

# Scientific Evidence on the Effects of State Gun Laws

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*Scientific Evidence on the Effects of State Gun Laws*

Testimony of Andrew R. Morral<sup>1</sup>  
The RAND Corporation<sup>2</sup>

Before the Committee on the Judiciary  
Pennsylvania State Senate

September 25, 2019

**T**hank you Chairwoman Baker, Minority Chair Farnese, and distinguished members of the Senate Judiciary Committee for the opportunity today to testify on what scientific research can tell us about the effects of different state gun laws. The views I will share are based on a series of peer-reviewed reports published by RAND as part of its internally funded Gun Policy in America initiative, a multiyear effort to better understand the effects of gun laws.<sup>3</sup> The goal of this initiative is to establish a shared set of facts that will improve public discussions and support the development of fair and effective gun policies.

This testimony is also informed by my own assessment of recently published studies as part of ongoing research funded by Arnold Ventures, as well as my experiences as director of the National Collaborative on Gun Violence Research, a private philanthropy that funds gun policy research. The collaborative was created with a \$20 million seed grant from Arnold Ventures, which recognized the urgent need for greater investment in this arena.<sup>4</sup>

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<sup>1</sup> The opinions and conclusions expressed in this testimony are the author's alone and should not be interpreted as representing those of the RAND Corporation or any of the sponsors of its research.

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<sup>3</sup> See RAND Corporation, *The Science of Gun Policy: A Critical Synthesis of Research Evidence on the Effects of Gun Policy in the United States*, Santa Monica, Calif.: RAND Corporation, RR-2088-RC, 2018; Andrew R. Morral, Terry L. Schell, and Margaret Tankard, *The Magnitude and Sources of Disagreement Among Gun Policy Experts*, Santa Monica, Calif.: RAND Corporation, RR-2088/1-RC, 2018; Terry L. Schell, Beth Ann Griffin, and Andrew R. Morral, *Evaluating Methods to Estimate the Effect of State Laws on Firearm Deaths: A Simulation Study*, Santa Monica, Calif.: RAND Corporation, RR-2685-RC, 2018; and Terry L. Schell and Andrew R. Morral, *Evaluating Methods and Findings from a Study of State Gun Policies*, Monica, Calif.: RAND Corporation, RR-1642-RC, 2016.

<sup>4</sup> RAND staffs the National Collaborative on Gun Violence Research but does not establish its research agenda or make decisions about which research projects to fund. Those decisions are made by an independent advisory committee. Information on the collaborative, its advisory committee, and RAND's staffing roles are available at [www.ncgvr.org](http://www.ncgvr.org).

In this testimony, I will make three points:

1. There is some rigorous research on the effects of different gun laws that could help inform Pennsylvania's decisions on gun laws.
2. We do not have a comprehensive understanding of the full range of costs and benefits associated with any gun laws.
3. Underinvestment in gun policy and gun violence research leaves Pennsylvania and other states with little scientific information on which to base policy. Pennsylvania might consider funding research in these areas to clarify which of its laws, policies, and programs are having their intended effects and where new policies or programs are needed.

## There Is Some Scientific Evidence That Can Inform Legislation

There are many studies demonstrating that states where there are more-permissive gun laws or where more households own guns also tend to be those where there are more gun suicides and homicides compared with states that have more-restrictive laws or fewer guns. These are correlational studies, however, and so do not prove that the laws or the guns themselves are responsible for these differences. There are several plausible explanations for why states with more guns have higher gun violence, and the guns themselves are only one possible explanation. The cause and effect could also run in the other direction: States with gun violence problems may be places where people are more likely to want to purchase guns and are more likely to have greater legal freedoms to possess and use them. Moreover, some combination of both effects could be at play.

In order to understand the effects directly attributable to laws, we have to look beyond the simple correlational studies to more-sophisticated analyses that try to rule out the possibility that factors other than a given law could explain changes in state outcomes after the law's passage.

Last year, RAND released a report entitled *The Science of Gun Policy* that reviewed all of the available evidence from these more-rigorous studies, focusing on the effects of 13 types of state gun policies (see table).<sup>5</sup> We were interested in not just evidence on the effects of these policies on suicides, homicides, injuries, and mass shootings but also evidence on how the policies affect individuals' use of guns defensively, the gun industry, participation in hunting and sport shooting, and officer-involved shootings.

We used standardized and rigorous criteria for evaluating scientific studies, and we reviewed more than 9,000 reports and papers to identify those that made scientifically credible claims about the effects attributable to specific state gun laws. Many of the gun law effects that we sought evidence for have not yet been studied rigorously. Others have been studied, but the studies were inconclusive or too methodologically weak. For the remainder of studies, we used a standardized scoring rubric to rate available evidence for the effects of the laws as being *limited*, *moderate*, or *supportive*, our highest evidence rating.

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<sup>5</sup> RAND Corporation, 2018.

Our search identified only one type of law or policy as having *supportive* evidence: Laws that require gun owners to store their weapons locked or where children cannot access them appear to reduce gun injuries and deaths among children. I believe that Pennsylvania does not have a child-access prevention law.

We found *moderate* evidence, our second-highest evidence rating, suggesting that stand-your-ground laws like Pennsylvania’s may increase homicide rates. Moreover, since

publication of our report, four more studies of these laws’ effects have been published, all of which support the conclusion that they increase homicides in general and gun homicides in particular.<sup>6</sup> And this increase in homicides does not appear to be attributable to an increase in justifiable homicides.

We found *limited* evidence, our weakest evidence rating, for three laws. Specifically, (1) “shall-issue” concealed-carry laws, or “right to carry” laws, may increase violent crime rates; (2) laws that require a higher minimum age to purchase guns may reduce firearm suicides among youths; and (3) the federal ban on the sale of assault weapons that was implemented in 1994 led to a surge in sales and prices for such weapons in the months leading up to the ban.

I am skipping over two of our reported findings—that dealer background checks may reduce firearm suicides and homicides and that prohibiting gun ownership by individuals with certain mental health histories may reduce suicides and violent crime—because there are studies that have been released since our research was conducted that raise questions about those conclusions. We plan to update our 2018 review of gun policy research evidence twice over the next two years, incorporating new research as it is released.

### Policies and Outcomes Evaluated by RAND

Policies	Outcomes
1. Background checks	1. Suicide
2. Bans on the sale of assault weapons and high-capacity magazines	2. Violent crime
3. Stand-your-ground laws	3. Unintentional injuries and deaths
4. Prohibitions associated with mental illness	4. Mass shootings
5. Lost or stolen firearm reporting requirements	5. Officer-involved shootings
6. Licensing and permitting requirements	6. Defensive gun use
7. Firearm sales reporting and recording requirements	7. Hunting and recreation
8. Child-access prevention laws	8. Gun industry
9. Surrender of firearms by prohibited possessors	
10. Minimum age requirements	
11. Concealed-carry laws	
12. Waiting periods	
13. Gun-free zones	

<sup>6</sup> See Cassandra K. Crifasi, Molly Merrill-Francis, Alex McCourt, Jon S. Vernick, Garen J. Wintemute, and Daniel W. Webster, “Association Between Firearm Laws and Homicide in Urban Counties,” *Journal of Urban Health*, Vol. 95, No. 3, 2018, pp. 383–390; Mouhcine Guettabi and Abdul Munasib, “Stand Your Ground Laws, Homicides and Gun Deaths,” *Regional Studies*, Vol. 52, No. 9, 2018, pp. 1250–1260; Chandler McClellan and Erdal Tekin, “Stand Your Ground Laws, Homicides, and Injuries,” *Journal of Human Resources*, Vol. 52, No. 3, 2017, pp. 621–653; Abdul Munasib, Genti Kostandini, and Jeffrey L. Jordan, “Impact of the Stand Your Ground Law on Gun Deaths: Evidence of a Rural Urban Dichotomy,” *European Journal of Law and Economics*, Vol. 45, No. 3, 2018, pp. 527–554.

Throughout our report, we avoided any suggestion that there is “strong” evidence for any gun law effects. There is not. Even the law effects we describe as having moderate or supportive evidence are based on just a few studies—nothing like the quality and depth of evidence that had accumulated on the link between smoking and cancer by the time states started prohibiting indoor smoking. Indeed, one of the clearest findings from our study was how little strong research has been done on the effects of gun policies and related topics. We found no scientific evidence meeting our inclusion criteria for the vast majority of more than 100 policy effects we examined.

To be clear, however, the absence of evidence for the effects of these laws does not mean that they have no appreciable effect. Rather, the scientific studies required to understand what the laws’ intended or unintended effects may be have not yet been conducted.

This same problem affects gun laws other than those we reviewed as well. For instance, I know of no studies that would meet our standards of acceptable scientific rigor that have examined whether arming teachers makes students more or less safe. There has been only one such study examining the effects of extreme risk protection orders, or “red flag” laws, and just one examining laws that require mandatory safety training to operate a weapon. In both cases, I would rate the results of those studies as inconclusive.

For these types of laws and several others, the lack of good evidence is partly the result of the laws being relatively new, so we do not yet have the long data series often necessary for identifying evidence about the laws’ causal effects. In such cases, the best evidence we can point to may be correlational or anecdotal. These studies can suggest the *possible* effects of the law, but they typically cannot prove that the effects were caused by the law. Nevertheless, there are some relatively compelling studies to consider.

For instance, researchers at the University of California in Davis (UC Davis) recently published a review of court records on 159 cases in which a California judge granted an extreme risk protection order; those cases represent a little more than one-third of all 414 such orders issued in California since the law was implemented.<sup>7</sup> In this sample, the researchers found 21 instances where an order had been issued after an individual who had access to firearms made credible threats indicating that they planned to commit a mass murder. These included, for instance, one young man who posted threats to his classmates on Instagram, including “RIP [name deleted] high school,” “Nobody w[ill] be graduating from [ZIP code deleted],” “I hate all of u,” “Hope I die tonight somehow,” and “Dead or in jail.” In another case, a known supporter of the Islamic State, and someone already on the Federal Bureau of Investigation’s Terrorism Screening Center Watchlist, told an acquaintance that he was planning mass violence. When the protection order was issued, he had recently purchased a semiautomatic pistol and was awaiting the end of California’s ten-day waiting period before taking possession of it.

In ten of these 21 cases, police recovered firearms from the recipient of the order—52 firearms in total. In three cases, gun purchases made prior to the order were blocked during

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<sup>7</sup> Garen J. Wintemute, Veronica A. Pear, Julia P. Schleimer, Rocco Pallin, Syney Sohl, Nicole Kravitz-Wirtz, and Elizabeth A. Tomsich, “Extreme Risk Protection Orders Intended to Prevent Mass Shootings: A Case Series,” *Annals of Internal Medicine*, 2019.

California’s waiting period. Notably, however, none of these 21 individuals who received extreme risk protective orders later engaged in a mass shooting or other mass violence over the period they were observed. We cannot say for sure that they would have committed such violence had they not been issued an extreme risk protective order. But what this analysis shows is that, in California, the relatively sparing use of extreme risk protective orders included cases in which a few of the individuals had the means to conduct a mass shooting and had expressed the intent to cause mass violence. That is, there were at least 21 cases in which there truly were credible “red flag” warnings of imminent risk to the community and in which extreme risk protective orders *might* have prevented another incident of mass violence.

More often—roughly two-thirds of the time, in some states—these orders are used to prevent self-harm or suicide, and some analyses have suggested that completed suicides among individuals whose firearms were removed pursuant to a protective order may have been substantially lower than would be expected had the individuals retained their weapons.<sup>8</sup>

## We Do Not Know the Full Costs and Benefits of Any Gun Laws

Even where evidence for the effects of a gun law is strongest, we generally know about the effects of the law on only a subset of outcomes, typically firearm suicides, homicides, or injuries. This is a problem for legislators because, typically, there are many other possible effects of the law that raise concerns among different stakeholder groups. For instance, we found that some of the most compelling available evidence suggests that child-access prevention laws can prevent childhood injuries and deaths. Nevertheless, most states, including Pennsylvania, have not adopted these laws. One reason for their reluctance is that some gun owners fear that if their guns are locked up, they will not be able to access them quickly in an emergency. This is particularly a concern among handgun owners, the large majority of whom acquired their weapons for reasons of self-defense.<sup>9</sup>

Unfortunately, we know of no rigorous studies that have tried to estimate how often child-access prevention laws prevent a homeowner from accessing his or her weapon when it is needed. Surely this could happen, but we do not have the information needed to understand the trade-offs these laws might entail between child lives lost and lives lost due to forgone self-defense opportunities.

In addition to the lack of research on defensive gun use, there is almost no rigorous research that has been published on the effects of state gun laws on hunting and sport shooting participation; officer-involved shootings; or the gun industry, including gun sales, shooting range operators, hunting outfitters, trainers, and others. These outcomes concern constituencies that are

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<sup>8</sup> See, for example, J. Swanson, M. Norko, H. Lin, et al, “Implementation and Effectiveness of Connecticut’s Risk-Based Gun Removal Law: Does It Prevent Suicides?” *Law and Contemporary Problems*, Vol. 80, 2017, pp. 179–208; and J. Swanson, M. Easter, K. Alanis-Hirsch, et al, “Criminal Justice and Suicide Outcomes with Indiana’s Risk-Based Gun Seizure Law.,” *Journal of the American Academy of Psychiatry and the Law*, Vol. 47, No. 3, 2019, pp. 188–197.

<sup>9</sup> Azrael, Deborah, Lisa Hepburn, David Hemenway, and Matthew Miller, “The Stock and Flow of U.S. Firearms: Results from the 2015 National Firearms Survey,” *Russell Sage Foundation Journal of the Social Sciences*, Vol. 3, No. 5, 2017, pp. 38–57.

often influential in gun policy debates. Unfortunately, we have little rigorous research to provide legislators with information on the wider set of costs and benefits attributable to state gun laws.

## The Commonwealth Needs More and Better Information on the Effects of Gun Laws

Almost 15,000 Pennsylvanians died of gunshot wounds in the decade from 2008 to 2017.<sup>10</sup> Almost two-thirds of these deaths were suicides. This is 10 percent more than the number who died from car crashes. It's more than the number who died of opioid overdoses, alcohol-induced deaths, liver disease, Parkinson's, and many other conditions that states and the federal government have traditionally tried to learn more about by investing in descriptive research, prevention research, and treatment research. But similar government investments have not been made to understand how to prevent firearm deaths, one of the leading causes of preventable deaths.

Because of this underinvestment, I cannot provide you with answers to basic questions about whether laws involving, for instance, gun-free zones or assault weapon bans make us more or less safe. This does not mean that states should hold off passing legislation that legislators believe is likely to improve public safety and health. No one suggests that laws should not be passed until rigorous scientific evidence is available to support them. Often, there is no such evidence available when legislation is called for. But we should be checking to ensure that the laws that are passed because they seem likely to improve public safety actually do, because well-intentioned laws might have no effect or effects opposite of the intended ones. Based on recent studies, stand-your-ground laws may be an example of a law that is having unintended effects.

Moreover, in the case of many gun laws, there have been such long-standing disagreements about their true effects—disagreements that go to the heart of whether a law is fair or effective—that it seems reasonable to invest in careful and objective research to clarify the truth.

Gun violence is a serious problem involving human decisionmaking, and many examples show that these kinds of problems can be improved with the aid of systematic research into the characteristics, causes, and prevention of those problems. Almost half a century ago, Congress created the National Highway Traffic Safety Administration, which has collected decades of invaluable data on car crashes and has an extensive annual research budget to investigate strategies for reducing crashes. Due in part to this investment, traffic fatalities per mile traveled are a quarter of what they were when the agency was established, and this improvement has occurred without any attempts to ban cars.<sup>11</sup> Similarly, long-standing federal research

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<sup>10</sup> Statistics presented in this paragraph are from two sources: (1) CDC WONDER, "About Underlying Cause of Death, 1999–2017," Centers for Disease Control and Prevention, December 2018, <http://wonder.cdc.gov/ucd-icd10.html>; data are from the "Multiple Cause of Death Files, 1999–2017," as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program; and (2) OverdoseFreePA, online database, undated, [www.overdosefreepa.pitt.edu](http://www.overdosefreepa.pitt.edu).

<sup>11</sup> Bureau of Transportation Statistics, "Motor Vehicle Safety Data," webpage, U.S. Department of Transportation, undated, Table 2-17, <https://www.bts.gov/content/motor-vehicle-safety-data>.



investments on the causes, consequences, and prevention of smoking have been important factors in producing dramatic reductions in smoking prevalence and associated disease.

Some needed research investments must necessarily await federal action, such as large-scale data collection efforts that could be used to estimate state-level firearm injuries or gun ownership. Similarly, a large-scale research program on gun policy and violence prevention probably requires a larger investment than most states could afford. Nevertheless, until the federal government begins investing in gun policy research at levels comparable to its investment in other causes of death that kill similar numbers of people, there is a critically important role for states to play to expand the base of available science.

Several states have risen to this challenge. California has made a considerable investment in gun policy research at the Violence Prevention Center at UC Davis, New Jersey has funded a new Center on Gun Violence Research based at Rutgers University, Washington state invested \$1 million in gun violence research at Harborview Medical Center, and five East Coast states and Puerto Rico have banded together to form the Regional Gun Violence Research Consortium. Each of these initiatives is relatively small, but all can make important contributions to understanding gun violence prevention efforts within their states, such as the UC Davis study examining cases where extreme risk protective orders in California may have prevented mass violence. Other states—and commonwealths—also should consider investing in research to better understand their own gun violence prevention efforts and where new programs or policies might provide the greatest reductions in preventable deaths.

# Appendix

## Summarizing the Available Evidence

After reviewing several thousand candidate studies, we identified just 62 that met our inclusion criteria, 45 of which were published since 2003. These 62 studies provided evidence for 30 of the 104 main policy effects we set out to examine (that is, the effects of each of the 13 policies on each of the eight main outcomes). We concluded that there was some evidence of an increase or decrease on an outcome for 11 of the policy effects, there was inconclusive evidence for 19 effects, and there were no qualifying studies that had evaluated any of the remaining effects (74). The table below summarizes the strength of evidence and direction (increase or decrease) of the effects that the scientific literature currently provides, with links to detailed syntheses of the available research.

Gun Policies	Outcomes							
	Defensive Gun Use	Gun Industry Outcomes	Hunting and Recreation	Mass Shootings	Officer-Involved Shootings	Suicide	Unintentional Injuries and Deaths	Violent Crime
Background Checks				INCONCLUSIVE		MODERATE		MODERATE
Bans on the Sale of Assault Weapons and High-Capacity Magazines		LIMITED		INCONCLUSIVE				INCONCLUSIVE
Child-Access Prevention Laws				INCONCLUSIVE		SUPPORTIVE	SUPPORTIVE	INCONCLUSIVE
Concealed-Carry Laws		INCONCLUSIVE		INCONCLUSIVE		INCONCLUSIVE	LIMITED	LIMITED
Firearm Sales Reporting Requirements								
Gun-Free Zones								
Licensing and Permitting Requirements				INCONCLUSIVE		INCONCLUSIVE		INCONCLUSIVE
Lost or Stolen Firearm Reporting Requirements								
Minimum Age Requirements				INCONCLUSIVE		LIMITED	INCONCLUSIVE	INCONCLUSIVE
Prohibitions Associated with Mental Illness						LIMITED		MODERATE
Stand-Your-Ground Laws	INCONCLUSIVE					INCONCLUSIVE		MODERATE
Surrender of Firearms by Prohibited Possessors								INCONCLUSIVE
Waiting Periods				INCONCLUSIVE				INCONCLUSIVE

In some cases, we found evidence for more than one sub-outcome for a given policy, and the strengths of the evidence differed across the sub-outcomes. For example, there is supportive evidence that child-access prevention laws decrease unintentional injuries and deaths among children, while there is limited evidence that these laws decrease the same outcome among adults. In this table, we show the highest strength of evidence for a policy and outcome relationship. To see details of all sub-outcomes, click on the associated box in the table.