences
685 by funding status and type: a scoping review. *Prev Med Rep*. 2021;24:101604.
686 doi:10.1016/j.pmedr.2021.101604
- 687 66. Ladapo JA, Rodwin BA, Ryan AM, Trasande L, Blustein J. Scientific publications on firearms in
688 youth before and after Congressional action prohibiting federal research funding. *JAMA*.
689 2013;310(5):532-534. doi:10.1001/jama.2013.119355
- 690 67. Melillo G. Gun violence research receives federal funding for first time in 20 years. *Am J*
691 *Accountable Care*. December 24, 2019. Accessed October 10, 2022.
692 [https://www.ajmc.com/view/gun-violence-research-receives-federal-funding-for-first-time-in-20-](https://www.ajmc.com/view/gun-violence-research-receives-federal-funding-for-first-time-in-20-years)
693 [years](https://www.ajmc.com/view/gun-violence-research-receives-federal-funding-for-first-time-in-20-years)
- 694 68. Carter PM, Cunningham RM. Adequate funding for injury prevention research is the next
695 critical step to reduce morbidity and mortality from firearm injuries. *Acad Emerg Med*.
696 2016;23(8):952-955. doi:10.1111/acem.12982
- 697 69. Betz ME, Ranney ML, Wintemute GJ. Frozen funding on firearm research: "doing nothing is
698 no longer an acceptable solution". *West J Emerg Med*. 2016;17(1):91-93.
699 doi:10.5811/westjem.2016.1.29767
- 700 70. Rajan S, Branans CC, Hargarten S, Allegrante JP. Funding for gun violence research is key to
701 the health and safety of the nation. *Am J Public Health*. 2018;108(2):194-195.
702 doi:10.2105/ajph.2017.304235
- 703 71. Baker SP, Teret SP, Dietz PE. Firearms and the public health. *J Public Health Policy*.
704 1980;1(3):224-229. doi:10.2307/3342086
- 705 72. Alexander GR, Massey RM, Gibbs T, Altekruise JM. Firearm-related fatalities: an
706 epidemiologic assessment of violent death. *Am J Public Health*. 1985;75(2):165-168.
707 doi:10.2105/ajph.75.2.165

- 708 73. Kellermann AL, Reay DT. Protection or peril? An analysis of firearm-related deaths in the
709 home. *N Engl J Med*. 1986;314(24):1557-1560. doi:10.1056/NEJM198606123142406
- 710 74. Teret SP, Wintemute GJ. Handgun injuries: the epidemiologic evidence for assessing legal
711 responsibility. *Hamline L Rev*. 1983;6:341.
- 712 75. Wintemute GJ. Firearms as a cause of death in the United States, 1920-1982. *J Trauma Acute*
713 *Care Surg*. 1987;27(5):532-536. doi:10.1097/00005373-198705000-00013
- 714 76. American Medical Association. Firearms injuries and deaths: a critical public health issue.
715 *Public Health Rep*. 1989;104(2):111-120.
- 716 77. American College of Emergency Physicians. Practice resources - violence. Updated October
717 2019. Accessed October 10, 2022. [https://www.acep.org/patient-care/policy-statements/firearm-](https://www.acep.org/patient-care/policy-statements/firearm-safety-and-injury-prevention/)
718 [safety-and-injury-prevention/](https://www.acep.org/patient-care/policy-statements/firearm-safety-and-injury-prevention/)
- 719 78. Muelleman RL, Reuwer J, Sanson TG, et al. An emergency medicine approach to violence
720 throughout the life cycle. SAEM Public Health and Education Committee. *Acad Emerg Med*.
721 1996;3(7):708-715. doi:10.1111/j.1553-2712.1996.tb03496.x
- 722 79. Dowd M, Sege R; Council on Injury, Violence, and Poison Prevention Executive Committee;
723 American Academy of Pediatrics. Firearm-related injuries affecting the pediatric population.
724 *Pediatrics*. 2012;130(5):e1416-e1423. doi:10.1542/peds.2012-2481
- 725 80. Kellermann AL, Rivara FP, Rushforth NB, et al. Gun ownership as a risk factor for homicide in
726 the home. *N Engl J Med*. 1993;329(15):1084-1091. doi:10.1056/NEJM199310073291506
- 727 81. Kellermann AL, Rivara FP, Somes G, et al. Suicide in the home in relation to gun ownership. *N*
728 *Engl J Med*. 1992;327(7):467-472. doi:10.1056/NEJM199208133270705
- 729 82. Kellermann AL, Somes G, Rivara FP, Lee RK, Banton JG. Injuries and deaths due to firearms in
730 the home. *J Trauma Acute Care Surg*. 1998;45(2):263-267. doi:10.1097/00005373-199808000-00010
- 731 83. Bailey JE, Kellermann AL, Somes GW, Banton JG, Rivara FP, Rushforth NP. Risk factors for
732 violent death of women in the home. *Arch Intern Med Res*. 1997;157(7):777-782.
733 doi:10.1001/archinte.1997.00440280101009
- 734 84. Omnibus Consolidated Appropriations Bill, HR 3610, 104th Cong (1996).
- 735 85. Consolidated Appropriations Act, 2012, HR 2055, 112th Cong (2011).
- 736 86. Kellermann AL, Rivara FP. Silencing the science on gun research. *JAMA*. 2013;309(6):549-
737 550. doi:10.1001/jama.2012.208207
- 738 87. Branas CC, Wiebe DJ, Schwab C, Richmond T. Getting past the "P" word in federally funded
739 public health research. *Inj Prev*. 2005;11(3):191. doi:10.1136/ip.2005.008474
- 740 88. World Health Organization. Disease and injury country estimates. Accessed October 10,
741 2022. <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates>
- 742 89. Alcorn T. Trends in research publications about gun violence in the United States, 1960 to
743 2014. *JAMA Intern Med*. 2017;177(1):124-126. doi:10.1001/jamainternmed.2016.7076

- 744 90. Chien LC, Gakh M, Coughenour C, Lin RT. Temporal trend of research related to gun violence
745 from 1981 to 2018 in the United States: a bibliometric analysis. *Inj Epidemiol.* 2020;7(1):9.
746 doi:10.1186/s40621-020-0235-6
- 747 91. He K, Sakran JV. Elimination of the moratorium on gun research is not enough: the need for
748 the CDC to set a budgetary agenda. *JAMA Surg.* 2019;154(3):195-196.
749 doi:10.1001/jamasurg.2018.4211
- 750 92. Subbaraman N. United States to fund gun-violence research after 20-year freeze. *Nature.*
751 2020;577(7788):12. doi:10.1038/d41586-019-03882-w
- 752 93. Anderson BA. The role of data in research and policy. In: Scott RA, Kosslyn SM, eds. *Emerging*
753 *Trends in the Social and Behavioral Sciences.* Wiley; 2015:1-13.
- 754 94. Durkin A, Willmore B, Sarnoff CN, Hemenway D. The firearms data gap. *J Law Med Ethics.*
755 2020;48(suppl 4):32-38. doi:10.1177/1073110520979399
- 756 95. Roman JK, Cook P, eds. *Improving Data Infrastructure to Reduce Firearms Violence.* NORC at
757 the University of Chicago; 2021. Accessed October 10, 2022.
758 https://www.norc.org/PDFs/A%20Blueprint%20for%20U.S.%20Firearms%20Data%20Infrastructure/Improving%20Data%20Infrastructure%20to%20Reduce%20Firearms%20Violence_Final%20Report.pdf
759 [f](https://www.norc.org/PDFs/A%20Blueprint%20for%20U.S.%20Firearms%20Data%20Infrastructure/Improving%20Data%20Infrastructure%20to%20Reduce%20Firearms%20Violence_Final%20Report.pdf)
- 760
- 761 96. Zeoli AM, Frattaroli S, Roskam K, Herrera AK. Removing firearms from those prohibited from
762 possession by domestic violence restraining orders: a survey and analysis of state laws. *Trauma*
763 *Violence Abuse.* 2019;20(1):114-125. doi:10.1177/1524838017692384
- 764 97. Cloud LK, Prood N, Ibrahim J. Disarming intimate partner violence offenders: an in-depth
765 descriptive analysis of federal and state firearm prohibitor laws in the United States, 1991-2016. *J*
766 *Interpers Violence.* 2022;38(5-6):5164-5189. doi:10.1177/08862605221120891
- 767 98. Frattaroli S, Zeoli AM, Webster DW. Armed, prohibited and violent at home: implementation
768 and enforcement of restrictions on gun possession by domestic violence offenders in four US
769 localities. *J Fam Violence.* 2021;36(5):573-586. doi:10.1007/s10896-020-00241-6
- 770 99. Roman JK. *First Report of the Expert Panel on Firearms Data Infrastructure. The State of*
771 *Firearms Data in 2019.* NORC at the University of Chicago; 2020. Accessed October 10, 2022.
772 [https://www.norc.org/PDFs/Firearm%20Data%20Infrastructure%20Expert%20Panel/State%20of%20](https://www.norc.org/PDFs/Firearm%20Data%20Infrastructure%20Expert%20Panel/State%20of%20Firearms%20Research%202019.pdf)
773 [Firearms%20Research%202019.pdf](https://www.norc.org/PDFs/Firearm%20Data%20Infrastructure%20Expert%20Panel/State%20of%20Firearms%20Research%202019.pdf)
- 774 100. Braga AA, Weisburd DL. Must we settle for less rigorous evaluations in large area-based
775 crime prevention programs? Lessons from a Campbell review of focused deterrence. *J Exp Criminol.*
776 2014;10(4):573-597. doi:10.1007/s11292-014-9205-8
- 777 101. Kondo MC, Andreyeva E, South EC, MacDonald JM, Branas CC. Neighborhood interventions
778 to reduce violence. *Annu Rev Public Health.* 2018;39:253-271. doi:10.1146/annurev-publhealth-
779 040617-014600

- 780 102. Braga AA, Weisburd DL. Police innovation and crime prevention: lessons learned from police
781 research over the past 20 years. Paper presented at: National Institute of Justice Policing Research
782 Workshop: Planning for the Future; November 28-29 2006; Washington, DC.
783 <https://www.ojp.gov/pdffiles1/nij/grants/218585.pdf>
- 784 103. Oliphant SN, Mouch CA, Rowhani-Rahbar A, et al. A scoping review of patterns, motives, and
785 risk and protective factors for adolescent firearm carriage. *J Behav Med.* 2019;42(4):763-810.
786 doi:10.1007/s10865-019-00048-x
- 787 104. Zeoli AM, Goldstick J, Mauri A, et al. The association of firearm laws with firearm outcomes
788 among children and adolescents: a scoping review. *J Behav Med.* 2019;42(4):741-762.
789 doi:10.1007/s10865-019-00063-y
- 790 105. Ranney M, Karb R, Ehrlich P, et al. What are the long-term consequences of youth exposure
791 to firearm injury, and how do we prevent them? A scoping review. *J Behav Med.* 2019;42(4):724-
792 740. doi:10.1007/s10865-019-00035-2
- 793 106. Ngo QM, Sigel E, Moon A, et al. State of the science: a scoping review of primary prevention
794 of firearm injuries among children and adolescents. *J Behav Med.* 2019;42(4):811-829.
795 doi:10.1007/s10865-019-00043-2
- 796 107. Garvin EC, Cannuscio CC, Branas CC. Greening vacant lots to reduce violent crime: a
797 randomised controlled trial. *Inj Prev.* 2013;19(3):198-203.
- 798 108. ATF Youth Crime Gun Interdiction Initiative. *Crime Gun Trace Analysis Reports: The Illegal*
799 *Youth Firearms Markets in 27 Communities.* US Department of the Treasury; 1998.
- 800 109. ATF Youth Crime Gun Interdiction Initiative. *Youth Crime Gun Interdiction Initiative*
801 *Performance Report.* US Bureau of Alcohol, Tobacco, and Firearms; 1999.
- 802 110. Sugarmann J, Rand K. *More Gun Dealers than Gas Stations: A Study of Federally Licensed*
803 *Firearms Dealers in America.* Violence Policy Center Washington, DC; 1992.
- 804 111. Pierce GL, Briggs L, Carlson DA. National report on firearm trace analysis for 1996–1997.
805 Unpublished Report. Northeastern University, Boston; 1998.
- 806 112. Wachtel J. Sources of crime guns in Los Angeles, California. *Policing.* 1998;21(2):220-239.
807 doi:10.1108/13639519810220127
- 808 113. Weil DS, Knox RC. Effects of limiting handgun purchases on interstate transfer of firearms.
809 *JAMA.* 1996;275(22):1759-1761. doi:10.1001/jama.1996.03530460063033
- 810 114. Wright MA, Wintemute GJ, Rivara FP. Effectiveness of denial of handgun purchase to
811 persons believed to be at high risk for firearm violence. *Am J Public Health.* 1999;89(1):88-90.
812 doi:10.2105/ajph.89.1.88
- 813 115. Joseph HL, Kuperminc GP. Bridging the siloed fields to address shared risk for violence:
814 building an integrated intervention model to prevent bullying and teen dating violence. *Aggress*
815 *Violent Behav.* 2020;55:101506. doi:10.1016/j.avb.2020.101506

- 816 116. Taylor C, Shewbridge A, Harris J, Green JS. Benefits of multidisciplinary teamwork in the
817 management of breast cancer. *Breast Cancer (Dove Med Press)*. 2013;5:79-85.
818 doi:10.2147/bctt.S35581
- 819 117. Thurow AP, Abdalla CW, Younglove-Webb J, Gray B. The dynamics of multidisciplinary
820 research teams in academia. *Rev High Educ*. 1999;22(4):425-440. doi: 10.1353/rhe.1999.0019
- 821 118. Van Lange PA. *Bridging Social Psychology: Benefits of Transdisciplinary Approaches*.
822 Psychology Press; 2006.
- 823 119. Alper J, French M, Wojtowicz A, eds. *Health Systems Interventions to Prevent Firearm Injuries
824 and Death: Proceedings of a Workshop*. The National Academies Press; 2019.
- 825 120. Butkus R, Doherty R, Bornstein SS. Reducing firearm injuries and deaths in the United States:
826 a position paper from the American College of Physicians. *Ann Intern Med*. 2018;169(10):704-707.
827 doi:10.7326/M18-1530
- 828 121. Leshner AI, Altevogt BM, Lee AF, McCoy MA, Kelley PW, eds. *Priorities for Research to
829 Reduce the Threat of Firearm-Related Violence*. The National Academies Press; 2013.
- 830 122. Ranney ML, Fletcher J, Alter H, et al. A consensus-driven agenda for emergency medicine
831 firearm injury prevention research. *Ann Emerg Med*. 2017;69(2):227-240.
832 doi:10.1016/j.annemergmed.2016.08.454
- 833 123. Report of the Council on Science and Public Health. American Medical Association. Accessed
834 October 10, 2022. [https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-
835 browser/premium/csaph/physician-role-firearm-safety.pdf](https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/premium/csaph/physician-role-firearm-safety.pdf)
- 836 124. Cunningham RM, Carter PM, Zimmerman M. The Firearm Safety Among Children and Teens
837 (FACTS) Consortium: defining the current state of the science on pediatric firearm injury prevention.
838 *J Behav Med*. 2019;42(4):702-705. doi:10.1007/s10865-019-00077-6
- 839 125. Branas CC, Flescher A, Formica MK, et al. Academic public health and the firearm crisis: an
840 agenda for action. *Am J Public Health*. 2017;107(3):365-367. doi:10.2105/ajph.2016.303619
- 841 126. Degutis LC, Spivak HR. *A Public Health Approach to Firearm Violence Prevention*. American
842 Public Health Association; 2021.
- 843 127. Posavac EJ. *Program Evaluation: Methods and Case Studies*. Routledge; 2015.
- 844 128. Milstein B, Wetterhall S, Group CEW. A framework featuring steps and standards for
845 program evaluation. *Health Promot Pract*. 2000;1(3):221-228.
- 846 129. Milstein B, Wetterhall SF. Framework for program evaluation in public health. *MMWR
847 Recomm Rep*. 1999;48(RR-11):1-40.
- 848 130. Bauchner H, Rivara FP, Bonow RO, et al. Death by gun violence—a public health crisis. *JAMA
849 Psychiatry*. 2017;74(12):1195-1196. doi:10.1001/jamapsychiatry.2017.3616
- 850 131. Wintemute GJ. Responding to the crisis of firearm violence in the United States: comment
851 on “Firearm legislation and firearm-related fatalities in the United States”. *JAMA Intern Med*.
852 2013;173(9):740. doi:10.1001/jamainternmed.2013.1292

- 853 132. Mercy JA, Rosenberg ML. Preventing firearm violence. In: Elliott DS, Hamburg BA, Williams
854 KR, eds. *Violence in American Schools: A New Perspective*. Cambridge University Press; 1998:159-
855 187.
- 856 133. Mallonee S, Fowler C, Istre GR. Bridging the gap between research and practice: a continuing
857 challenge. *Inj Prev*. 2006;12(6):357-359. doi:10.1136/ip.2006.014159
- 858 134. Hanson DW, Finch CF, Allegrante JP, Sleet D. Closing the gap between injury prevention
859 research and community safety promotion practice: revisiting the public health model. *Public Health*
860 *Rep*. 2012;127(2):147-155. doi:10.1177/003335491212700203
- 861 135. Degli Esposti M, Wiebe DJ, Gasparrini A, Humphreys DK. Analysis of “stand your ground”
862 self-defense laws and statewide rates of homicides and firearm homicides. *JAMA Netw Open*.
863 2022;5(2):e220077. doi:10.1001/jamanetworkopen.2022.0077
- 864 136. Birkeland S, Murphy-Graham E, Weiss C. Good reasons for ignoring good evaluation: the
865 case of the Drug Abuse Resistance Education (DARE) program. *Eval Program Plan*. 2005;28(3):247-
866 256. doi:10.1016/j.evalprogplan.2005.04.001
- 867 137. West SL, O’Neal KK. Project DARE outcome effectiveness revisited. *Am J Public Health*.
868 2004;94(6):1027-1029.
- 869 138. Rosenbaum DP. Just say no to DARE. *Criminol Public Policy*. 2007;6(4):815-824.
- 870 139. Maahs J, Pratt TC. “I hate these little turds!”: science, entertainment, and the enduring
871 popularity of Scared Straight programs. *Deviant Behav*. 2017;38(1):47-60.
872 doi:10.1080/01639625.2016.1190619
- 873 140. David-Ferdon C, Vivolo-Kantor AM, Dahlberg LL, Marshall KJ, Rainford N, Hall JE. *A*
874 *Comprehensive Technical Package for the Prevention of Youth Violence and Associated Risk*
875 *Behaviors*. National Center for Injury Prevention Control, Centers for Disease Control and
876 Prevention; 2016. Accessed October 10, 2022. <https://stacks.cdc.gov/view/cdc/43085>.
- 877 141. Niolon PH; Centers for Disease Control and Prevention. *Preventing Intimate Partner Violence*
878 *Across the Lifespan: A Technical Package of Programs, Policies, and Practices*. Government Printing
879 Office; 2017.
- 880 142. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. *Preventing Suicide: A*
881 *Technical Package of Policies, Programs, and Practice*. National Centers for Injury Prevention and
882 Control, Centers for Disease Control and Prevention; 2017.
- 883 143. Kondo M, Hohl B, Han S, Branas C. Effects of greening and community reuse of vacant lots
884 on crime. *Urban Studies*. 2016;53(15):3279-3295. doi:10.1177/0042098015608058
- 885 144. Gong CH, Bushman G, Hohl BC, et al. Community engagement, greening, and violent crime: a
886 test of the greening hypothesis and busy streets. *Am J Community Psychol*. Published online October
887 10, 2022. doi:10.1002/ajcp.12622

- 888 145. Heinze JE, Krusky-Morey A, Vagi KJ, et al. Busy Streets Theory: the effects of community-
889 engaged greening on violence. *Am J Community Psychol*. 2018;62(1-2):101-109.
890 doi:10.1002/ajcp.12270
- 891 146. Branas CC, South E, Kondo MC, et al. Citywide cluster randomized trial to restore blighted
892 vacant land and its effects on violence, crime, and fear. *Proc Natl Acad Sci USA*. 2018;115(12):2946-
893 2951. doi:10.1073/pnas.1718503115
- 894 147. Hohl BC, Kondo MC, Kajeepeta S, et al. Creating safe and healthy neighborhoods with place-
895 based violence interventions. *Health Aff (Millwood)*. 2019;38(10):1687-1694.
896 doi:10.1377/hlthaff.2019.00707
- 897 148. Jay J, Miratrix LW, Branas CC, Zimmerman MA, Hemenway D. Urban building demolitions,
898 firearm violence and drug crime. *J Behav Med*. 2019;42(4):626-634. doi:10.1007/s10865-019-00031-
899 6
- 900 149. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight
901 remediation as a cost-beneficial solution to firearm violence. *Am J Public Health*. 2016;106(12):2158-
902 2164. doi:10.2105/AJPH.2016.303434
- 903 150. Lee LK, Fleegler EW, Farrell C, et al. Firearm laws and firearm homicides: a systematic review.
904 *JAMA Intern Med*. 2017;177(1):106-119. doi:10.1001/jamainternmed.2016.7051
- 905 151. Gibbs KD, Jr., Griffin KA. What do I want to be with my PhD? The roles of personal values and
906 structural dynamics in shaping the career interests of recent biomedical science PhD graduates. *CBE*
907 *Life Sci Educ*. 2013;12(4):711-723. doi:10.1187/cbe.13-02-0021
- 908 152. Schneider R, Ness KK, Rockwell S, Shaver K, Brutkiewicz R. *Faculty Workload Survey Research*
909 *Report*. National Academy of Sciences, Engineering, and Medicine; 2012. Accessed October 10, 2022.
910 https://thefdp.org/default/assets/File/Documents/fws_2012_exec_summary.pdf
- 911 153. Edwards MA, Roy S. Academic research in the 21st century: maintaining scientific integrity in
912 a climate of perverse incentives and hypercompetition. *Environ Eng Sci*. 2017;34(1):51-61.
913 doi:10.1089/ees.2016.0223
- 914 154. Estrada M, Hernandez PR, Schultz PW. A longitudinal study of how quality mentorship and
915 research experience integrate underrepresented minorities into STEM careers. *CBE Life Sci Educ*.
916 2018;17(1):1. doi:10.1187/cbe.17-04-0066
- 917 155. Atkins K, Dougan BM, Dromgold-Sermen MS, Potter H, Sathy V, Panter AT. "Looking at
918 myself in the future": how mentoring shapes scientific identity for STEM students from
919 underrepresented groups. *Int J STEM Educ*. 2020;7(1):42. doi:10.1186/s40594-020-00242-3
- 920 156. Robinson KA, Perez T, Nuttall AK, Roseth CJ, Linnenbrink-Garcia L. From science student to
921 scientist: predictors and outcomes of heterogeneous science identity trajectories in college. *Dev*
922 *Psychol*. 2018;54(10):1977-1992. doi:10.1037/dev0000567

- 923 157. Cheruvelil KS, Soranno PA, Weathers KC, et al. Creating and maintaining high-performing
924 collaborative research teams: the importance of diversity and interpersonal skills. *Front Ecol Environ.*
925 2014;12(1):31-38. doi:10.1890/130001
- 926 158. Medin DL, Lee CD. Diversity makes better science. *APS Observer*. April 27, 2012. Accessed
927 October 10, 2022. <https://www.psychologicalscience.org/observer/diversity-makes-better-science>
- 928 159. Sierra-Mercado D, Lázaro-Muñoz G. Enhance diversity among researchers to promote
929 participant trust in precision medicine research. *Am J Bioeth*. Apr 2018;18(4):44-46.
930 doi:10.1080/15265161.2018.1431323
- 931 160. Burroughs T. A healthier black community starts with more researcher representation at
932 universities. *HuffPost*. Updated May 13, 2017. Accessed April 25, 2022.
933 https://www.huffpost.com/entry/a-healthier-black-communi_b_9933836
- 934 161. Richardson Jr J. How researchers of color are left out of the gun violence conversation in
935 media and academia. December 20, 2018. Accessed April 25, 2022.
936 [https://www.diverseeducation.com/opinion/article/15103858/how-researchers-of-color-are-left-](https://www.diverseeducation.com/opinion/article/15103858/how-researchers-of-color-are-left-out-of-the-gun-violence-conversation-in-media-and-academia)
937 [out-of-the-gun-violence-conversation-in-media-and-academia](https://www.diverseeducation.com/opinion/article/15103858/how-researchers-of-color-are-left-out-of-the-gun-violence-conversation-in-media-and-academia)
- 938 162. Puttagunta R, Coverdale TR, Coverdale J. What is taught on firearm safety in undergraduate,
939 graduate, and continuing medical education? A review of educational programs. *Acad Psychiatry*.
940 2016;40(5):821-824. doi:10.1007/s40596-016-0490-6
- 941 163. Parikh K, Silver A, Patel SJ, Iqbal SF, Goyal M. Pediatric firearm-related injuries in the United
942 States. *Hosp Pediatr*. 2017;7(6):303-312. doi:10.1542/hpeds.2016-0146
- 943 164. Metz J. Repeal the Dickey Amendment to address polarization surrounding firearms in the
944 United States. *Am J Public Health*. 2018;108(7):864-865. doi:10.2105/ajph.2018.304461
- 945 165. Sloan JH, Kellermann AL, Reay DT, et al. Handgun regulations, crime, assaults, and homicide:
946 a tale of two cities. *New Engl J Med*. 1988;319(19):1256-1262. doi:10.1056/NEJM198811103191905
- 947 166. National Rifle Association. Medical journal's article seriously flawed, NRA says. *American*
948 *Rifleman*. 1989:55-56.
- 949 167. Wintemute GJ. Gun shows across a multistate American gun market: observational evidence
950 of the effects of regulatory policies. *Inj Prev*. 2007;13(3):150-155. doi:10.1136/ip.2007.016212
- 951 168. Wadman M. Firearms research: the gun fighter. *Nature*. 2013;496(7446):412-415.
952 doi:10.1038/496412a
- 953 169. Donnelly KA, Kafashzadeh D, Goyal MK, et al. Barriers to firearm injury research. *Am J Prev*
954 *Med*. 2020;58(6):825-831. doi:10.1016/j.amepre.2020.01.005
- 955 170. Simundić AM. Bias in research. *Biochem Med (Zagreb)*. 2013;23(1):12-15.
956 doi:10.11613/bm.2013.003
- 957 171. Smith J, Noble H. Bias in research. *Evid Based Nurs*. 2014;17(4):100-101. doi:10.1136/eb-
958 2014-101946

- 959 172. Pannucci CJ, Wilkins EG. Identifying and avoiding bias in research. *Plast Reconstr Surg*.
960 2010;126(2):619-625. doi:10.1097/PRS.0b013e3181de24bc
- 961 173. Glasgow RE, Lichtenstein E, Marcus AC. Why don't we see more translation of health
962 promotion research to practice? Rethinking the efficacy-to-effectiveness transition. *Am J Public*
963 *Health*. 2003;93(8):1261-1267. doi:10.2105/ajph.93.8.1261
- 964 174. National Institute of Mental Health. Welcome to the NIMH data archive. Accessed April 25,
965 2022. <https://nda.nih.gov/>
- 966 175. Kellermann AL. Obstacles to firearm and violence research. *Health Aff (Millwood)*.
967 1993;12(4):142-153. doi:10.1377/hlthaff.12.4.142

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