

Harvard Injury Control Research Center

Summary of Firearms Research Publications through September 2024

Since 1990, HICRC's small team of researchers has published 276 books, book chapters and journal articles on guns, along with various op-eds, letters, book reviews, responses, encyclopedia entries, etc. Among peer-reviewed journal articles, HICRC research was:

1. The first to describe national gun storage practices—and to show that firearm owners who have received training are not more likely to store their guns safely.
2. The first to determine what is actually taught in firearm training classes
3. The first to show that members of the National Rifle Association support most sensible gun control laws.
4. The first to document the various ways guns are used by batterers to intimidate their intimate partners.
5. The first to document the psychological costs of gun ownership on the community.
6. The first to explain the large overestimates of self-defense gun use.
7. The first to demonstrate that most so-called self-defense gun use is illegal, and inimical to society.
8. The first to document the large numbers of gun intimidations (hostile gun displays) not included in the NCVS
9. The first to document the association between gun carrying in motor vehicles and road rage.
10. The first to determine whose guns are being stolen.
11. The first to provide national information on guns on college campuses, and the type of students who bring guns to college.
12. The first to document that most inner-city teens who have carried guns illegally would prefer to live in a world where it was impossible for teens such as themselves to have access to firearms.
13. The first to document that the major reason why both rates of killings of police and killings of civilians by police vary so greatly across US states was the varying levels of household gun ownership.

The Center also showed the contagious nature of adolescent gun carrying and documented the strong association between household gun ownership levels and violent death to children and to women—deaths from homicide, suicide and gun accidents. The Center was among the first to document that boys commonly play with household firearms without adult supervision or knowledge and among the first to advocate for bean bag guns, tasers, and other less lethal weapons for police. A Center study provides the current best estimate of the number of guns in America and the percentage of gun transfers that occur without a background check.

Four of our major accomplishments have been:

- (a) making the case that violence is a public health problem;
- (b) promoting and creating a working model for the National Violent Death Reporting System;
- (c) providing overwhelming scientific evidence that a gun in the home increases the risk of completed suicide; and
- (d) working with gun advocates to disseminate ways to reduce rates of gun suicide.

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BOOKS:

1. Henigan, Dennis A; Nicholson EB, **Hemenway, David**. *Guns and the Constitution*. Northampton, MA: Aletheia Press, 1995. The last chapter of this short book, "Guns, Public Health and Public Safety," contains an interview with David Hemenway that explains the public health approach for reducing firearm injury.

2. **Hemenway, David**. *Private Guns and Public Health*. Ann Arbor, MI: University of Michigan Press, 2017. This book summarizes the literature on the relationship between guns and injuries and describes the public health approach to reducing firearm-related violence. The hardcopy came out in 2004, a paper edition with an Afterward summarizing the 2004-05 scientific literature was published in 2006, and the paperback was re-published in 2017 with a new cover and a new introduction summarizing the literature and the major events of the previous decade.

HOMICIDE:

1. Where there are more guns there is more homicide (literature review)

Our review of the academic literature found that a broad array of evidence indicates that gun availability is a risk factor for homicide, both in the United States and across high-income countries. Case-control studies, ecological time-series and cross-sectional studies indicate that in homes, cities, states and regions in the U.S., where there are more guns, both men and women are at a higher risk for homicide, particularly firearm homicide.

Hepburn, Lisa; Hemenway, David. Firearm availability and homicide: A review of the literature. *Aggression and Violent Behavior: A Review Journal*. 2004; 9:417-40.

2. Across high-income nations, more guns = more homicide

We analyzed the relationship between homicide and gun availability using data from 26 developed countries from the early 1990s. We found that across developed countries, where guns were more available, there were more homicides. These results often held even when the United States was excluded.

Hemenway, David; Miller, Matthew. Firearm availability and homicide rates across 26 high income countries. *Journal of Trauma*. 2000; 49:985-88.

3. Across states, more guns = more homicide

Using a validated proxy for firearm ownership, we analyzed the relationship between firearm availability and homicide across 50 states over a ten-year period (1988-1997).

After controlling for poverty and urbanization, for every age group, people in states with many guns had elevated rates of homicide, particularly firearm homicide.

Miller, Matthew; Azrael, Deborah; Hemenway, David. Household firearm ownership levels and homicide rates across U.S. regions and states, 1988-1997. *American Journal of Public Health*. 2002; 92:1988-1993.

4. Across states, more guns = more homicide (2)

Using survey data on rates of household gun ownership, we examined the association between gun availability and homicide across states, 2001-2003. We

found that states with higher levels of household gun ownership had higher rates of firearm homicide and overall homicide. This relationship held for both genders and all age groups, after accounting for rates of aggravated assault, robbery, unemployment, urbanization, alcohol consumption, and resource deprivation (e.g., poverty). There was no association between gun prevalence and non-firearm homicide.

Miller, Matthew; Azrael, Deborah; Hemenway, David. State-level homicide victimization rates in the U.S. in relation to survey measures of household firearm ownership, 2001-2003. *Social Science and Medicine*. 2007; 64:656-64.

5. A summary of the evidence on guns and violent death

This book chapter summarizes the scientific literature on the relationship between gun prevalence (levels of household gun ownership) and suicide, homicide and unintentional firearm death and concludes that where there are higher levels of gun ownership, there are more gun suicides and more total suicides, more gun homicides and more total homicides, and more accidental gun deaths.

This is the first chapter in the book and provides an up-to-date and readable summary of the literature on the relationship between guns and death. It also adds to the literature by using the National Violent Death Reporting System data to show where (home or away) the shootings occurred. Suicides for all age groups and homicides for children and aging adults most often occurred in their own home.

Miller M, Azrael D, Hemenway D. Firearms and violence death in the United States. In: Webster DW, Vernick JS, eds. *Reducing Gun Violence in America*. Baltimore MD: Johns Hopkins University Press, 2013.

POLICE HOMICIDE:

1. More guns = more homicides OF police

This article examines homicide rates of Law Enforcement Officers (LEOs) from 1996 to 2010. Differences in rates of homicides of LEOs across states are best explained not by differences in crime, but by differences in household gun ownership. In high gun states, LEOs are 3 times more likely to be murdered than LEOs working in low-gun states.

This article was cited by President Obama in a speech to a police association. This article will hopefully bring police further into the camp of those pushing for sensible gun laws.

Swedler DI, Simmons MM, Dominici F, **Hemenway D**. Firearm prevalence and homicides of law enforcement officers in the United States. *American Journal of Public Health*. 2015; 105:2042-48.

2. More guns = more homicide BY police

US states with high levels of household gun ownership had higher rates of fatal shootings of civilians by police, even after adjusting for rates of violent crime, poverty, urbanization and racial composition. The relationship between gun levels and police killings was strongest for rates of police shootings of victims who were armed with guns. The rate of fatal police shootings in the high-gun states was 3.6 times greater than in the low-gun states.

This article was cited in the US Supreme Court Bruen decision, No. 20-843, June 2022.

Hemenway D, Azrael D, Conner A, Miller M. Variation in rates of fatal police shootings across US states: the role of firearm availability. *Journal of Urban Health*. 2019; 96:63-73.

3. While violent crime is higher in urban areas, police killing of civilians is not.

Using data from Washington Post's "Fatal Force Database" (2015-2017), we showed that there is little difference in rates of police killing of civilians between urban and rural areas. Indeed, among Whites, rates of fatal police shooting deaths were higher in rural than urban areas. Efforts to reduce police shootings should include rural as well as urban police forces.

Hemenway D, Berrigan J, Azrael D, Barber C, Miller M. Fatal police shootings of civilians by rurality. *Preventive Medicine*. 2020; 134:106046.

4. Creating a typology of civilians shot and killed by police using a latent class analysis.

With NVDRS data from 2014-2015, we used latent class analysis to create a data-driven, exhaustive, mutually exclusive typology of seven classes. Classes differ across such dimensions as the event that brought the police and civilian together, the highest level of force used by the victim, and the kind of weapon used.

Wertz J, Nelson E, Salhi C, Azrael D, Barber C, Hemenway D, Miller M. A typology of civilians shot and killed by US police: a latent class analysis of firearm legal intervention homicide. *Journal of Urban Health*. 2020; 97:317-7328.

5. In about 1/3 of police homicides of civilians, the victim showed signs of a mental health crisis.

Using the National Violent Death Reporting System (NVDRS), we read the narratives of over 600 fatal police shootings from 17 states for 2014-2015. In 32% the victims showed signs of a mental health crisis. In three quarters of the cases, the crisis manifested as suicidal ideation, typically expressed verbally to a family member/intimate partner.

Khan H, Miller M, Barber C, Azrael D. Fatal police shootings of victims with mental health crises: a descriptive analysis of data from the 2014-15 National Violent Death Reporting System. *Journal of Urban Health*. 2024; 101:262-271.

6. States with more guns have high rates of both civilians shooting police and police shooting and killing civilians.

Using data from the Gun Violence Archive, Washington Post, and the Department of Justice, we constructed a cross-sectional state-level dataset 2019-2022. There was a strong across-state positive correlation ($r=.66$) between rates of police shot by civilians and civilians shot and killed by police. After accounting for differences in violent crime and other variables, the percentage of households with firearms was the consistent common denominator explaining the cross-state differences in rates both of police getting shot, and police shooting and killing civilians.

Jain V, **Hemenway D.** Cross-state relationship of firearm violence between police and civilians: gun ownership as a common denominator. *Journal of Urban Health*. 2024. <https://doi.org/10.1007/s11524-024-00904-5>.

SUICIDE:

1-2. Gun availability is a risk factor for suicide (literature reviews)

We performed reviews of the academic literature on the effects of gun availability on suicide rates. The preponderance of current evidence indicates that gun availability is a risk factor for youth suicide in the United States. At the turn of this century, the evidence that gun availability increases the suicide rates of adults was credible, but was less compelling. Most of the disaggregate findings of particular studies (e.g. handguns are more of a risk factor than long guns, guns stored unlocked pose a greater risk than guns stored locked) were suggestive but not yet well established.

Miller, Matthew; Hemenway, David. The relationship between firearms and suicide: A review of the literature. *Aggression and Violent Behavior: A Review Journal*. 1999; 4:59-75.

Miller, Matthew; Hemenway, David. Gun prevalence and the risk of suicide: A review. *Harvard Health Policy Review*. 2001; 2:29-37.

3. Across states, more guns = more suicide (cross sectional analyses)

Using a validated proxy for firearm ownership rates, we analyzed the relationship between firearm availability and suicide across 50 states over a ten-year period (1988-1997). After controlling for poverty and urbanization, for every age group, across the United States, people in states with many guns had elevated rates of suicide, particularly firearm suicide.

Miller, Matthew; Azrael, Deborah; Hemenway, David. Household firearm ownership levels and suicide across U.S. regions and states, 1988-1997. *Epidemiology*. 2002; 13:517-524.

4. Across states, more guns = more suicide (2) (cross sectional analyses)

Using survey data on rates of household gun ownership, we examined the association between gun availability and suicide across states, 1999-2001. States with higher levels of household gun ownership had higher rates of firearm suicide and overall suicide. This relationship held for both genders and all age groups. It remained true after accounting for poverty, urbanization and unemployment. There was no association between gun prevalence and non-firearm suicide.

Miller, Matthew; Lippmann, Steven; Azrael, Deborah; Hemenway, David. Household firearm ownership and rates of suicide across U.S. states. *Journal of Trauma*. 2007; 62:1029-35.

5. Across states, more guns = more suicides (time series analysis)

Using survey data on rates of household gun ownership, we examined the association between gun availability and suicide over time, 1981-2001. Changes in the levels of household firearm gun ownership was significantly associated with changes in both firearm suicide and overall suicide, for men, women and children, even after controlling for region, unemployment, alcohol consumption and poverty. There was no relationship between changes in gun ownership and changes in non-firearm suicide.

Miller, Matthew; Azrael, Deborah; Hepburn, Lisa; Hemenway, David; Lippman, Steven. The association between changes in household firearm ownership and rates of suicide in the United States, 1981-2002. *Injury Prevention*. 2006; 12:178-82.

6. Across states, more guns = more suicide (Northeast)

We analyzed data on suicide and suicide attempts for states in the Northeast. Even after controlling for rates of attempted suicide, states with more guns had higher rates of suicide.

Miller, Matthew; Hemenway, David; Azrael, Deborah. Firearms and suicide in the Northeast. *Journal of Trauma*. 2004; 57:626-632.

7. Across U.S. regions, more guns = more suicide (cross sectional analysis)

We analyzed the relationship of gun availability and suicide among differing age groups across the 9 US regions. After controlling for divorce, education, unemployment, poverty and urbanization, the statistically significant relationship holds for 15 to 24 year-olds and 45 to 84 year-olds, but not for 25 to 44 year-olds.

Birckmayer, Johanna; Hemenway, David. Suicide and gun prevalence: Are youth disproportionately affected? *Suicide and Life Threatening Behavior*. 2001; 31:303-310.

8. Differences in mental health cannot explain the regional more guns = more suicide connection

We analyzed the relationship of gun availability and suicide among differing age groups across the 9 US regions. Levels of gun ownership were highly correlated with suicide rates across all age groups, even after controlling for lifetime major depression and serious suicidal thoughts.

Hemenway, David; Miller, Matthew. The association of rates of household handgun ownership, lifetime major depression and serious suicidal thoughts with rates of suicide across US census regions. *Injury Prevention*. 2002; 8:313-16.

9. Gun owners do not have more mental health problems than non-owners

We added questions to, and analyzed data from the National Comorbidity Study. Gun owning households do not have more mental health problems than non-gun owning households; differences in mental health do not explain why gun owners and their families are at higher risk for completed suicide than non-gun owning families.

Miller, Matthew; Molnar, Beth; Barber, Catherine; Hemenway, David; Azrael, Deborah. Recent psychopathology, suicidal thoughts and suicide attempts in households with vs. without firearms: findings from the National Comorbidity Study Replication. *Injury Prevention*. 2009; 15:183-87.

10. Gun owners are not more suicidal than non-owners

We analyzed data from the Second Injury Control and Risk Survey, a 2001-2003 representative telephone survey of U.S. households. Of over 9,000 respondents, 7% reported past-year suicidal thoughts, and 21% of these had a plan. Respondents with firearms in the home were no more likely to report suicidal thoughts, plans or attempts, but if they had a suicidal plan, it was much more likely to involve firearms. The higher rates of suicide among gun owners and their families cannot be explained by higher rates of suicidal behavior, but can be explained by easy access to a gun.

Betz, Marian E; **Barber, Catherine; Miller, Matthew.** Suicidal behavior and firearm access: results from the second injury control and risk survey (ICARIS-2). *Suicide and Life Threatening Behaviors*. 2011; 41:384-91.

11. Adolescents who commit suicide with a gun use the family gun

The vast majority of adolescent suicide guns come from parents or other family members.

Johnson, Rene M; Barber, Catherine; Azrael, Deborah; Clark, David E; Hemenway, David. Who are the owners of firearms used in adolescent suicides? *Suicide and Life Threatening Behavior*. 2010; 40:609-611.

12. The case-fatality rate for suicide attempts with guns is higher than other methods

Across the Northeast, case fatality rates ranged from over 90% for firearms to under 5% for drug overdoses, cutting and piercing (the most common methods of attempted suicide). Hospital workers rarely see the type of suicide (firearm suicide) that is most likely to end in death.

Miller, Matthew; Azrael, Deborah; Hemenway, David. The epidemiology of case fatality rates for suicide in the Northeast. *Annals of Emergency Medicine*. 2004; 723-30.

13. The public does not understand the importance of method availability

Over 2,700 respondents to a national random-digit-dial telephone survey were asked to estimate how many of the more than 1,000 people who had jumped from the Golden Gate Bridge would have gone on to commit suicide some other way if an effective suicide barrier had been installed. Over 1/3 of respondents estimated that none of the suicides could have been prevented. Respondents most likely to believe that no one could have been saved were cigarette smokers and gun owners.

Miller, Matthew; Azrael, Deborah; Hemenway, David. Belief in the inevitability of suicide: Results from a national survey. *Suicide and Life Threatening Behavior*. 2006; 36:1-11.

14. Lethal means reduction strategies can successfully reduce suicide

This article summarizes recent additions to the scientific literature about means restriction policies and suicide.

Johnson, Rene M; Coyne-Beasley, Tamera. Lethal means reduction: What have we learned? *Current Opinion in Pediatrics*. 2009; 21: 635–640

15. There are effective ways to reduce suicide without affecting mental health

This introduction to suicide as an international public health problem examines the role of promoting mental health, changing cultural norms, and reducing the availability of lethal means in preventing suicide.

Barber, Catherine; Miller, Matthew. A public health approach to preventing suicide. In: Finkel, Madelon L. Perspectives in Public Health: Challenges for the Future. Santa Barbara CA: Praeger Publishers, 2010.

16. Differences in suicide rates across the U.S. are best explained by gun prevalence

This summary of the scientific literature on suicide in the United States emphasizes the importance of levels of household firearm ownership in explaining different rates of suicide over time and across states, households and genders.

Miller, Matthew; Azrael, Deboarh; Barber, Catherine. Suicide mortality in the United States: The importance of attending to method in understanding population-level disparities in the burden of suicide. *Annual Review of Public Health.* 2012; 33:393-408.

17. The main factor explaining differences in suicide rates across states is gun ownership, not rates of suicide attempts

Using data from recently available state-level suicide attempt data, this study examines whether the association between state-level firearm ownership and completed suicide remains after accounting for suicide attempt rates. Results show that firearm ownership rates – independent of underlying rates of suicidal behavior – largely explain the variation in suicide mortality across the 50 states.

This study answers skeptics of the empirical literature who claim that the association between firearm ownership and suicide mortality reflects unmeasured suicidal proclivities associated with firearm ownership.

Miller, Matthew; Barber, Catherine; Azrael, Deborah; White R. Firearms and suicide in the United States: Is risk independent of underlying suicidal behavior? *American Journal of Epidemiology.* 2013; 178: 946-55.

18. U.S. cities with more guns have higher rates of suicide because of higher rates of gun suicide

Across metropolitan statistical areas that are comprised of large U.S. cities, higher rates of firearm ownership are strongly associated with higher rates of firearm suicide and overall suicide, but not with non-firearm suicide. This study provides evidence consistent with previous case-control work and ecological studies across states and regions that firearms in the home increase the suicide risk.

We had previously shown that levels of household gun ownership largely explain the differences in suicide rates across regions and states. This article shows that gun ownership levels also explain much of the differences in suicide rates across cities. It is not altitude or remoteness from medical care facilities that can explain this gun-suicide connection.

Miller M, Warren M, Azrael D, Hemenway D. Firearms and suicide in US cities. *Injury and Prevention*. 2015; 21:e116-e119.

19. Firearms dealers can help prevent suicide

This article describes the New Hampshire gun shop project. After a spate of firearm suicides, a committee of firearm dealers, firearm rights advocates, and suicide prevention professionals including HICRC worked on ways to help gun shops help prevent suicide. Within a couple of years, half of New Hampshire gun shops were using suicide prevention materials developed by the committee.

The gun shop project has become a model of cooperation between public health professionals and gun advocates, a model that is being rolled out throughout the nation. This is the first academic article describing the cooperation and documenting its success. HICRC personnel took the lead on the campaign's written materials and the pre- and post-campaign interviews with gun shop owners.

Vriniotis M, Barber C, Frank E, Demicco R, and the NH Firearm Safety Coalition. A suicide prevention campaign for firearm dealers in New Hampshire. *Suicide and Life-Threatening Behavior*. 2015; 45(2): 157-163.

20. This article prioritizes the research needed to make a means restriction approach successful

This paper describes (a) the evidence about guns and suicide; (b) the types of voluntary programs (not command-and-control legislation) that will reduce firearm suicides, and (c) the research needed that can help create effective programs.

The National Action Alliance for Suicide Prevention and the National Institute of Mental Health (NIMH) asked HICRC to write priorities for firearm research. This article describes a research agenda that will provide the knowledge to make a means restriction approach successful.

Barber C & Miller M. Reducing a suicidal person's access to lethal means of suicide: A research agenda. *American Journal of Preventive Medicine*. 2014; 47(3):S264-72.

21. Guns, not antidepressant medication, explain the variants in suicide across the U.S.

This cross-sectional analysis of U.S. counties and states shows that differences in rates of suicide are not explained by differences in antidepressant medication, but are explained by levels of household firearm ownership.

Some mental health professionals have been claiming that antidepressant medication deserves the credit for the fall in suicide in the 1990s, and is the major reason some states have low suicide rates. This article shows that it's the guns.

This article received the Jess Krauss award as the best article in *Injury Epidemiology* for the year 2014.

Opoliner A, Azrael D, Barber C, Fitzmaurice G, Miller M. Explaining geographic patterns of suicide in the U.S.: The role of firearms and antidepressants. *Injury Epidemiology*. 2014; March 20, 1:6.

22. A summary for sociologists of the evidence on guns and suicide

This essay, in the leading suicide textbook in the field, should help medical professionals to begin to use the Means Matter approach at the individual patient level and to promote it at the societal level.

Azrael D, Miller M. Reducing access to lethal means: A review of the evidence base. In: *The International Handbook of Suicide and Attempted Suicide*, 2nd ed. West Sussex, England: John Wiley & Sons. 2015.

23. Guns alone explain the gun-suicide connection

This article demonstrates that it is virtually impossible for unmeasured confounding to explain the association between firearms and suicide. The association is a real one.

Historically, the tobacco lobby claimed that the association between cigarettes and cancer could possibly be explained by some unknown risk factor for both. This assertion was finally refuted when scientists showed the absurd degree of association between both that such an unmeasured confounder would have to have. This article uses the same refutation for those who try to deny the causal association between guns and suicide.

Miller M, Swanson SA, Azrael D. Are we missing something pertinent? A bias analysis of unmeasured confounding in the firearm-suicide literature. *Epidemiologic Reviews*. 2016; 38(1):62-9.

24. Ecological studies as well as case-control studies are important in understanding the connection of guns and violent death

The solicited commentary emphasizes the importance of the ecological studies of guns and suicide --- that they overcome the “ecological fallacy.” The commentary also argues that ecological studies may be superior to case-control studies dealing with guns and homicide since men are usually shot outside the home with someone else’s gun. The commentary shows that there is strong ecological evidence of the gun-suicide connection in addition to the solid evidence from the case-control studies.

This commentary makes the case that the case-control studies analyzed in a recent meta-analysis provide only one part of the evidence that a gun in the home increases the risk of suicide. Adding ecological (and other) studies makes the case overwhelming.

Hemenway D. Guns, suicide, and homicide: Individual-level versus population-level studies (Commentary). *Annals of Internal Medicine*. 2014 Feb; 160:134-135.

25. Public health experts and gun owner groups are working together to reduce suicide.

This article describes the work HICRC has done over the past decade in finding common ground with gun owners to reduce firearm suicide. Gun owner groups are seen as part of the solution rather than part of the problem of suicide in America. Suicide is a gun owner’s issue—gun owning families are at higher risk

for suicide. Partnerships among gun shop owners, firearm instructors, gun rights stakeholders and health professionals help to change social norms about guns and suicide, and can save lives.

Barber, Cathy; Frank, Elaine; Demicco, Ralph. Reducing suicides through partnerships between health professionals and gun owner groups—beyond docs vs locks. **JAMA-Internal Medicine**. 2017; 177 (1):5-6.

26. Few Americans understand that a gun in the home increases the risk of completed suicide

While the overwhelming majority of firearms researchers and suicide experts agree that a gun in the home increases the risk of suicide, that knowledge has yet to reach the general population. HICRC's national firearm survey finds that only 15% of Americans agree that the presence of a firearm in the home increases the risk for suicide, and only 30% of health care practitioners agree. Clearly more education about the scientific findings is needed.

Conner, Andrew; Azrael, Deborah; Miller, Matthew. Public opinion about the relationship between firearm availability and suicide: results from a national survey. *Annals of Internal Medicine*. 2018; 168(2):153-55.

27. Only 20% of suicide attempts in gun owning households are with firearms, but 75% of their suicides are firearm suicides

This paper combines six known “facts” about suicide (e.g., households with firearms are at approximately 3x the risk of suicide as households without firearms) to reach six estimates not currently available in the literature such as: gun-owning households account for about 90% of all firearm suicides; some 75% of their suicides are firearm suicides, but only 20% of their suicide attempts are with firearms. Among non-owning households, only 1% of their suicide attempts are with firearms, but firearms account for 10% of their suicides. The reasonableness of these results provides support for the reasonableness of the half-dozen known “facts” about firearms and suicide.

Hemenway D. Comparing gun-owning vs non-owning households in terms of firearm and non-firearm suicide and suicide attempts. *Preventive Medicine*. 2019; 119:14-16.

28. Honor-related suicides are distinct from other causes of suicide

Personal honor is associated with culturally defined honor-norms and its loss may predicate suicide. Reading the narratives from the National Violent Death Reporting System, we identified 163 honor-related suicides. Compared to the other 54,333 suicides in the database, honor-related suicides were more likely to write a suicide note, discuss suicidal intent, have criminal-legal problems, job and relationship problems, and suffer depression. Honor suicides are associated with public challenges to personal reputation.

Roberts K, **Miller M, Azrael D**. Honor-related suicide in the United State: A study of National Death Reporting System data. *Archives of Suicide Research*. 2019; 223:34-46.

29. Handguns are used in three fourths of firearm suicides, but in rural counties, long guns are used in a majority of adolescent male suicides.

We used NVDRS data 2005-2015, for the 13 states providing full data. Between 2005-2015 suicide rates by handguns, but not by long guns, increased in both urban and rural counties. Although handguns were used in nearly $\frac{3}{4}$ of firearm suicides for the total population, long gun use was relatively high in rural counties and among adolescents. Indeed, in rural counties, long guns were used in 51% of adolescent male suicides.

Hanlon TJ, **Barber C, Azrael D, Miller M**. Type of firearm used in suicides: findings from 13 states in the National Violent Death Reporting System, 2005-2015. *Journal of Adolescent Health*. 2019; 65:366-370.

30. Suicide attempts with firearms have the highest case fatality rate (90%).

We used data from Vital Statistics, National Emergency Departments, and Inpatient data to determine case fatality rates (CFR) for suicide (2007-2014).. Overall, 8.5% of suicide attempts were fatal (14.7% for males, 3.3% for females). The CFR was 3.4% of young people aged 15-24 and 35.4% for those 65+. Firearms were the most lethal (89.6%) followed by drowning (56.4%) and hanging (52.7%).

Conner A, Azrael D, Miller M. Suicide case fatality rates in the United States, 2007 to 2014: a nationwide population-based study. *Annals of Internal Medicine*. 2019; 171:885-895.

31. It is possible to effectively collaborate with firearm stakeholders.

If fewer people in suicidal crisis have ready access to firearms, the US will see a reduction in its suicide rate. This article describes the emerging literature on community-based, firearm stakeholder engaged efforts to amplify key messages and normalize life-saving behaviors.

Henn M, **Barber C**, **Hemenway D**. Involving firearm stakeholders in community-based suicide prevention efforts. *Current Epidemiology Reports*. 2019; 6:231-237.

32. Large longitudinal study finds that handgun ownership leads to more suicides, because it increases firearm suicide.

In California a cohort of 26 million residents—who had not previously acquired handguns-- were followed up to 12 years. Over 675,000 acquired handguns, and these people were far more likely to die by suicide, because of their high rates of firearm suicide. More than half of all their suicides occurred more than a year after firearm acquisition. They did not have higher rates of suicide by other means, or higher all-cause mortality.

Studdert DM, Zhang Y, Swanson SA, Prince L, Rhodden JA, Holsinger EE, Spittal MJ, Wintemute GJ, **Miller M**. Handgun ownership and suicide in California. *New England Journal of Medicine*. 2020; 382:2220-2229.

33. More mental health problems is not why adolescents living in homes with guns are more likely to die by suicide.

Other studies have shown that living in a home with guns is associated with higher rates of suicide (because of higher rates of firearm suicide). Could this difference in suicide rates be explained by their having more mental health problems? Data for this study come from a nationally representative sample of over 10,000 adolescents aged 13-18. 31% live in a home with guns, and the mental health characteristics of both groups (living and not living in a home with guns) are similar.

Swanson S, Eyllon M, Sheu Y, **Miller M**. Firearm access and adolescent suicide risk: Toward a clearer understanding of effect size. *Injury Prevention*. 2020; 27:264-270.

34. Evidence suggests there is probably little effect on non-firearm suicide for policies that reduce suicide.

This short commentary discusses that the limited evidence suggests there should not be large second-order effects on non-firearm suicide—due to lethal substitution or contagion—of policies that might reduce firearm suicide.

Azrael D, Miller M. Access to firearms, homicide, and suicide: role of the mortality multiplier. *American Journal of Public Health.* 2020; 110:1456-1457.

35. Few survivors of firearm suicide attempts go on to die by suicide.

Using linked Utah data, most suicide deaths were firearm deaths. Among 56 people who survived a firearm attempt, none subsequently died by suicide during the study period.

Thomas NM, **Barber C, Miller M.** A cohort study of initial self-harm events: method-specific case fatality of index events, predictors of fatal and non-fatal repetition, and frequency of method-switching. *International Review of Psychiatry.* 2021; 33:598-606.

36. Voluntary policies could reduce suicides at gun ranges.

Using NVDRS data from 2004-2015, we text searched over 63,000 firearm suicides for those occurring at public shooting ranges. We estimate that 35 such suicides occur each year. When gun ownership was noted, 86% of the guns were rented from the range. Some ranges have adopted policies, such as allowing rentals only if the person is not alone, that are responsive to the actual characteristics of these deaths can could potentially prevent most.

Barber C, Walters H, Brown T, **Hemenway D.** Suicides at gun ranges. *Crisis.* 2021; 42:13-19.

37. Among suicide decedents those who used a firearm are the least likely to have a history of deliberate self-harm.

Using linked data from Utah, we found that 19% of non-firearm suicide decedents had visited a hospital for deliberate self-harm, and 55% for any behavioral health issue (substance abuse, mental health, self-harm). Firearm suicide decedents respective numbers were 8% and 41%. Hospital-based interventions to prevent suicide should not be limited to visits for self-harm.

Berrigan J, Miller M, Zhang W, Azrael D, Barber C. Hospital visit histories of suicide decedents: a study in Utah. *Injury Prevention*. 2022; 28:259-261.

38. Only about half of women firearm suicides used their own gun—1/3 used their partners gun.

Using National Violent Death Reporting System (NVDRS) data for 2015-2017, we found that among firearm suicides, 88% of adult males used their own gun, 52% of adult women used their own gun; and 42% of youth aged 18-20 used their own gun. Different methods are required for these three groups if the goal is to reduce quick access to a firearm among those at-risk.

Barber C, Azrael D, Miller MJ, Hemenway D. Who owned the gun in firearm suicides of men, women and children in five US states? *Preventive Medicine*. 2022; 164:107066

39. Over 40% of firearm owners believe that restricting access to firearms would have zero effect on US suicides.

Data come from our 2019 National Firearm Survey, with responses from more than 2,500 firearm owners.

Andrew Conner, Azrael D, Miller M. Perceptions of firearm accessibility and suicide among US adults living in household with firearms. *JAMA Network Open*. 2022; 5:32239278.

40. The construction/extraction occupation had the highest rate of suicide among occupations in Utah.

Using linked data, we examined the suicide decedents who worked in Construction/Extraction in Utah. Two thirds of the males had a substance abuse problem, 48% were reported to have intimate partner problems, 26% had criminal problems and 25% were unemployed.

Henn M, **Barber C, Zhang W, Staley M, Azrael D, Miller M.** Identifying occupation groups for suicide prevention: a statewide data linkage study. *Archives of Suicide Research*. 2023; 27:494-504.

41. Suicide risk seems to decline when firearm ownership ends (“divestment”)

Using longitudinal data from over 500,000 handgun owners from California, this study compares owners who got rid of their guns vs owners who didn't. Divestment appeared to reduce firearm suicide by 50%, and controlling for other factors, also reduce total suicide risk.

Swanson SA, Studdert DM, Yifan Zhang, Prince L, **Miller M**. Handgun divestment and risk of suicide. *Epidemiology*. 2023; 34:99-106.

BLACK SUICIDE:

1.Black and White differences in demographic firearm suicide patterns cannot be explained by differences in the gun ownership patterns.

Using data from the 2001-04 Behavioral Risk Factor Surveillance System (BRFSS) and vital statistics data for the same period, we compared demographic patterns of gun ownership and suicide between Black and White men. The gun ownership patterns were very similar (e.g., gun ownership increased with age, and was higher in rural communities) but the suicide patterns were not. White demographic firearm suicide patterns reflected their gun ownership patterns, but Black firearm suicide fell with age, and was equal in rural and urban areas. Differences in Black and White suicide patterns cannot be explained by differences in gun ownership patterns.

Hemenway D, Zhang W. Patterns of household gun ownership and firearm suicide among Black men compared to White men. *Preventive Medicine*. 2022; 165 (Part A): 107318.

2. Unlike the strong correlation for Whites, across states Black suicide rates are only weakly correlated with Black gun ownership rates

We use state level data on gun ownership from the Behavioral Risk Factor Surveillance System (BRFSS) for 2001-2004, and state-level Vital Statistics data to compare the relationship across states between gun ownership and suicide separately for White adults and Black adults. For Whites the correlations between guns and firearm suicide (.82) and overall suicide rates (.63) are as expected. However, for Blacks, the comparable correlations are (.67) and (.17). Future studies will try to explain this differential racial relationship.

Hemenway D, Azrael D, Zhang W, Miller M. Black household gun ownership and Black suicide rates across US states. *Journal of the National Medical Association*. 2023; 115:263-169.

ALZHEIMER'S DISEASE:

1. Caregivers of persons with dementia rarely receive advice on firearm safety from health care providers.

An anonymous internet convenience sample of 82 caregivers of persons with dementia reported that while 32% had spoken with a healthcare provider for advice about driving, only 9% had about firearm safety—yet the people they were caring for were more likely to have a gun in the home than they were to drive.

Betz ME, Ranney ML, Knoepke CE, Johnson RL, Pallin R, **Miller M**, Wintemute GJ. Dementia and firearms: an exploratory survey of caregiver needs. *Journal of General Internal Medicine*. 2019. 34:1981-83.

2. Patients with dementia often have access to firearms.

Data from our 2019 National Firearm Survey found that 31% of patients with dementia had access to firearms in the home, yet only 5% of their caregivers had ever had a health professional talk to them about firearm safety.

Betz ME, **Azrael D**, Johnson RL, Knoepke CE, Ranney ML, Wintemute GJ, Matlock D, Suresh K, **Miller M**. Views of firearm safety among caregivers of people with Alzheimer disease and related dementias. *JAMA Network Open*. 2020 3:e207756.

3. Caregivers of Alzheimer's patients need good tools to help make good decisions about firearms.

This short paper describes the development of a Decision-Aid for patients with dementia to help caregivers understand various strategies to improve safety with regard to firearms, motor vehicles, and home safety.

Polzer E, Nearing K, Knoepke CE, Matlock DD, **Azrael D**, Siry BJ, Meador L, Betz ME. 'Safety in Dementia': Development of an online caregiver tool for firearm, driving, and home safety. *Journal of the American Geriatric Society*. 2020; 68:2137-2139.

TRAINING PHYSICIANS ABOUT SUICIDE:

1. Physicians need to do more to help reduce access to lethal means

This commentary presents the overwhelming evidence that the availability of lethal means increases the suicide rate and argues that physicians need to take an active role in reducing access for potentially suicidal individuals.

Miller, Matthew; Hemenway, David. Guns and suicide in the United States. *The New England Journal of Medicine*. 2008; 359:989-991.

2. Emergency department physicians and nurses rarely counsel about lethal means restriction

In one Boston emergency department (ED), ED physicians and nurses believe they should counsel suicidal patients on lethal means restriction, but they often don't. Psychiatrists working at the ED were much more likely to ask about firearms.

Betz, Marian E; **Barber, Catherine; Miller, Matthew.** Lethal means restriction as suicide prevention: Variation in belief and practices among providers in an urban ED. *Injury Prevention*. 2010; 16:278-81.

3. Emergency department physicians and nurses do not believe lethal means restriction can prevent suicide

Physicians and nurses at 8 emergency departments (n = 631) were surveyed about their practices and beliefs concerning means restriction and whether they asked their patients about guns. The proportion of providers who reported that they "almost always" ask suicidal patients about firearm access varied across five patient scenarios: 64% would ask a suicidal patient whose suicide plan involved firearms and 21% would ask a suicidal patient who did not have a specific plan. Less than half believed that most suicides are preventable; two-thirds of nurses thought that most or all firearm suicide decedents would have died by another method if the firearm had not been available.

Many ED nurses and physicians do not understand the importance of the availability of lethal means in determining whether or not a suicide attempt ends in death. The Means Matter Campaign needs to continue educating these professionals.

Betz, Marian E; **Miller, Matthew; Barber, Catherine** et al. Lethal means restriction for suicide prevention: Beliefs and behaviors of emergency department providers. *Depression and Anxiety*. 2013; 10:2013-20.

4. Mental health providers can be trained to reduce the risk of gun suicide

The Counseling on Access to Lethal Means (CALM) workshops were effective in improving mental health care providers' attitudes, beliefs and skills regarding lethal means counseling.

Johnson, Rene M; Frank, Elaine; Ciocca, Mark; **Barber, Catherine.** Training mental health providers to reduce at-risk patients' access to lethal means of suicide: Evaluation of the CALM project. *Archives of Suicide Research.* 2011 15(3): 259-264.

5. Suicide training in means reduction can be accomplished via the Internet

This article describes Harvard Injury Control Research Center's (HICRC) National Center for Suicide Prevention Training, which uses the public health approach and includes training on means restriction.

Stone, Deborah; Barber, Catherine, Posner, Marc. Improving public health practice in suicide prevention through online training: A case example. In: Sher, Leo & Vilens, Alexander, eds. *Internet and Suicide.* New York: Nova Science, 2009.

6. A summary for psychiatrists of the evidence on guns and suicide

This essay summarizes the evidence concerning guns and suicide for a leading psychiatry textbook on violence and mental illness. It is part of our ongoing work to educate medical professionals to become knowledgeable about and advocates for the Means Matter approach to suicide prevention.

Miller M, Barber C, Azrael D. Firearms and suicide in the U.S. In: Gold LH, Simon RI eds. *Gun Violence and Mental Illness.* Arlington, VA: American Psychiatric Publishing. 2015.

7. Training increases whether providers ask about suicide

This study evaluated, via self-report, an intervention to change provider attitudes and practices related to suicide risk assessment at emergency departments (EDs). Clinicians were trained in conducting universal risk assessment, but there was not training on lethal means counseling. There was a large increase in the percentage of providers reporting universal screening and secondary assessment of suicide risk. The proportion of nurses reporting asking suicidal patients about firearm access increased (the proportion of doctors asking did not change). Still, the numbers asking remained low relative to ideal practice.

Getting more providers to ask about firearms should help reduce suicides. The findings support the feasibility of implementing universal screening for suicide in EDs and points to the need for specific training in lethal means counseling.

Betz ME, Arias AA, **Miller M, Barber C**, et al. Change in emergency department providers' beliefs and practices after new protocols for suicidal patients. *Psychiatric Services*. 2015; 66:625-31.

8. Patients appreciate counseling about firearms

Sixteen psychiatric emergency clinicians were trained via an online course written by HICRC to provide lethal means counseling with parents of patients under 18 years receiving care for suicidality. Interviews with 114 families found that parents had favorable impressions of the counseling and good recall of the main messages. Everyone who reported there were guns in the home at the time of the visit reported at follow-up that all were currently locked, compared to 67% reporting this at the time of the visit.

The project demonstrates the feasibility of a Means Matter intervention for families with at-risk children.

Runyan C, Becker A, Brandspigel S, **Barber C**, Trudeau A, Novins D. Lethal means counseling for parents of youth seeking emergency care for suicidality. *Western Journal of Emergency Medicine*. 2016; 17:8-14.

9. Many emergency department physicians fail to ask suicidal patients about firearms

In a study of eight emergency departments, half of patients treated for suicide ideation or attempts, who had firearms in the home, had not been assessed for access to lethal means.

This study demonstrates the importance of training in lethal means counseling since lethal means assessment in emergency departments is still not the norm.

Betz ME, **Miller M, Barber C**, Betty B, Miller I, Camargo CA, Bourdreaux ED. Lethal means access and assessment among suicidal emergency department patients. *Depression and Anxiety*. 2016; 33(6):502

10. Physicians can help reduce suicide—without changing anyone’s mental health.

This commentary describes effective ways physicians and others who see people in crisis can reduce suicide. Many major successes in suicide prevention focused on reducing access to the lethal means of suicide rather than on solving mental health problems. In the United States, while 1% of suicide attempts are with guns, half of completed suicides are gun suicides. The commentary provides information on how physicians and others can help change social norms and reduce suicide by communicating this message: putting time and distance between a suicidal person and a gun can save a life.

Barber, Catherine; Hemenway, David; Miller, Matthew. How physicians can reduce suicide—without changing anyone’s mental health” *American Journal of Medicine* (‘the green journal’) 2016; 129(10):1016-7.

11-18. We are collaborating in ways to improve lethal means counselling.

11. Betz ME, Knoepke CE, Siry B, Clement A, **Azrael D**, Ernestus S, Matlock DD. ‘Lock to Live’: development of a firearm storage decision aid to enhance lethal means counselling and prevent suicide. *Injury Prevention*. 2019; 25(Suppl1): i18-i24.

12. Pallin R, Siry B, **Azrael D**, Knoepke CE, Matlock DD, Clement A, Ranney ML, Wintemute GJ, Betz ME. ‘Hey, let me hold your guns for a while’: a qualitative study of messaging for firearm suicide prevention. *Behavioral Sciences and the Law*. 2019; 37:259-269.

13. Valenstein M, Walters H, Pfeiffer P, Ganoczy D, Ilgen M, **Miller M**, Fiorella M, Bossarte R. Possession of household firearms and firearm-related discussions with clinicians among Veteran receiving VA mental health care. *Archives of Suicide Research*. 2020; 24(Sup 1): 260-279.

14. Betz ME, Knoepke CE, Simpson S, Siry BJ, Clement A, Saunders T, Johnson R, **Azrael D**, Boudreaux ED, Omeragic F, Adams LM, Amond S, Juarez-Colunga E, Matlock DD. An interactive web-based lethal means safety decision aid for suicidal adults (Lock to Live): pilot randomized control trial. *Journal of Medical Internet Research*. 2020; 22:e16253.

15. Hoops K, Fahimi J, Studenmund C, **Barber C**.....Ranney ML. Consensus-driven priorities for firearm injury education among medical professionals. *Academic Medicine*. 2022; 97:93-104.

16. Suicide prevention in the ED: lessons learned

This article provides information for others who will try to use the ED to reduce suicide.

Runyan CW, Brandspigel S, **Barber CW**, Betz M, **Azrael D**, **Miller M**. Lessons learned in conducting youth suicide prevention research in emergency departments. *Injury Prevention*. 2020; 26:159-163.

17-18. What ED behavioral health clinicians found effective

A survey of ED behavioral health clinicians who provided lethal means counseling to parents of adolescents at risk for suicide felt more comfortable when they were able to offer free firearm storage devices, and when they could cite research findings that suicide attempts with guns rarely afforded second chances, and that suicidal behavior is often impulsive and always unpredictable.

Salhi C, **Berrigan J**, **Azrael D**, Beatriz E, **Barber C**, Runyan C, **Miller M**. 'It's changed how we have these conversations': emergency department clinicians' experiences implementing firearms and other lethal suicide methods counseling for caregivers of adolescents. *International Review of Psychiatry*. 2021; 33:617-625.

Salhi C, Beatriz E, Berrigan J, **Azrael D**, Houston A, Tunyan C, **Barber C**, Betz M, **Miller M**. 'Your son needs help...and we're gonna help him.': A qualitative study of the experiences of gun-owning caregivers of adolescents receiving lethal means counseling in the emergency department. *Social Science and Medicine*. 2023; 335:116218,

19. ED physicians need better training about how to make firearm storage decisions.

Medical providers at four Colorado hospitals were surveyed about their attitudes and behaviors related to lethal means screening and counseling of patients with suicide risk. Fewer than 35% of ED providers, compared to 81% of behavioral health providers, felt confidence in their ability to counsel patients about guns.

Diurba S, Johnson RL, Siry BJ, Knoepke CE, Suresh K, Simpson SA, **Azrael D**, Ranney ML, Wintemute GJ, Betz ME. Lethal means assessment and counseling in the emergency department: differences by provider type and personal home firearms. *Suicide and Life-Threatening Behavior*. 2020; 50:1054-1064.

20. Few clinicians discuss firearms safety with their patients.

Our 2019 national survey asked a nationally random sample of adults living in homes with guns if their clinician had ever discussed firearm safety with them. Only 7.5% said yes; 12% of parents with children and 5% of adults without children in the home.

Conner A, Azrael D, Miller M. Firearm safety discussions between clinicians and US adults living in household with firearms: results from a 2019 national survey. *Annals of Internal Medicine*. 2021; 174:725-728.

HOMICIDE FOLLOWED BY SUICIDE:

1. Most men who shoot and kill their intimate partners then kill themselves (Kentucky)

We analyzed data from the Kentucky Firearm Injury Statistics Program for 1998-2000. While less than 7% of all firearm homicides were followed by a firearm suicide, in two-thirds of the cases in which a woman was shot in an intimate partner-related homicide, the male perpetrator then killed himself with the firearm. Few of these female victims had contact with the Department of Community-Based Services.

Walsh, Sabrina; **Hemenway, David**. Intimate partner violence: Homicides followed by suicides in Kentucky. *Journal of Kentucky Medical Association*. 2005; 103:667-70.

2. Most men who shoot and kill their intimate partners then kill themselves (many states)

We analyzed characteristics of homicides that were followed by suicide and by suicide attempts using data from multiple sites. Fifty-nine percent of the men who killed a female intimate partner with a firearm also took their own life.

Barber, Catherine W; Azrael, Deborah; Hemenway, David; Olson, Lenora M.; Nie, C; Schaechter, Judy; Walsh, Sabrina. Suicides and suicide attempts following homicide: Victim-suspect relationship, weapon type, and presence of antidepressants. *Homicide Studies*. 2008; 12:285-97.

3. High rates of homicide followed by suicide in U.S. likely due to firearm access

In a comparison of homicides-suicides in the Netherlands, Switzerland and the United States (using NVDRS data), major differences — e.g., Switzerland and the U.S. have much higher rates of homicide-suicide than the Netherlands — are explainable by the availability of firearms.

Liem, Marieke; **Barber, Catherine**; Markwalder, Nora; Killias, Martin; Nieuwbeerta, Paul. Homicide-suicide and other violent deaths: An international comparison. *Forensic Science International*. 2011; 207:70-76.

ACCIDENTS:

1. Across states, more guns = more unintentional firearm deaths

We analyzed data for 50 states over 19 years to investigate the relationship between gun prevalence and accidental gun deaths across different age groups. For every age group, where there were more guns, there were more accidental deaths. The mortality rate was 7 times higher in the four states with the most guns compared to the four states with the fewest guns.

Miller, Matthew; Azrael, Deborah; Hemenway, David. Firearm availability and unintentional firearm deaths. *Accident Analysis and Prevention*. 2001; 33:477-84.

2. Across states, unsafe gun storage = more unintentional firearm deaths

We analyzed data from the 2002 Behavioral Risk Factor Surveillance System that asked questions about guns and gun storage in the home, combined with information on deaths from the National Center for Health Statistics. Across states, both firearm prevalence AND questionable storage practices (i.e. storing firearms loaded and unlocked) were associated with higher rates of unintentional firearm deaths.

Miller, Matthew; Azrael, Deborah; Hemenway, David; Vrinotis, Mary. Firearm storage practices and rates of unintentional firearm deaths in the United States. *Accident Analysis and Prevention*. 2005; 37:661-67.

3. Youth killed in gun accidents are shot by other youth

The majority of people killed in firearm accidents are under age 24, and most of these young people are being shot by someone else, usually someone their own age. The shooter is typically a friend or family member, often an older brother. By contrast, older adults are at a far lower risk of accidental firearm death, and most often are shooting themselves. This article highlights one of the many benefits of the National Violent Death Reporting System (NVDRS). Before the NVDRS, data on the shooter in unintentional gun deaths was not readily available.

Hemenway, David; Barber, Catherine; Miller, Matthew. Unintentional firearm deaths: a comparison of other-inflicted and self-inflicted shootings. *Accident Analysis & Prevention*. 2010; 42:1184-8.

4. Risk factors for accidental gun death: consuming alcohol, hunting, playing with the gun, and thinking it is unloaded when it's not.

NVDRS data (2005-2015) indicate there were over 400 accidental gun deaths annually. The victimization rate was highest for 10-29-year-olds. The vast majority of victims were male. Common circumstances were playing with the gun (28%), thinking the gun was unloaded (17%), and hunting (14%). Firearm manufacturers, safety instructors, and gun owners could all contribute to preventing these deaths.

Solnick S, **Hemenway, D.** Unintentional firearm deaths in the United States, 2005-2015. *Injury Epidemiology*. 2019; 6:42

CHILDREN & ADOLESCENTS:

1. Across states, more guns = more violent deaths to children

We analyzed the relationship between firearm availability and unintentional gun death, homicide and suicide for 5-14 year olds across the 50 states over a ten-year period. Children in states with many guns have elevated rates of unintentional gun deaths, suicide and homicide. The state rates of non-firearm suicide and non-firearm homicide among children are not related to firearm availability.

Miller, Matthew; Azrael, Deb; Hemenway, David. Firearm availability and unintentional firearm deaths, suicide, and homicide among 5-14 year olds. *Journal of Trauma*. 2002; 52:267-75.

2. Child firearm suicide appears more impulsive than suicide by other means (Arizona)

We analyzed data from the Arizona Childhood Fatality Review Team comparing youth gun suicide with suicide by other means. Children who used a firearm to commit suicide had fewer identifiable risk factors for suicide, such as expressing suicidal thoughts. Gun suicides appear more impulsive and spontaneous than suicide by other means.

Azrael, Deborah; Hemenway, David; Miller, Matthew; Barber, Catherine; Schackner, Robert. Youth suicide: Insights from 5 years of Arizona child review team data. *Suicide and Life Threatening Behavior*. 2004; 34:36-43.

3. Guns are rarely used in infant homicides

This article used data from various locations to describe the circumstances of infant homicides. Guns were almost never used to kill infants. The perpetrator was virtually always caught, and often was the one calling the police.

Fujiwara, Takeo; Barber, Catherine; Schaechter, Judy; Hemenway, David. Characteristics of infant homicides in the U.S.: Findings from a multi-site reporting system. *Pediatrics*. 2009; 124:e210-17.

4. Parents incorrectly believe their children have not handled the family gun

At family practice clinics in rural Alabama, over 400 parents were separated from their children, and both were asked questions about guns in the home. We found

that over 1/3 of parents who reported that their son had not handled a household gun were contradicted by the child.

Baxley, Frances; Miller, Matthew. Parental misperceptions about their children and firearms. *Annals of Pediatric and Adolescent Medicine*. 2006; 160:542-47.

5. Unsupervised firearm handling by adolescents often involves shooting the gun

We analyzed data from a telephone survey of over 5,800 California adolescents conducted in 2000-01. We found that one-third of adolescents reported handling a firearm, 5% without adult supervision or knowledge. Smoking, drinking and parents not knowing the child's whereabouts in the afternoon were associated with unsupervised gun handling. These events usually occurred away from home, with friends. Half involved shooting the gun.

Miller, Matthew; Hemenway, David. Unsupervised firearm handling by California adolescents. *Injury Prevention*. 2004; 10:163-68.

6. Parents would not feel uncomfortable if asked by other parents if they have a gun

We evaluated a year-long comprehensive, community-based campaign in a small Midwestern city that promoted the importance of parents asking adults in whose homes their children play or visit about household firearms and their safe storage. Attitudes and behavioral intentions changed modestly, but not significantly, in the expected direction. In addition, most parents believed that asking about firearms is a good idea and few would feel uncomfortable if another parent asked about firearms in their home. However, they overestimated the likelihood that asking about firearms would be offensive to other parents.

Johnson, Rene M; Lintz, Jenny; Gross, Daniel, Miller, Matthew; Hemenway, David. Evaluation of the ASK campaign in two Midwestern cities. *ISRN Public Health*. 2011 Dec 1;2012.

7. There are many sensible low-cost policies that could reduce child violent deaths

The public health approach provides innovative ideas for protecting children from firearm injury.

Hemenway, David. Protecting children from firearm violence. *Big Ideas for Children: Investing in our Nation's Future*. 2008; 203-210.

8. While children are typically shot by other children, 2-4 years-olds usually shoot themselves

Using data from the National Violent Death Reporting System for 16 states from 2005 to 2012, we estimate that there were 110 unintentional firearm deaths to children 0-14 annually in the U.S. during this 8 year time period, 80% higher than reported by the Vital Statistics. The large majority of children are shot by an adult who is not a family member.

While children are typically shot by other children, victims aged 2-4 are usually shooting themselves. While many boys aged 11-14 are shot unintentionally at a friend's house, this is not the case for girls and children aged 10 years and under.

This article received the Jess Krauss award as the best article in *Injury Epidemiology* for the year 2015.

Hemenway, David, Solnick SJ. Children and unintentional firearm death. *Injury Epidemiology*. 2015: 2:26-31.

9. Child perpetration of homicide can be classified into 5 categories

Using data from the National Violent Death Reporting System, we examined homicides by children aged 0-14. Nearly 90% of the perpetrators were boys, over 90% were aged 11-14, and most used guns. We created five categories which accounted for over 70% of the events. These categories are: (1) the Caretaker, a juvenile, often an older brother, is given the responsibility of caring for an infant. The homicide typically occurs in the residence and blunt force is used (no guns); (2) Impulsive shooting during play, in which the child typically shoots a sibling or friend. Except for some notation of momentary anger, these cases look much like unintentional firearm fatalities; (3) Robbery, a group of youth are trying to steal money, usually from an adult; (4) Group assault, a group of youth are fighting, usually with other youth; (5) Killing an adult family member, typically a parent or grandparent. Creating a typology of events is useful both for understanding the problem and determining solutions.

Hemenway, David; Solnick, Sara J. The epidemiology of homicide perpetration by children. *Injury Epidemiology*. 2017; Dec 4(1): 5-

10. Commentary: Do home guns increase depression among adolescent girls?

A large longitudinal cohort study of adolescents by Kim in *Social Science & Medicine* (2017) found that gaining easy access to a firearm in the home was associated with increased depression among girls and increased fear in schools. We discuss many relevant studies (e.g., a meta-analysis of 78 studies found that the mere presence of weapons increases aggressive thought, hostile appraisals and actual aggression). We conclude: “My hope is that Kim’s 2018 study of the psychological effects of gun ownership will be a seminal investigation, leading to increased interest in the psychological effects—both positive and negative—of firearms on all members of the household, as well as members of the surrounding community.”

Hemenway, David. Easy home gun access and adolescent depression. *Social Science & Medicine*. 2018; 203:60-63.

11. 20% of homicides of children (aged 2-14) are related to Intimate Partner Violence (IPV)

Using the NVDRS (2005-2014), we read narratives of homicides to children age 2-14 to determine which were IPV-related. Two types of such homicides are (1) the perpetrator also kills (or attempts to kill) the intimate partner (54% of the IPV cases), and (2) intimate partner conflict (e.g., divorce, separation, custody) precedes the homicide (46% of IPV cases). Overall, 20% of child deaths were IPV-related. Compared with other perpetrators of child homicide, IPV-related perpetrators were more likely to be White, use a firearm, and die by suicide.

Adhia A, Austin SB, Fitzmaurice GM, **Hemenway D.** The role of intimate partner violence in homicides of children aged 2-14 years. *American Journal of Preventive Medicine*. 2019; 56:38-46.

12. 7% of homicides of adolescence aged 11-18 are Intimate Partner Homicide (IPH)

From NVDRS data (2003-2016), the perpetrators of 7% of the homicides were ex- or current spouse, boyfriend or girlfriend. 90% of the victims were female. Common reasons were jealousy, broken relationship, pregnancy—combined with access to a firearm.

Adhia A, Kernie MA, **Hemenway D, Vavilala MS, Rivara FP.** Intimate partner homicide of adolescent victims. *JAMA Pediatrics*. 2019; 173:571-77.

13. Many parents incorrectly believe their adolescents could not independently gain access to the household firearm.

In our 2019 national survey, 280 parents and their adolescents (aged 13-17) separately answered questions about firearm access in their home. In households where parents said these teenagers could not access a firearm, 22% of the adolescents reported they could access the firearm in less than 5 minutes, and another 15% said it would take 5 minutes to an hour.

Salhi C, **Azrael D, Miller M.** Parent and adolescent reports of adolescent access to household firearms in the United States. *JAMA Network Open.* 2021; 4:e210989.

14. In 2017, firearms became the leading cause of death for children and youth aged 1-24.

In this Commentary, we use Vital Statistics data to report a change in the leading cause of death for 1-24-year-olds in the United States. For more than six decades motor vehicles had been their leading cause of death, but because of improvements in motor vehicle safety, and increases in the lethality of firearms, in 2017 guns surpassed motor vehicles as the leading cause of death for this age group.

Lee LK, Douglas K, **Hemenway D.** Crossing lines: a change in the leading cause of death among US children. *New England Journal of Medicine.* 2022; 286:1485-1487.

15. 12% of US gun owners in homes with children (under age 18) report their child can independently access their firearm.

Over 680 gun owners with children responded to questions from our 2019 National Firearm Survey. 12% said that a child in their home could access and load one of their guns when they were not present.

Berrigan J, Azrael D, Miller M. Parental perceptions of their children's access to household firearms. *Journal of Pediatrics.* 2023; 255:154-58.

16. Children (age 0-14) in low gun states are less likely to commit a homicide, or a suicide, or be the perpetrator in an accidental gun death.

Using NVDRS data (2017-2018), we examined child perpetrators of violent death. We estimate that annually, 82 children become homicide suspects, 624 commit suicide, and 71 are the shooter in an accidental gun death. Overall, in

these violent deaths, the large majority of the perpetrators and victims are male, and over 80% of all the deaths occur at home. Dividing the states into 3 levels of firearm ownership, children in the lowest level states are less likely to be perpetrators of each of the types of violent death, largely due to lower rates of firearm death.

Solnick SJ, **Hemenway D**. Child perpetrators of homicide, suicide, and unintentional firearm fatalities in the United States. In: *The Routledge International Handbook of Juvenile Homicide 2024* (pp. 274-287). Routledge.

WOMEN:

1. Across states, more guns = more female violent deaths

We analyzed the relationship between firearm availability and unintentional gun death, homicide and suicide for women across the 50 states over a ten-year period. Women in states with many guns had elevated rates of unintentional gun deaths, suicides and homicides, particularly firearm suicides and firearm homicides.

Miller, Matthew; Azrael, Deborah; Hemenway, David. Firearm availability and unintentional firearm deaths, suicide, and homicide among women. *Journal of Urban Health*. 2002; 79:26-38.

2. Across high-income countries, more guns = more female homicide deaths.

We analyzed the relationship between gun availability and homicides of women with data from 25 high-income countries. Across developed nations, where gun are more available, there are more homicides of women. The United States has the most firearms and U.S. women are far more likely to be homicide victims than women in other developed countries.

Hemenway, David; Shinoda-Tagawa, Tomoko; Miller, Matthew. Firearm availability and female homicide victimization rates across 25 populous high-income countries. *Journal of the American Medical Women's Association*. 2002; 57:100-04.

3. Women's suicides increase when a handgun is brought into the home.

We analyzed data on 9.5 million California women living with co-habitants in a handgun free home. Between 2004-2016, for over 330,000 of these women, a co-habitant brought a handgun into the home. Over 2,000 of these women died by suicide. Their excess suicide rate was accounted for by higher rates of suicide by firearm. Women with and without handguns in the home had similar rates of non-firearm suicide. Keeping a handgun in the home increases the risk of completed suicide to non-owners.

Miller M, Zhang Y, Prince L, Swanson SA, Wintemute GJ, Holsinger EE, Studdert DM. Suicide deaths among women in California living with handgun owners vs those living with other adults in handgun-free homes, 2004-2016. *JAMA Psychiatry*. 2022; 79:582-588.

VETERANS:

1. Veterans have high rates of firearm suicide

There are no differences in suicide risk among middle-aged and older male veterans and non-veterans. Suicide by firearm is higher, suicide by non-firearm is lower. It is probable that lower baseline risk of active duty soldiers (healthy worker effect) tends to be counterbalanced by the accessibility of firearms to these veterans.

Miller, Matthew; Barber, Catherine; Azrael, Deborah, Calle, Eugenia E; Lawler, Elizabeth; Mukamal, Kenneth J. Suicide among US veterans: A prospective study of 500,000 middle-aged and elderly men. *American Journal of Epidemiology*. 2009; 170:494-500.

2. Reducing access to lethal means can begin to reduce Veteran suicide rates today

This editorial in an issue of the flagship public health journal devoted entirely to veteran suicide emphasizes the importance of the availability of firearms in determining whether suicide attempts prove fatal.

Miller, Matthew. Preventing suicide by preventing lethal injury: The need to act on what we already know. *American Journal of Public Health*. 2012; 102(S1):e1-3.

3. Most veterans do not own firearms

Using data from the HICRC sponsored National Firearms Survey, which oversampled US veterans, researchers provided detailed, nationally representative information on firearm ownership among US veterans. About 47% of male veterans and 24% of female veterans own firearms. Over 63% report that protection is a primary reason for firearm ownership.

Cleveland, Emily C; **Azrael, Deborah;** Simonetti, Joseph A. Firearm ownership among American veterans: findings from the 2015 National Firearm Survey *Injury Epidemiology*. 2017; 4(1) 33-

4-5. One third of Veterans store their guns loaded and unlocked

Data from the HICRC 2015 National Firearm Survey show that 1 in 3 US Veteran firearm owners store a household firearm loaded and unlocked. Storage is similar among those with and without self-reported suicide risk factors. Veterans

who own more guns, own guns for protection, and carry guns are more likely than others to store guns loaded and unlocked.

Simonetti J, **Azrael D**, Rowhani-Rahbar A, **Miller M**. Firearm storage practices among American veterans. *American Journal of Preventive Medicine*. 2018; 55:445-454.

Simonetti J, **Azrael D**, **Miller M**. Firearm storage practices, risk perceptions, and planned suicide prevention actions among veteran gun owners with and without self-harm risk factors. *Suicide and Life Threatening Behavior*. 2019; 49:653-664.

6-7. Few Veterans receive clinician-delivered firearm safety counseling; most believe clinicians should provide such counseling.

Data come our 2019 National Firearm Survey.

Simonetti JA, **Azrael D**, **Zhang W**, **Miller M**. Receipt of clinician-delivered firearm safety counseling among US Veterans: results from a 2019 national survey. *Suicide and Life Threatening Behavior*. 2022; 52:1121-1125.

Aunon FM, **Azrael D**, Simonetti JA, **Miller M**. Beliefs among Veteran firearm owners regarding whether clinicians should discuss firearm safety with patients. *JAMA Network Open*. 2023; e:2321219.

GUN OWNERSHIP:

1. Almost half of gun owners own four or more guns

We analyzed a nationally representative household telephone survey of over 2,750 adults that we conducted in 2004. We found that 38% of households (45% of men and 11% of women) reported owning at least one firearm. Almost half (48%) of gun owners reported owning four or more guns with a few possessing large numbers of guns; 64% of gun owners owned at least one handgun. Gun ownership remains widespread, but a smaller percentage of gun owners possess an increasing percentage of the gun stock.

Hepburn, Lisa; Miller, Matthew; Azrael, Deborah; Hemenway, David. The US gun stock: Results from the 2004 national firearms survey. *Injury Prevention*. 2007; 13:15-19.

2. Owners of semi-automatic guns are more likely to binge drink than other gun owners

We analyzed data from a national random-digit-dial telephone survey. Owners of semi-automatic weapons are more likely than other gun owners to be male, own a gun for protection, and report binge drinking.

Hemenway, David; Richardson, Elizabeth. Characteristics of automatic or semi-automatic firearm ownership. *American Journal of Public Health*. 1997; 87:286-88.

3-4. Gun ownership creates external psychic costs

We analyzed whether perceptions of safety might be affected if more people in a community acquired firearms using data from a national random-digit-dial survey of adults conducted under the auspices of the Harvard Injury Control Research Center. By a margin of more than 3 to 1, Americans would feel less safe, not safer, as others in their community acquire guns. Among women, but not among men, those who have been threatened with a gun are particularly likely to feel less safe.

Hemenway, David; Solnick, Sara J; Azrael, Deborah R. Firearms and community feelings of safety. *Journal of Criminal Law and Criminology*. 1995; 86:121-132.

Miller, Matthew; Azrael, Deborah; Hemenway, David. Community firearms and community fear. *Epidemiology*. 2000; 11:709-714.

5. For over 20% of firearm acquisitions in the past two years, there was no background check

Using data from a HICRC sponsored nationally representative survey of more than 1600 firearm owners, we estimate that 22% of gun owners who reported obtaining their most recent firearm in the previous two years reported doing so without a background check. For firearms purchased privately, 50% were obtained without a background check (with an even higher percentage for gun owners living in states that do not regulate private firearm sales). An accompanying editorial by Philip Cook of Duke University was entitled “At last, a good estimate of the magnitude of the private-sale loophole for firearms.”

Miller, Matthew; Hepburn, Lisa; Azrael, Deborah. Firearm acquisition without background checks: results for a national survey. *Annals of Internal Medicine*. 2017; 166(4): 232-39.

6. 22% of US adults are gun owners

Using data from HICRC’s 2015 national survey, we estimate that 22% of US adults own guns. In other words, there are 3.5 times as many adults do not own guns as do own guns. We estimate there are approximately 265 million guns in the US, with the mean number of guns per owner of 4.8. One half of all guns in the US are owned by 3% of the US adult population. This article lays out a large number of facts about US gun ownership.

Azrael, Deborah; Hepburn, Lisa; Hemenway, David; Miller, Matthew. The stock and flow of US firearms: results from the 2015 National Firearms Survey. *The Russell Sage Foundation Journal of the Social Sciences*. 2017; 3(5):38-57.

7. About 1 million Americans become new gun owners each year.

Using data from the HICRC sponsored National Firearms Survey, we examined differences between new and long-standing gun owners. New owners are younger, own fewer guns, are more likely to own guns solely for protection, but fortunately, are also more likely to store their guns safely.

Wertz J, Azrael D, Hemenway D, Sorenson S, Miller M. Differences between new and long-standing US gun owners: results from a national survey. *American Journal of Public Health* 2018; 108:871-877.

8. In a 5-year period, about 2% of the US population has stopped owning guns.

Using data from the HICRC sponsored National Firearms Survey, we questioned currently non-gun owning respondents who had owned a firearm in the preceding 5 years. These represented about 2% of US adults. Most were over age 65, and fewer than 10% had gotten rid of the gun for safety reasons.

Wertz J, Azrael D, Miller M. Americans who become a new versus a former gun owner: implications for youth suicide and unintentional firearm injury. *American Journal of Public Health* 2019; 109:212-214.

9. Female and male gun owners are demographically similar, cite similar reasons for owning guns, and are equally likely to store 1+ guns loaded and unlocked.

From a 2015 online survey of over 3900 adults, we find that 12% of women and 33% of men own a gun. Female owners own fewer guns (3.6 vs 5.6) and are more likely to own only handguns. Male and female reasons for owning guns, and their gun storage are similar.

Wolfson JA, **Azrael D, Miller M.** Gun ownership among US women. *Injury Prevention*. 2020; 26:49-54.

10. One in four California adults live in a home with a firearm. About half of the total stock of firearms is owned by the 10% of firearm owners with 10+ firearms.

A 2018 survey of California adults found that about half the California gun stock is owned by 10% of the gun owners (or 2.5% of California adults).

Kravitz-Wirtz N, Pallin R, **Miller M, Azrael D**, Wintemute GJ. Firearm ownership and acquisition in California: findings from the 2018 California Safety and Well-being Survey. *Injury Prevention*. 2020; 26:516-523.

11. Handgun divestiture is rare. Only about 1% of handgun owners each year get rid of all their guns.

A longitudinal study of handgun owners in California found that 4.5% divested within 5 years of their first acquisition, with divestment more common among women and younger adults. Among those who divested, over 1/3 reacquired a handgun within 5 years.

Swanson SA, **Miller M**, Zhang Y, Prince L, Holsinger EE, Templeton Z, Studdert DM. Patterns of handgun divestment among handgun owners in California. *Injury Epidemiology* 2022; 9:2.

12. Most older adult gun owners don't have a plan about transferring their firearms if it becomes unsafe for them to have one.

Our 2019 national firearm survey oversampled older adults. Of 1,000 adult firearm owners aged 65+, only 20% had a plan to transfer guns if they became unsafe to have them, and half had a plan of what to do with the guns if they died.

Betz M, **Miller M**, Matlock DD, Wintemute GJ, Johnson RL, Grogan C, Lum HD, Knoepke CE, Ranney ML, Suresh K, **Azrael D**. Older firearm owners and advance planning; results of a national survey. *Annals of Internal Medicine*. 2021; 174:279-282.

TRAINING:

1. Basic firearm training classes rarely discuss important public health issues about firearms

In the first study of its kind, volunteers audited twenty basic firearm classes in the Northeastern US. While most trainers cover many aspects of firearm safety, very few discuss important public health issues such as guns and suicide, gun theft as a major source of illegal guns, using guns in self-defense only as a last resort, techniques for de-escalating threats, or provide data on home invasions, gun accidents, sexual assaults or homicides. We believe that collaboration between public health experts and firearm trainers could lead to additional information being provided to trainees to increase firearm safety.

Hemenway, David; Rausher, Steven; Violano Pina; Raybould, Toby A; **Barber Catherine.** Firearms training: what is actually taught? *Injury Prevention*. 2017 Oct (Epub ahead of publication). 2019; 25:123-128.

2. Among gun owners, nationally 61% have received formal firearms training

HICRC's national survey of gun owners finds that 61% report having ever received formal firearms training. In the New England region, over 78% have received formal training. Gun owners in the three southern regions (South Atlantic, East South Central, West South Central) are least likely to have received formal training. The training content seems to vary widely. Only 15% of gun owners report receiving any information about suicide prevention.

Rowhani-Rahbar, Ali; Lyons, Vivian; Simonetti, Joseph A; **Azrael, Deborah; Miller, Matthew.** Formal firearm training among adults in the USA: results from a national survey. *Injury Prevention*. 2018; 24(2):161-165.

3. We worked with gun trainers to create a suicide prevention module for firearm training courses.

Houtsma C, Powers J, Raines AM, Bailey M, **Barber C**, True G. Engaging stakeholders to develop a suicide prevention learning module for Louisiana firearm training courses. *Injury Epidemiology*. 2023; 10:

THEFT:

1.The South accounts for 2/3 of all guns stolen in the US.

In the HICRC survey of more than 1600 US gun owners (2015), 2.4% reported having a gun stolen in the past five years, with a mean of 1.5 guns lost per theft. This represents approximately 250,000 guns theft incidents annually with about 380,000 total guns stolen. Individuals who own many guns, who carry guns, and who do not store guns safely are at higher risk of having guns stolen. Of the four US regions, the South, which is home to 37% of US households, accounts for two-thirds of guns stolen. Although gun theft is a common way that guns get into criminal hands, this study appears to be the first journal article to focus on the epidemiology of gun theft from private citizens.

Hemenway, David; Azrael, Deborah; Miller, Matthew. Whose guns are stolen? The epidemiology of gun theft victims. *Injury Epidemiology*. December 2017; 4:11.

GUN STORAGE:

1-3. Gun training is not associated with appropriate gun storage

We analyzed a number of national random-digit-dial telephone surveys. Many gun owners report storing their guns loaded and unlocked. Gun training is often associated with an increased likelihood of storing firearms in this manner.

Weil, Douglas S; Hemenway, David. Loaded guns in the home: An analysis of a national, random survey of gun owners. *JAMA*. 1992; 267:3033-37. See response: Weil DS, Hemenway D. Violence in America: Guns. *JAMA*. 1992; 268:307.

Hemenway, David; Solnick, Sara J; Azrael Deborah R. Firearm training and storage. *JAMA*. 1995; 273:46-50. See response: Hemenway D, Solnick SJ, Azrael DR. Firearms training. *JAMA*. 1995; 273:1733-34.

Berrigan J, Azrael D, Hemenway D, Miller M. Firearm training and storage practices among US gun owners: a nationally representative study. *Injury Prevention*. 2019; 25Suppl 1(i31-i38).

4. Women often incorrectly believe the gun is stored appropriately

We analyzed gun storage practices from data obtained from a 1999 national random-digit-dial survey of adults conducted under the auspices of the Harvard Injury Control Research Center. Prior studies found that women appear to underreport household gun ownership. This study indicates that women, when they report a gun in the home, often incorrectly believe that it is stored unloaded and locked up.

Azrael, Deborah; Miller, Matthew; Hemenway, David. "Are firearms stored safely in households with children? It depends on whom you ask." *Pediatrics* electronic pages. 2000; 106: e31.

5. Too many parents store guns dangerously

Some 400 parents with firearms in the home responded to questions about firearms storage. Over 20% of parents had a loaded firearm and 8% stored at least one firearm loaded and unlocked. Households with teenagers were somewhat more likely to store firearms unsafely.

Johnson, Renee M; Miller, Matthew; Vrinotis, Mary; Azrael, Deborah; Hemenway, David. "Are household firearms stored less safely in homes with

adolescents?: Analysis of a national random sample of parents.” *Archives of Pediatrics & Adolescent Medicine*. 2006; 160:788-92.

6. It is better to create a safe environment than to rely on educating children not to touch guns

We summarized the literature on preventing child access to firearms.

Johnson, Renee; Hemenway, David. Prevention of children and youths’ access to and operation of firearms: A review of interventions. Preventing access to and use of firearms. In: Trafton, Jodie A & Gordon, William P (eds). *Best Practices in the Behavioral Management of Health from Preconception to Adolescence, Vol III*. Institute for Brain Potential. 2008.

7. Gun owners store guns poorly even for children at risk for firearm suicide and accidents.

Using data from the HICRC-sponsored National Firearms Survey of close to four thousands adults, HICRC researchers found that millions of US children live in homes where firearms are left loaded or unlocked or both. A child’s history of depression or attention-deficit/hyperactivity disorder does not appreciably influence parental decisions about whether to have firearms in the home or to store the firearms safely.

Scott, John; Azrael, Deborah; Miller, Matthew. Firearm storage in homes with children with self-harm risk factors” *Pediatrics*. 2018; 141:e20172600.

8. Close to 5 million US children live in a home with a loaded and unlocked firearm

Data from a nationally representative sample of US adults indicate that about 1/3 of households contain a firearm, and the in 20% at least one gun is stored loaded and unlocked. Hence about 7% of US children live in a home with firearms stored in the most unsafe manner.

Azrael D, Cohen J, Salhi C, Miller M. Firearm storage in gun-owning households with children: results of a 2015 national survey. *Journal of Urban Health*. 2018; 95:295-304.

9. Improved firearm storage could reduce youth firearm suicide and unintentional firearm deaths by up to 1/3.

We conducted a modeling study using Monte Carlo simulation to determine the possible effects of an intervention on youth (age 0-19) firearm suicide and unintentional firearm deaths of increasing the percentage of households with youth storing all guns locked. The model indicated that 6%-32% of the deaths could be eliminated depending on the percentage increase in safer storage.

Monuteaux MC, **Azrael D, Miller M**. Association of increased safe household firearm storage with firearm suicide and unintentional death among US youths. *JAMA Pediatrics*. 2019; 173:657-662.

10. Nearly 60% of gun owners believe a gun makes a home safer, and those owners are most likely to store their guns loaded and unlocked.

From our 2015 national survey, 58% of gun owners believe the gun makes the home safer (only 2.5% believe guns make the home more dangerous). 40% of the owners who believe the gun makes the home safer store at least one gun loaded and unlocked. Of those who thought the gun made the home more dangerous, only 4% kept a gun loaded and unlocked. In the middle group, 18% kept a gun loaded and unlocked. Gun owners who believe that firearms make homes safer are far more likely to store guns loaded and unlocked.

Mauri AI, Wolfson JA, **Azrael D, Miller M**. Firearm storage practices and risk perceptions. *American Journal of Preventive Medicine*. 2019; 57:830-835.

11. Almost half of gun owners believe unconditionally that guns make the home safer—they typically don't store their guns safely.

From our 2019 national survey, we used latent class analysis to construct three types of gun owners. Many (47%) believe that guns unconditionally make the home safer; some that "it depends" (34%); and some (19%) believe guns do not pose a risk as long as they are stored safely. Compared to the other groups, the first group is most likely to store guns loaded and unlocked.

Salhi C, **Azrael D, Miller M**. Patterns of gun owner beliefs about firearm risk in relation to firearm storage: a latent class analysis using the 2019 National Firearm Survey. *Injury Prevention*. 2021; 27:271-276.

12. Among new COVID-19 gun owners 40% kept at least one gun unlocked.

A May 2020 Amazon Mechanical Turk survey of new gun owners found that they acquired the gun for protection, and only 60% stored all their guns locked up.

Lyons VH, Haviland MJ, **Azrael D**, Adhia A, Bellenger MA, Ellyson A, Rowhani-Rahbar A, Rivara FP. Firearm purchasing and storage during the COVID-19 pandemic. *Injury Prevention*. 2021; 27:87-92.

13. The large COVID spike in gun purchases resulted in an additional 2.9% of the US adult population becoming new gun owners. These new owners were predominantly women, Blacks, and Hispanics.

Data from our 2021 national survey showed that 7.5 million Americans became new gun owners between January 2019-April 2021. Among the new owners, 50% were women, 20% were Black, and 20% were Hispanic.

Miller M, Zhang W, Azrael D. Firearm purchasing during the COVID-19 pandemic: Results from the 2021 National Firearms Survey. *Annals of Internal Medicine*. 2022: 175:219-225.

14. Parents with children are securing guns more safely—but more parents now have guns.

Data from our 2021 National Firearm Survey show that 44% of firearm owners with children store all guns locked and unloaded, compared to 29% in our 2015 national survey. But because more parents have guns, the number of children living in households with loaded and unlocked firearm (4.6 million) had not changed.

Miller M, Azrael D. Firearm storage in US households with children: findings from the 2021 National Firearm Survey. *JAMA Network Open*. 2022; 5:e2148823.

15. Handgun lockboxes appear to be preferred to cable locks.

Over 225 gun-owning parents were given either handgun lockboxes or cable locks. At follow-up, 28% reported using the lockbox, compared to 14% the cable lock.

Barber C, Azrael D, Berrigan J, Betz ME, Brandspigel S, Runyan C, Salhi C, Vrinotis M, **Miller M.** Selection and use of firearm and medication locking devices in a lethal means counseling program. *Crisis*. 2023; 44:216-223.

PHYSICIANS GAG ORDER:

1. Physicians should be allowed to ask patients about firearm availability

This commentary discusses the serious problems with the Florida law making it an offense for pediatricians and other doctors to discuss firearms with their patients under many circumstances.

Murtagh, Lindsey; **Miller, Matthew**. Censorship of the patient-physician relationship: A new Florida law. *JAMA*. 2011; 306:1131-32.

2.The Docs v Glocks Florida gag order pits the 1st and 2nd Amendments

A NEJM Perspective on the case of *Wollschlaeger v. Governor of Florida* describes the issues at stake in the upcoming decision concerning a Florida law which regulates physician' speech concerning patients' gun ownership. The full court can "jeopardize physicians' ability to counsel patients about the importance of gun safety and potentially other important issues, or it can safeguard physicians' ability to speak truthfully to patients, without compromising the state's ability to regulate the practice of medicine."

Parmet, Wendy; Smith, Jason; **Miller, Matthew**. *Wollschlaeger v. Governor of Florida--The First Amendment, Physician Speech, and Firearm Safety*. *New England Journal of Medicine*. 2016; 374 (24) 2304-07.

3. Physicians are allowed to counsel patients about firearms; now they have to provide accurate scientific information.

A NEJM Perspective describes the long-awaited US Court of Appeals for the Eleventh Circuit 10-1 decision that affirmed that the First Amendment applies to speech between doctors and patients. The court found no evidence "that routine questions to patients about the ownership of firearms are medically inappropriate, ethically problematic, or practically ineffective." "We expect doctors to doggedly exhort unhealthy patients to exercise more, eat less, or stop smoking, even when such admonishments may 'annoy persistently.'" A gun in the home substantially increases the risk of death to household members yet the majority of Americans are unaware of the heightened risk. Currently, most clinicians rarely if ever provide firearm-safety counseling. The Court ruled such counseling eminently legal. Now more physicians have to provide (scientifically based) advice about firearms.

Parmet, Wendy; Smith, Jason; **Miller, Matthew**. Physicians, firearms, and free speech - overturning Florida's firearm-safety gag rule. *New England Journal of Medicine*. 2017; 376(20); 1901-03.

GUNS AT COLLEGE:

1. Students with guns at college are more likely to misuse alcohol

Using data from mailed surveys of over 10,000 undergraduates in 1997, we examined the prevalence of gun ownership. Approximately 3.5% of undergraduates reported having a working firearm at college. Students with guns were more likely to be male, white, live in a fraternity, live off-campus, binge drink, drive after drinking, and be injured severely enough to require medical attention. Students with guns at college are more likely to engage in alcohol-related behaviors that put themselves and others at risk of injury.

Miller, Matthew; Hemenway, David; Wechsler, Henry. Armed and dangerous? Guns at college. *Journal of American College Health*. 1999; 48:7-12.

2. At college, more guns = more gun threats

Using data from mailed surveys of over 10,000 undergraduates in 2001, we examined correlates of gun possession at college. The 2001 survey confirmed the findings of the 1997 surveys, and also showed that guns on college campuses were more common in regions with higher levels of gun prevalence, and that gun threats to college students were also more common in these regions.

Miller, Matthew; Hemenway, David; Wechsler, Henry. Guns and gun threats at college. *Journal of American College Health*. 2002; 51:57-65.

GUN THREATS AND SELF DEFENSE GUN USE:

1-3. Guns are not used millions of times each year in self-defense

We use epidemiological theory to explain why the “false positive” problem for rare events can lead to large overestimates of the incidence of rare diseases or rare phenomena such as self-defense gun use. We then try to validate the claims of many millions of annual self-defense uses against available evidence. We find that the claim of many millions of annual self-defense gun uses by American citizens is invalid.

Hemenway, David. Survey research and self-defense gun use: An explanation of extreme overestimates. *Journal of Criminal Law and Criminology*. 1997; 87:1430-1445.

Hemenway, David. The myth of millions of annual self-defense gun uses: A case study of survey overestimates of rare events. *Chance* (American Statistical Association). 1997; 10:6-10.

Cook, Philip J; Ludwig, Jens; Hemenway, David. The gun debate’s new mythical number: How many defensive uses per year? *Journal of Policy Analysis and Management*. 1997; 16:463-469.

4. Most purported self-defense gun uses are gun uses in escalating arguments, and are both socially undesirable and illegal

We analyzed data from two national random-digit-dial surveys conducted under the auspices of the Harvard Injury Control Research Center. Criminal court judges who read the self-reported accounts of the purported self-defense gun use rated a majority as being illegal, even assuming that the respondent had a permit to own and to carry a gun, and that the respondent had described the event honestly from his own perspective.

Hemenway, David; Miller, Matthew; Azrael, Deborah. Gun use in the United States: Results from two national surveys. *Injury Prevention*. 2000; 6:263-267.

5. Firearms are used far more often to intimidate than in self-defense

Using data from a national random-digit-dial telephone survey conducted under the direction of the Harvard Injury Control Center, we examined the extent and nature of offensive gun use. We found that firearms are used far more often to frighten and intimidate than they are used in self-defense. All reported cases of criminal gun use, as well as many of the so-called self-defense gun uses, appear to be socially undesirable.

Hemenway, David; Azrael, Deborah. The relative frequency of offensive and defensive gun use: Results of a national survey. *Violence and Victims*. 2000; 15:257-272.

6. Guns in the home are used more often to intimidate intimates than to thwart crime

Using data from a national random-digit-dial telephone survey conducted under the direction of the Harvard Injury Control Research Center, we investigated how and when guns are used in the home. We found that guns in the home are used more often to frighten intimates than to thwart crime; other weapons are far more commonly used against intruders than are guns.

Azrael, Deborah R; Hemenway, David. In the safety of your own home: Results from a national survey of gun use at home. *Social Science and Medicine*. 2000; 50:285-91.

7. Adolescents are far more likely to be threatened with a gun than to use one in self-defense

We analyzed data from a telephone survey of 5,800 California adolescents aged 12-17 years, which asked questions about gun threats against and self-defense gun use by these young people. We found that these young people were far more likely to be threatened with a gun than to use a gun in self-defense, and most of the reported self-defense gun uses were hostile interactions between armed adolescents. Males, smokers, binge drinkers, those who threatened others and whose parents were less likely to know their whereabouts were more likely both to be threatened with a gun and to use a gun in self-defense.

Hemenway, David; Miller, Matthew. Gun threats against and self-defense gun use by California adolescents. *Archives of Pediatrics and Adolescent Medicine*. 2004; 158:395-400.

8. Criminals who are shot are typically the victims of crime

Using data from a survey of detainees in a Washington D.C. jail, we worked with a prison physician to investigate the circumstances of gunshot wounds to these criminals.

We found that one in four of these detainees had been wounded, in events that appear unrelated to their incarceration. Most were shot when they were victims

of robberies, assaults and crossfires. Virtually none report being wounded by a “law-abiding citizen.”

May, John P; **Hemenway, David**. Oen, Roger; Pitts, Khalid R. When criminals are shot: A survey of Washington DC jail detainees. *Medscape General Medicine*. 2000; June 28. www.medscape.com

9-10. Few criminals are shot by decent law-abiding citizens

Using data from surveys of detainees in six jails from around the nation, we worked with a prison physician to determine whether criminals seek hospital medical care when they are shot. Criminals almost always go to the hospital when they are shot. To believe fully the claims of millions of self-defense gun uses each year would mean believing that decent law-abiding citizens shot hundreds of thousands of criminals. But the data from emergency departments belie this claim, unless hundreds of thousands of wounded criminals are afraid to seek medical care. But virtually all criminals who have been shot went to the hospital, and can describe in detail what happened there.

May, John P; **Hemenway, David**. Oen, Roger; Pitts, Khalid R. Medical Care Solicitation by Criminals with Gunshot Wound Injuries: A Survey of Washington DC Jail Detainees. *Journal of Trauma*. 2000; 48:130-132.

May, John P; **Hemenway, David**. Do Criminals Go to the Hospital When They are Shot? *Injury Prevention*. 2002; 8:236-238.

11. Self-defense gun use is rare and not more effective at preventing injury than other protective actions

Victims use guns in less than 1% of contact crimes, and women never use guns to protect themselves against sexual assault (in more than 300 cases). Victims using a gun were no less likely to be injured after taking protective action than victims using other forms of protective action. Compared to other protective actions, the National Crime Victimization Surveys provide little evidence that self-defense gun use is uniquely beneficial in reducing the likelihood of injury or property loss.

This article helps provide accurate information concerning self-defense gun use. It shows that many of the claims about the benefits of gun ownership are largely myths.

Hemenway D, Solnick SJ. The epidemiology of self-defense gun use: Evidence from the National Crime Victimization Surveys 2007-2011. *Preventive Medicine*. 2015; 79: 22-27.

12. Fewer than 600 potential perpetrators are killed annually by defensive gun use. Many of these defensive gun uses do not seem socially beneficial.

We read a random sample of defensive gun use news reports for the Gun Violence Archive in 2019. We created a typology of 13 categories, including escalating arguments, drug-related, gang-like, romantic disputes, store robberies, unoccupied vehicle theft, unarmed burglaries, and home invasions. Many of the categories contained defensive gun use that did not seem socially beneficial. From news reports we can be certain the incident occurred, and there is a story behind the incident, one usually vetted by the police, with occasional input from victims, perpetrator, family, neighbors and witnesses.

Hemenway D, Shawah C, Lites E. Defensive gun use: what can be learned from new reports? *Injury Epidemiology*. 2022; 9:19-

BATTERERS:

1. Batterers use guns in a variety of ways to intimidate their victims

We analyzed survey data collected from over 8,000 males enrolled in a certified batterer intervention program in Massachusetts, 1999-2003. Recent gun owners were 8 times more likely to have threatened their partners with a gun than non-gun owners. Four main types of gun threats against partners were (a) threatening to shoot them, (b) threatening to shoot a pet or person the victim cares about, (c) cleaning, holding or loading a gun during an argument, and (d) shooting a gun during an argument.

Rothman, Emily; **Hemenway, David; Miller, Matthew; Azrael, Deborah.** Batterers' use of guns to threaten intimate partners. *Journal of the American Medical Women's Association*. 2005; 60:62-68.

2. Batterers with guns are more dangerous than batterers without guns

We analyzed survey data of over 4,500 men in Massachusetts batterers' intervention programs. Risk factors for having a gun included having gambling problems, having attempted murder, and having threatened a partner with a firearm.

Rothman, Emily F.; **Johnson, Renee M.; Hemenway, David.** Gun possession among a sample of Massachusetts batterer program enrollees. *Evaluation Review*. 2006; 30:283-95.

GUN CARRYING:

1-2. Adolescents carry guns for protection—against other adolescents carrying guns

We surveyed 7th and 10th graders in inner city schools in Boston and Milwaukee. We found that almost a quarter of 7th grade boys had already carried a gun, illegally. The overwhelming reason for carrying was self-protection. While guns were easily acquired, the large majority of respondents, and even the majority of those who had already carried a gun, wanted to live in a society where it was impossible for teens to get guns.

Hemenway, David; Prothrow-Stith, Deborah, Bergstein, Jack M; **Ander, Roseanna**; Kennedy, Bruce. Gun carrying among adolescents. *Law and Contemporary Problems*. 1996; 59:39-53.

Bergstein, Jack M; **Hemenway, David**; Kennedy, Bruce; Quaday, Sher; **Ander, Roseanna**. Guns in young hands: A survey of urban teenagers' attitudes and behaviors related to handgun violence. *Journal of Trauma*. 1996; 41:794-798.

3. Students who are old in their class are more likely to carry guns illegally

Using data from the Massachusetts Youth Risk Behavior survey, we analyzed risk factors for adolescent gun carrying. We found that a simple objective measure – whether a student is old for their grade – is an important predictor of gun carrying. This fact may help clinicians identify high-risk students and target prevention strategies.

Hayes, D Neil; Hemenway, David. Age-within-school-class and adolescent gun carrying. *Pediatrics* electronic pages. 1999; 103:e64.

4. Increased gun carrying reduces community feeling of safety

This paper uses data from two national random-digit-dial surveys to examine public attitudes about gun carrying. By a margin of 5 to 1, Americans feel less safe rather than safer as more people in their community begin to carry guns. By margins of at least 9 to 1, Americans do not believe that regular citizens should be allowed to bring their guns into restaurants, college campuses, sports stadium, bars, hospitals or government buildings.

Hemenway, David; Azrael, Deborah; Miller, Matthew. U.S. national attitudes concerning gun carrying. *Injury Prevention*. 2001; 7:282-285.

5. Social disorder increases the likelihood of adolescent gun carrying

We analyzed data from over 1,800 youth in Chicago examining risk factors for adolescent gun carrying. We found that aspects of the neighborhood (social disorder, safety, collective efficacy) were important predictors of illegal gun carrying by youth.

Molnar, Beth; **Miller, Matthew; Azrael, Deborah**; Buka Steven. Neighborhood predictors of concealed firearm carrying among children and adolescents. *Archives of Pediatric Adolescent Medicine*. 2004; 158:657-64.

6. Selling crack is associated with carrying guns

We analyzed data from interviews of over 200 young men and women at the Rhode Island Correctional Institution. We found that selling crack was highly associated with gun carrying; using hard drugs was not. Findings provide further evidence of a crack-gun connection.

Kacanek, Deborah; Hemenway, David. Gun carrying and drug selling among youth incarcerated men and women. *Journal of Urban Health*. 2006; 83:266-74.

7. Adolescents overestimate peer gun carrying and thus are more likely to carry themselves

We analyzed data from a random survey conducted in 2008 of over 1,700 high school students in Boston. Over 5% of students reported carrying a gun, 9% of boys and 2% of girls. Students substantially overestimated the percentage of their peers who carried guns and the likelihood that a respondent carried a gun was strongly associated with his perception of the level of peer gun carrying.

Hemenway, David; Vrinotis, Mary; Johnson, Rene M; Miller, Matthew; Azrael, Deborah. Gun carrying by high school students in Boston, MA: Does overestimation of peer gun carrying matter? *Journal of Adolescence*. 2011; 34:997-1003

8. Without police discretion, many dangerous people obtain carry licenses

This is the first study to examine when, in may-issue states, the police use discretion to refuse to issue a permit. Our survey of police chiefs in Massachusetts found that chiefs issued few discretionary denials – median 2 per year. Common reasons for denial were providing false information, a history of assault (e.g., IPV), a history of drug or alcohol abuse, or mental-health issues. Allowing such individuals to legally carry firearms will not enhance public safety.

Local police chiefs typically know more about the people in their community than does a national computer.

Hemenway D, Hicks JG. “May issue” gun carrying laws and police discretion: Some evidence from Massachusetts. *Journal of Public Health Policy*. 2015; 36:324-34.

9. More guns and weak gun laws lead to more illegal youth gun carrying

Using data on high school students from the Youth Risk Behavior Survey for years 2007, 2009, and 2011, youth were more likely to carry guns in states with weak gun laws and many guns. Across states, strong gun laws are associated with a lower likelihood of youth gun carrying.

This article provides evidence on another of the society-level costs of weak gun laws and high levels of household gun ownership.

Xuan Z, **Hemenway D**. State gun law environment and youth gun carrying in the United States. *JAMA Pediatrics*. 2015; 11:1-9.

10. Approximately 9 million Americans carry loaded handguns monthly

HICRC’s national firearm survey finds that 24% of handgun owners report carrying loaded handguns in the past 30 days. Handgun owners living in “shall issue” states were far more likely to report carrying than gun owners living in “may issue” states.

Rowhani-Rahbar, Ali; **Azrael, Deborah**; Lyons, Vivian; Simonetti, Joseph; **Miller, Matthew**. Loaded handgun carrying among US adults, 2015. *American Journal of Public Health* 2017; 107(12): 1930-36.

11. Few Americans want the concealed carry of firearms in public places.

Using data from HICRC’s nationally representative on-line survey conducted in 2015, we find that fewer than 20% of respondents support gun carrying in schools, bars or sports stadiums. In no location, including restaurants, service settings, retail stores, college campuses, places of worship, and government buildings, did even a third of Americans support gun carrying. These views contrast sharply with the current trend in state legislatures to expand the locations where individuals can legally carry guns.

Wolfson, Julia; Teret, Stephen; **Azrael, Deborah**; **Miller, Matthew**. The article appears online in the *American Journal of Public Health*. 2017; 107:929-37.

12. Depressed adolescents are more likely to carry guns to school.

Data from the HICRC surveys of Boston high school students show that adolescent depression is associated with carrying guns to school and that social connectedness—positive relationships between the youth and adults—appears to reduce the likelihood of school gun carrying.

Juan SC, **Hemenway D**. From depression to youth school gun carrying in America: Social connectedness may help break the link. *Cogent Social Science*. 2017 Apr 7;3(1):1314877.

13. Urban youth carry guns intermittently through adolescence and primarily for self-defense/protection.

This scoping review identified 53 relevant peer-reviewed journal articles on adolescent gun carrying, and agreed on seven important research priorities.

Oliphant SN, Mouch CA, Rowhani-Rahbar A, Hargarten S, Jay J, **Hemenway D**, Zimmerman M, Carter PM. A scoping review of patterns, motives, and risk and protective factors for adolescent firearm carriage. *Journal of Behavioral Medicine*. 2019; 42:S1763-810.

14. There is more gun carrying in states with permissive carry laws.

With data from our 2019 National Firearm Survey, we found that 30-33% of handgun owners carried a gun concealed monthly in shall issue and permitless carry states, compared to 15% in may issue states. The number of handgun owners carrying in the past month increased from 9 million in 2015 to 16 million in 2019.

Rowhani-Rahbar A, Gallagher A, **Azrael D**, **Miller M**. Trend in loaded handgun carrying among adult handgun owners in the United States, 2015-2019. *American Journal of Public Health*. 2022; 112:1783-1790

ROAD RAGE:

1. Motorists with guns are more likely to act aggressively (Arizona)

Using data from a telephone survey in Arizona, we examined the relationship between road rage and gun carrying in motor vehicles. We found that self-reported hostile actions (e.g., obscene gestures, cursing or shouting, aggressively tailgating) were more common among men, young adults, and individuals who carried a firearm in their car.

Miller, Matthew; Azrael, Deborah; Hemenway, David; Solop, Frederic I. Road rage in Arizona: Armed and dangerous? *Accident Analysis and Prevention*. 2002; 34:807-814.

2. Motorists with guns are more likely to engage in types of road rage (U.S.)

Over 2,400 licensed drivers responded to questions about their own aggressive driving in a 2004 national random-digit-dial survey. We found that 17% of respondents admitted to making obscene or rude gestures in the past year, and another 9% admitted to aggressively following too closely. Males, young adults, binge drinkers, those ever arrested for a non-traffic violation, and motorists who had been in a vehicle in which there was a gun, were more likely to engage in such forms of road rage.

Hemenway, David; Vrinotis, Mary; Miller, Matthew. Is an armed society a polite society? Guns and road rage. *Accident Analysis and Prevention*. 2006; 38:687-95.

SEGREGATION:

1. Residential segregation appears to increase gun violence

Various measures of residential segregation are strongly associated with fatal and non-fatal firearm assault in Massachusetts communities.

Krieger N, Feldman JM, Waterman PD, Chen JT, Coull BA, **Hemenway D**. Local residential segregation matters. *Journal of Urban Health*. 2017 Apr 1;94(2):244-58.

2. Higher levels of racial residential segregation, greater differences in Black and White firearm homicide rates

We examined 32 states over the period 1991-2013. States with higher level of residential segregation had higher differences in Black and White firearm homicide disparities, even after controlling for levels of Black and White deprivation.

Knopov A, Rothman E, Cronin SW, Franklin L, Cansever A, Potter F, Mesic A, Xuan Z, Siegel M, **Hemenway D**. The role of residential segregation in Black-White disparities in firearm homicide at the state level in the United States, 1991-2015. *Journal of the National Medical Association*. 2019; 111:62-75.

OTHER COUNTRIES:

1. In Jamaica, most gun homicides occur during disputes or are revenge killings

We read the police narratives for every homicide in Jamaica, 1998-2002. The murder rate has been increasing steadily in Jamaica, and most of the murders are completed with firearms. The principal motives are disputes and revenge. Drugs, gangs, and political killings are no longer the main factors associated with murder.

Lemard, Glendene; Hemenway, David. Violence in Jamaica: An analysis of homicides 1998-2002. *Injury Prevention*. 2006; 12:15-18.

2. In Canada, most firearm deaths occur within 24 hours of the shooting

Using data for all firearm-injured patients in the Canadian National Trauma Registry, we evaluated demographic and causal factors of injury. We found that about 40% of the shooting victims died in-hospital, with 83% of fatalities occurring on the first day. ISS score, first systolic blood pressure, first Glasgow Coma Scale score, male gender and self-inflicted injury were all predictors of in-hospital death.

Finley, Christian J; **Hemenway, David**; Clifton, Joanne; Brown D Ross; Simons, Richard K; Hameed S Morad. The demographics of significant firearm injury in Canadian trauma centres and the associated predictors of in-hospital mortality. *Canadian Journal of Surgery*. 2008; 51:197-203.

3. In Mexico as in the USA, more guns = more gun suicide; gun ownership levels are not related to non-gun suicide

We assess the relationship between handgun prevalence and firearm suicide across the 32 states of Mexico for 2005. Where there were more handguns, there were more firearm suicides. There was no relationship between handgun prevalence and non-firearm suicides.

Miller, Matthew; Borges, Guilherme. Firearms and suicide in Mexico: Intimations of mortality. *Jovenes*. 2009; 32: 90-107.

4. Israel and Switzerland are not awash with firearms

Gun advocates cite Switzerland and Israel as exemplars of nations with widespread gun ownership, permissive gun laws, and encouragement of armed

civilians who can deter and thwart shootings. These claims are evaluated with analysis of the International Crime Victimization Survey data and translation of laws and original source material. Compared with the United States, Switzerland and Israel have lower rates of gun ownership, stricter gun control laws, and their policies discourage gun ownership.

Rosenbaum, Janet E. Gun utopias? Firearm access and ownership in Israel and Switzerland. *Journal of Public Health Policy*. 2012; 33:46-58.

5. Few urban Mexican homes contain firearms

Data from a 2017 household telephone survey of over 1,300 adults living in nine Mexican cities found that only 3% of homes contain firearms. Most individuals who report owning firearms possess only one gun, having purchased it recently for self-defense. Respondents were much more likely to believe that crime in Mexico would increase rather than decrease if guns were allowed in more places.

Esparza, David Perez and **Hemenway, David**. What is the level of household gun ownership in urban Mexico? An estimate from the first Mexican survey on gun ownership 2017. *Injury Prevention*. 2019; 25:93-97.

6. In Sao Paulo, binge drinking is positively associated with the desire to purchase a firearm.

Surveys in Sao Paulo city, Brazil in 2003, 2008, 2013 found that while only 1.5% of the population reported living in a home with firearms, 15.7% would obtain one if they could. The desire to own a firearm was associated with both alcohol consumption and binge drinking.

Justus M, **Miller M, Hemenway D**. The relationship between alcohol consumption and the desire to own a firearm: an empirical study of citizens in Sao Paulo city, Brazil. *Public Health*. 2020: 179:186-194.

7. In both Hong Kong and the US, the higher rates of suicide by males compared to females is explained by the men choosing methods with higher case fatality rates.

As is common in many countries, in Hong Kong and the US, women attempt suicide more often than men, but males suicide rates are higher. In both

countries, this can be largely explained by men using more lethal means (jumping in Hong Kong, guns in the US).

Cai Z, Chang Q, Yip PSF, **Conner A, Azrael D, Miller M**. The contribution of method choice to gender disparity in suicide mortality: A population-based study in Hong Kong and the United States of American. *Journal of Affective Disorders*. 2021; 294:17-23.

8. The successful Australian policy response to the Port Author mass shooting provides lessons for the US.

At minimum, it shows what can be accomplished if conservatives are willing to step up and respond to the problem.

Negin J, Alpers PA, Nassar N, **Hemenway D**. Australian firearm regulation at 25—successes, ongoing challenges and lessons for the world. *New England Journal of Medicine*. 2021; 384:1581-1583.

POLICY EVALUATION:

1. “Shall issue” laws have no significant effect on the overall homicide rate

We analyzed the effect on homicide of changes in state-level gun carrying laws using pooled cross-sectional time-series data for 50 states from 1979-1998. There was no statistically significant association between changes in concealed carry laws and state homicide rates. The finding was consistent across a variety of models.

Hepburn, Lisa; Miller, Matthew; Azrael, Deborah; Hemenway, David. The effect of nondiscretionary concealed weapon carrying laws on homicide. *Journal of Trauma*. 2004; 56:676-681.

2. Child access prevention laws may reduce unintentional child firearm fatalities

We analyzed the effect on unintentional firearm fatalities to children of child access prevention (CAP) laws, which allow a firearm owner to be charged with a crime if a child gains access to an unsecured firearm, using pooled cross-sectional time series data for 50 states from 1979 to 2000. We found that states that enacted CAP laws – with felony rather than misdemeanor penalties – experienced greater subsequent declines in the rate of unintentional firearm deaths for children age 0 to 14 years, compared to states not enacting CAP laws.

Hepburn, Lisa; Azrael, Deborah; Miller, Matthew; Hemenway, David. The effect of child access prevention laws on unintentional child firearm fatalities, 1979-2000. *Journal of Trauma*. 2006; 61:423-28.

3. Some gun policy evaluations are designed to ensure that no effect will be found

This article on statistics describes the limitations of studies that claim no effect of gun shows and no effect of the Australian gun buyback.

Hemenway, David. How to find nothing. *Journal of Public Health Policy*. 2009; 30:260-68.

4. Results of a flawed study results should not affect policy

This paper highlights the serious flaws in a study that found no effect of gun shows on homicide or suicide.

Wintemute, Garen; **Hemenway, David**; Webster, Daniel; Pierce Glenn; Braga Anthony A. Gun shows and gun violence: Fatally flawed study. *American Journal of Public Health*. 2010;100;1856-60.

5. The Brady Bill has major limitations in scope, monitoring and enforcement

One section of this chapter discusses the three aspects of regulation: the rules, monitoring of those rules, and punishments if the rules are not complied with. The Brady bill is discussed as an example of a law with major deficiencies in all three aspects.

Hemenway, David. Public policy. In: Guohua Li and Susan P. Baker, eds. *Injury Research: Theories, Methods and Approaches*. New York: Springer, 2012.

6. States with strong gun laws have lower rates of firearm homicide and firearm suicide

We conducted a state-level ecological study for 2007-2010 and found that states with more firearm laws had lower rates of both gun homicide and gun suicide, even after controlling for race, poverty, unemployment, college education, population density, and non-firearm deaths.

Reviews by the Centers for Disease Control and the Institute of Medicine conclude that the evidence is not strong enough to determine whether or not firearm laws reduce lethal violence. This study provides evidence consistent with the hypothesis that firearm laws are effective in reducing homicide and suicide.

Fleegler EW, Lee LK, Monuteaux MC, **Hemenway D**, Mannix R. Firearm legislation and firearm-related fatalities in the United States. *JAMA-Internal Medicine*. 2013; 173:732-40.

7. Universal background checks could reduce firearm mortality

An article by Kalesan et al finds that all gun control laws are associated with lower rates of firearm mortality—except Stand Your Ground laws, which are associated with higher rates. In a cross-sectional state analysis, universal background checks are most strongly associated with lower firearm mortality. In a Commentary, we discuss some limitations of the article, and that the large effect indicated for individual laws have to be taken with a grain of salt.

Hemenway D. *Firearm legislation and mortality in the USA.* The Lancet. 2016; 387:1796-97.

8. Stronger gun laws are associated with lower rates of firearm homicide

Our literature review found that, in the US, stronger firearm laws were associated with lower rates of firearm homicide, even after adjusting for demographic and sociologic factors. There was evidence that specific laws such as universal background checks and permit-to-purchase requirements seemed to decrease firearm homicide rates.

Lee LK, Fleegler EW, Farrell C, Avakame E, Srinivasan S, **Hemenway D**, Monuteaux MC. Firearm laws and firearm homicides: a systematic review. *JAMA Internal Medicine.* 2017 Jan 1;177(1):106-19.

9. Crime guns flow from states with weak gun laws to states with strong gun laws

In a state-level panel study 2006-16, we found that the percentage of guns traced to a dealer within that state was much higher for states with weak gun laws. Four laws independently associated with a lower percentage of in-state guns were permits of firearm purchase, a waiting period, prohibition of firearm possession by persons with a violent misdemeanor conviction, and a requirement to relinquish firearms when a person becomes disqualified.

Collins T, Greenberg R, Siegel M, Xuan Z, Rothman EF, Cronin SW, **Hemenway D.** State firearm laws and interstate transfer of guns in the United States, 2006-16. *Journal of Urban Health.* 2018; 95:322-336.

10. Laws banning the sale of large capacity magazines (LCMs) appear to reduce the number and severity of mass shootings.

From 1990-2017, there were 69 mass shootings in which at least 6 people were killed. When the perpetrator had a large capacity magazine (LCM), on average there were 62% more deaths. The incidence of these high-fatality mass was more than double the rate in states that did not ban LCMs, and the number of deaths per population was three times higher.

Klarevas L, **Conner A, Hemenway D**. The effect of large capacity magazine bans on high-fatality mass shootings, 1990-2017. *American Journal of Public Health*. 2019; 109:1754-1761.

11. Firearm laws have differential impacts on homicide rates among Black and White victims.

We examined state-level data from 1991-2016. Universal background check laws and permit requirement laws were associated with lower homicide rates among both Black and White populations, and “shall issue” laws were associated with higher homicide rates. Laws that prohibit firearm purchase for violent misdemeanor convictions and require firearm relinquishment for having a domestic violence restraining order were associated with lower Black homicide but not lower White homicide.

Knopov A, Xuan Z, Rothman E, Siegel M, **Hemenway D**. Impact of state firearm laws on homicide rates among Black and White population in the US, 1991-2016. *Health and Social Work*. 2019; 44:232-240.

12. Firearm laws have differential impacts on homicides in large cities compared to their impact on suburban and rural areas.

We examined state-level data from 1991-2016. Universal background check laws and may issue laws (police discretion) concerning concealed carry, were associated with lower rates of firearm homicide in large cities but not suburban and rural areas. By contrast, laws that prohibited firearm purchase by individuals convicted of a violent misdemeanor were associated with lower rates of firearm homicide in suburban and rural areas, but not in big cities. Permit requirement laws were associated with lower rates of firearm suicide in all areas.

Siegel M, Solomon B, Knopov A, Rothman E, Cronin S, Xuan Z. **Hemenway D**. The impact of state firearm laws on homicide rates in suburban and rural areas compared to large cities in the United States, 1991-2016. *Journal of Rural Health*. 2020; 36:255-265.

13. Demolishing vacant buildings can reduce urban firearm violence.

We examined the large-scale program in Detroit that demolished over 10,000 vacant buildings in its first 3 years. The program was associated with a 11% reduction in firearm assaults relative to control locations. No effects were observed for illegal drug violations, and no evidence of spatial crime displacement was detected.

Jay J, Miratrix LW, Branas CC, Zimmerman MA, **Hemenway D**. urban building demolitions, firearm violence, and drug crime. *Journal of Behavioral Medicine*. 2019; 42:S1626-634.

14. Universal background checks and violent misdemeanor laws appear to reduce homicide; Shall issue laws appear to increase homicide. None of the ten state laws examined affected suicide.

We examined state homicide and suicide rates 1991-2016 and their relationship with 10 state laws.

Siegel M, Pahn M, Xuan Z, Fleegler E, **Hemenway D**. The impact of state firearm laws on homicide and suicide deaths in the United States: a cross sectional analysis. *Journal of General Internal Medicine*. 2019; 34:2021-2028.

15. Age limits on purchasing won't protect the many young people already living with firearms.

This Editorial emphasizes that while reducing access to lethal means reduces suicide, the age limit on gun purchases may not have a large effect on youth suicide since many youth will still have access to household guns.

John A, **Azrael D**, **Miller M**. Access to firearms and adolescent suicide. *British Medical Journal* 2020; 370:m2829.

16. An ED counseling intervention seems to have improved gun storage in families with youth aged 10-17.

We evaluated a counseling intervention at four hospital sites in Colorado to improve firearm storage in families with youth aged 10-17 who made ED visits for a behavioral health concern. More families reported improving their firearm storage after the intervention compared to the control group.

Miller M, Salhi C, **Barber C**, **Azrael D**, Beatriz E, **Berrigan J**, Brandspigel S, Betz ME, Runyan C. Changes in firearm and medication storage practices in

homes of youth at risk for suicide: Results of the SAFETY study, a cluster emergency department-based, multisite stepped-wedge trial. *Annals of Emergency Medicine*. 2020; 76:194-205.

17. California's comprehensive background check law has increased the percentage of gun acquisitions that have a background check.

In 1991, California passed a comprehensive background check law. In 2018, an internet survey of a representative sample of California adults asked about their most recent firearm acquisition. 45% of those who acquired a gun before 1991 did not have a background check compared to 17% whose most recent purchase came after 1991. Among current California residents who obtained their most recent gun outside of California, 27% did not have a background check. While the California law seems to have an effect, there appear to be gaps in implementation and enforcement.

Kravitz-Wirtz N, Pallin R, Kagawa RMC, **Miller M, Azrael D**, Wintemute GJ. Firearm purchases without background checks in California. *Preventive Medicine*. 2021; 145:106414.

18. Adults in gun owning households don't know whether their state has specific state firearm laws. This fact can limit the effectiveness of the laws.

Our 2019 national firearms survey showed that many gun owners don't know their own state's gun laws. For example, among gun owners in states which had these laws, only 34% of gun owners knew there was a Child Access Prevention Law, only 40% knew there was an Extreme Risk Protection Law, only 60% knew there was a universal background check law, and 64% knew about the requirement to report lost and stolen guns. Not knowing a law exists makes it less likely that gun owners will be influenced by the law.

Rowhani-Rahbar A, Haviland MJ, **Azrael D, Miller M**. Knowledge of state gun laws among US adults in gun-owning households. *JAMA Network Open*. 2021; 4:e2135141.

19. The benefits of Child Access Prevention (CAP) laws are probably overstated.

Using data from our 2019 National Firearm Survey, we found that gun owners with children in CAP law states were no more likely to lock their firearms (and most didn't know whether they lived in a state with a CAP law).

Miller M, Zhang W, Rowhani-Rahbar A. **Azrael D**. Child access prevention laws and firearm storage: results from a national survey. *American Journal of Preventive Medicine*. 2022; 62:333-340.

20. A higher proportion of gun owners in states with comprehensive background check laws had a background check when they acquired their most recent firearm.

Using data from our 2019 National Firearm Survey, we asked about respondents most recent gun acquisition. For those residing in states with comprehensive background check laws, 12% did not undergo a check, compared to 24% in states without comprehensive background check laws. The differences were largely due to differences in checks during private sales from family/friends/acquaintances, and non-purchase transfers. Comprehensive background checks seem to reduce non-check acquisitions.

Hepburn L, **Azrael D**, **Miller M**. Firearm background checks in states with and without background check laws. *American Journal of Preventive Medicine*. 2022; 62:227-233.

21. Recent Supreme Court decisions badly affect public health.

This paper models the projected impact of three 2022 Supreme Court decisions including the Bruen case. The model projects over 150 additional firearm deaths and more than 350 additional nonfatal injuries annually from Bruen. These are conservative estimates.

Gaffney A, Himmelstein DU, Dickman S, Myers C, **Hemenway D**, McCormick D, Woolhandler S. Projected health impacts of three 2022 Supreme Court decisions on COVID-19 workplace protections, handgun carry restrictions, and abortion rights. *JAMA Network Open*. 2023; 6:e2315578.

22. Falsification strategies using negative controls can help determine causal interpretation of results.

This paper provides many examples of using negative control analyses. For example, for Child Access Prevention laws to work, gun owners should probably know that they exist, and change their storage behavior. The effect of these laws should be greater for youth suicide than for suicide by the gun owner. Falsification tests can help indicate causality.

Swanson SA, **Miller M**. Toward a clearer understanding of what works to reduce gun violence: the role of falsification strategies. *American Journal of Epidemiology*. 2024; 193:1061-65.

23. There are ways to improve causal inferences about firearm policies

A scoping review of empirical firearm policy research indexed in PubMed 2000-2021 found 124 articles examining any of 18 prespecified firearm policies. One third used legislative score as the primary exposure, and 38% did not examine changes in policy over time. Many assumptions of casual identification were not acknowledged. Only 1/3 included bias analyses.

Rencken CA, Schleimer JP, **Miller M**, Swanson SA, Rowhani-Rahbar A. Reporting and description of research methodology in studies estimating effects of firearm policies. *Epidemiology*. 2024; 35:458-468.

24. In California, Red Flag laws (ERPOs) may prevent 1 suicide for every 22 ERPOs issued.

Assuming the efficacy of the ERPO law as found in Connecticut, data on over 25 million California adults suggests that, in California, it would take about 22 ERPOs to save one life.

Miller M, Zhang Y, Studdert DM, Sonja Swanson S. Updated estimate of the number of extreme risk protection orders to prevent one suicide. *JAMA Network Open*. 2024; 7:e2414864.

PUBLIC HEALTH APPROACH:

1-8. The public health approach emphasizes prevention and focuses not only on the gun user but also the instrument of violence and the environment

These articles summarize the public health problems caused by firearms, and the public health approach to reducing firearm injuries.

1.Hemenway, David. “A public health approach to firearms policy” in Mechanic, David; Rogut, Lynn B; Colby, David C; Knickman, James R. eds. *Policy Challenges in Modern Health Care*. New Brunswick, NJ: Rutgers University Press, 2005. pp. 85-98.

2. Hemenway, David. The public health approach to reducing injury and violence. *Stanford Law and Policy Review*. 2006, 17:635-56.

3. Hemenway, David; Miller, Matthew. Public health approach to the prevention of gun violence. *New England Journal of Medicine*. 2013; 368:2033-35.

4. Hemenway D. The public health approach to violence prevention. Voigt L, Harper DW, Thornton WE, Jr., eds. *Preventing Lethal Violence in New Orleans*. Lafayette, LA: University of Louisiana Press. 2015.

5. Hemenway D. Reducing firearm violence. *Crime and Justice*. Reinventing American Criminal Justice. 2017; 46:201-230.

This long article explains the public health approach to gun violence and describes ten policies that could substantially reduce the problem. The article appeared in an edited volume in one of the most widely read journals for criminologists.

6. Hemenway D. An injury prevention class exercise—three pronged list making. *Injury Prevention*. 2019; 25:565-569.

This article provides a description of a class exercise that helps students broaden their approach for policies and programs that can reduce firearm and other injuries.

7. Hemenway D. Importance of firearm research. *Injury Prevention*. 2019; 25:i1

8. Hemenway D, Miller M. Reducing firearm violence—why a public health approach is helpful. *Journal of Policy Analysis and Management*. 2019; 38:795-801.

9-10. We can learn from the successes in other public health arenas

The public health approach to reduce the problems of motor vehicles, tobacco and alcohol is applied to firearms policy. Manufacturers try to focus prevention efforts on the user rather than the product. Public health efforts emphasize systematic data collection and a multi-faceted policy approach that includes modifying the product and the environment.

Mozaffarian, Dariush; **Hemenway, David**; Ludwig, David S. Curbing gun violence: Lessons from public health successes. *JAMA*. 2013; 309:551-52.

Hemenway, David. The public health approach to motor vehicles, tobacco, and alcohol, with applications to firearms policy. *Journal of Public Health Policy*. 2001; 22:381-402.

11. Many sensible policies can reduce our firearm problem

A chapter in the book focuses on future success stories and includes a summary of policies aimed at reducing firearm injury.

Hemenway, David. Future Successes. In: *While We Were Sleeping: Success Stories in Injury and Violence Prevention*. University of California Press; May 2009.

12. Changing social norms is also an effective way to reduce firearm violence

This viewpoint discusses social norms that could be changed to reduce suicide, gun trafficking, accidents and interpersonal violence, with examples of successes in norm changes from other fields.

Hemenway, David. Preventing gun violence by changing social norms. *JAMA-Internal Medicine*. 2013;173(13):1167-8.

OPINION SURVEYS:

1-2. The public favors most sensible gun policies, policies the U.S. does not have

We analyzed surveys of the American public over time. Household gun ownership levels have been decreasing in the United States since the 1980s. Most adults, and even most gun owners, favor most gun control laws short of bans on gun ownership.

Blendon, Robert J; Young, John T; **Hemenway, David**. The American public and the gun control debate. *JAMA*. 1996; 275:1719-22.

Young, John T; **Hemenway, David**; Blendon, Robert J; Benson, John M. Poll. Trends: Guns. *Public Opinion Quarterly*. 1996; 60:634-649.

3. NRA members support many regulatory proposals

We analyzed data from a national random-digit-dial telephone survey. National Rifle Association (NRA) members are similar to other gun owners in many respects, but they are more likely to own six or more guns. Unlike the NRA leadership, both NRA members and non-member gun owners support waiting periods and mandatory registration of handguns.

Weil, Douglas S; Hemenway David. I am the NRA: An analysis of a national random sample of gun owners. *Violence and Victims*. 1993; 8:353-65. See also Weil DS, Hemenway D. A response to Kleck (NRA). *Violence and Victims*. 1993; 8:377-85.

4. Most gun owners would purchase a childproof gun

Using data from our National Firearms Survey, we find that among gun owners, over half of those who own handguns (55%) were willing to purchase a childproof gun. This suggests a substantial market exists for childproof guns among potential purchasers of new guns. This article contradicts the gun lobby assertion that there will not be a market for safer guns.

Wolfson JA, Teret SP, Frattaroli S, **Miller M, Azrael D**. The US public's preference for safer guns. *American Journal of Public Health*. 2016; 106: 411-413.

5-6. Most patients think it appropriate for physicians to discuss firearms with them

Using data from our 2015 and 2019 National Firearms Survey, we found that two-thirds of US adults think that it is at least sometimes appropriate for providers to talk to patients about firearms.

Betz ME, **Azrael D, Barber C, Miller M**. Public opinion regarding whether speaking with patients about firearms is appropriate: results of a national survey. *Annals of Internal Medicine*. 2016; 165:543-50.

Simonetti JA, **Azrael D, Zhang W, Miller M**. Perspectives on clinician-delivered firearm safety counseling during routine care: results of a national survey. *Preventive Medicine*. 2022; 158:107039.

7. We find scientific consensus on many gun issues

Monthly we surveyed firearm researchers and found that scientific consensus on many gun issues. Results of short polls show agreement that more guns and weak gun laws cause serious public health problems, that the costs of gun availability are typically greater than the benefits, and that stronger gun laws may improve public safety and health. 84% of researchers agreed and only 8% disagreed with the statement “in the United States, having a gun in the home increases the risk of suicide.” The surveys provide information about agreement or lack of agreement on specific issues and about the quality of the scientific evidence.

Hemenway, David; Nolan, Elizabeth P. The scientific agreement on firearm issues. *Injury Prevention*. 2017; 23(4):221-25.

8. Most Americans find it unacceptable to sell a gun to a stranger without a background check, independent of whether it is legal or not.

One way that guns get into the wrong hands is via gun sales without a background check. Using data from a HICRC nationally representative on-line survey conducted in 2015, we find that 72% of American adults agree with the statement that “whether it is legal or not, it is NOT acceptable to sell a gun to a stranger without a background check”; 11% disagree. Subgroups less likely to agree are young adults, men, conservatives, those with less than a high school education, and gun owners. Still, most Americans, including 64% of gun owners believe that selling a gun to a stranger without a background check is unacceptable behavior.

Hemenway, David; Azrael, Deborah; Miller, Matthew. Selling a gun to a stranger without a background check: acceptable behavior? *Injury Prevention*. 2018; 24:213-217.

9. Most gun owners know little about the relative risks of the three types of firearm injuries –accidents, assaults, self-harm.

Our 1999 National Firearm Survey of 2950 gun owners found that gun owners incorrectly ranked the likelihood of three types of firearm injuries for various groups (e.g., adolescents, persons with Alzheimer's disease).

Rowhani-Rahbar A, Haviland MJ, **Azrael D, Miller M.** Perceptions of firearm-related harm among US adults living in firearm-owning households: a nationally representative study. *Injury Prevention*. 2022; 28:86-89.

SURVEILLANCE AND DATA QUALITY:

1. The National Violent Death Reporting System (NVDRS) is already providing useful data

This essay provides many specific examples of new knowledge available from the NVDRS, some of which has already informed policy.

Barber, Catherine; Azrael, Deborah; Hemenway, David. A truly national National Violent Death Reporting System. *Injury Prevention*. 2013; 19(4):225-6.

2. A good national data system for violent death is crucial

A broadened reporting system, not only for firearms but for all violent deaths (all suicides and homicides) will provide more useful data, at only a small increased cost. This article summarizes the need for such a surveillance system, and its status as of 2001.

Azrael, Deborah; Barber, Catherine; Mercy, James. Linking data to save lives: Recent progress in establishing a National Violent Death Reporting System. *Harvard Health Policy Review*. 2001; 2:38-42.

3. A violent death reporting system will be useful for policy evaluation

This article highlights the benefits of surveillance systems for various social issues (e.g., economics, crime, public health). It shows how the additional information provided by a national violent death reporting system can be used for policy evaluation.

Azrael, Deborah; Barber, Catherine; Hemenway, David; Miller, Matthew. "Data on violent injury." In: Jens Ludwig and Philip J. Cook, eds. *Evaluating Gun Policy: Effects on Crime and Violence*. Washington D.C.: Brookings Institution. 2003.

4. We describe the history of the creation of National Violent Death Reporting System

We describe the effort of many groups, which led to the creation of this data system.

Hemenway, David; Barber, Catherine W; Gallagher, Susan S; **Azrael Deborah.** Creating a national violent death reporting system: A successful beginning. *American Journal of Preventive Medicine.* 2009; 37:68-71.

5. The vital statistics underestimates other-inflicted gun accidents

Do the vital statistics provide an accurate count of unintentional firearm deaths? We compared the Supplemental Homicide Report data on “manslaughter by negligence,” which are considered to be accidents with the vital statistics data. We found that only 23% of the negligence manslaughters were classified as accidents on the death certificates. Official vital statistics data almost certainly undercount firearm accident deaths when the victim is shot by another person.

Barber, Catherine; Hemenway, David; Hochstadt, Jenny; Azrael, Deborah. Underestimates of accidental firearm fatalities: Comparing Supplementary Homicide Report data with Vital Statistics. *Injury Prevention.* 2002; 8:252-256.

6. For accidental gun deaths, NVDRS data are accurate, Vital Statistics are not

We carefully read all the circumstances of any death characterized as an unintentional firearm fatality by the state vital statistics registry (death certificate), the medical examiner or coroner, the police, or the National Violent Death Certificate (NVDRS) abstractor. We found that the NVDRS data were extremely accurate but the Vital Statistics data were not. The Vital Statistics data seriously under-report accidental deaths to children (many true accidents are reported as homicides) and over-report accidental deaths to adults (many homicides and suicides are reported as accidents).

Barber, Catherine; Hemenway, David. Too many or too few unintentional firearm deaths in official U.S. mortality data? *Accident Analysis and Prevention.* 2011; 43:724-31.

7. The best proxy measure of firearm prevalence is the percentage of suicides with guns

Various proxy measures for the prevalence of firearm ownership were compared with surveys-based estimates. One proxy, the percentage of suicides with a firearm, performed consistently better than other measures in cross-sectional comparisons.

Azrael, Deborah; Cook, Philip J; **Miller, Matthew.** State and local prevalence of firearms ownership: Measurement, structure and trends. *Journal of Quantitative*

Criminology. 2004; 20:43-62. Also see National Bureau of Economic Research Working Paper #8570.

8. CDC's WISQARS dramatically underestimates the costs of street gun violence

This commentary emphasizes that cost of injury estimates that focus on medical costs and productivity losses of the victims (e.g., WISQARS) dramatically underestimate the costs of street gun crime. Costs of street gun crime also include costs to the shooters family, criminal justice costs, trauma of witnesses, the costs of avoidance (e.g., children not being able to go out and play), the likelihood of retaliation, and the destruction of neighborhoods

Hemenway, David. Measuring the cost of injury: Underestimating the costs of street violence. *Injury Prevention*. 2011; 17(5):289-90.

9. Vital Statistics and police reports undercount homicides by police

Homicides by police are vastly undercounted by police reports and by Vital Statistics. The National Violent Death Reporting System will be an excellent source for good data on police homicides but all states need to be part of the system.

Police killings are constantly in the news. This article provides another endorsement for the NVDRS, and shows that the U.S. doesn't need to create another data system for the sole purpose of tracking police homicide.

Barber C, Azrael D, Cohen A, Miller M, Thymes D, Wang D, Hemenway D. Homicides by police: Comparing counts from the National Violent Death Reporting System, Vital Statistics, and Supplementary Homicide Reports. *Journal of Public Health*. 2016; 106(5):922-7.

10. Good data systems are important

This essay in a statistical journal highlights the importance of data **systems** (i.e., data collected consistently and comparably across sites and over time), provides examples of the need to recognize the current limitations of each system (e.g., NVDRS) along with the importance to keep improving them, and bemoans the lack of both data and funding for the analysis of firearm issues.

Hemenway, David. Firearms data and an ode to data systems. *Chance* (American Statistical Association) 2018 Feb; 31(1):7-11.

11. There are data deficiencies and insufficient research in the firearms area.

We argue that as anti-science sentiment sweeps the world, it is vital to stop the suppression of firearms studies. “The attempt to muzzle research requires constant push-back. I am always shocked to remember how recent the Enlightenment was, and how fragile is the freedom to be able to make careers out of the search for truth.”

Hemenway, David. Fighting the silencing of gun research. *Nature*. 2017; 546: 345-47.

12. Creating a large longitudinal data set in California

Virtually all existing evidence on firearms and health come from ecological and case-control studies. Because California has been collecting data on all lawful handgun transfers, HICRC has been helping to create a large cohort of more than 28 million California adults by linking the handgun data with voter registration files and all-cause mortality data. Assembly of the LongSHOT cohort was completed in 2019. This dataset will provide incredibly useful longitudinal data on risk factors for violent death.

Zhang Y, Holsinger EE, Prince L, Rodden JA, Swanson S, **Miller, M**, Wintemute G, Studdert D. Assembly of the longshot cohort: public record linkage on a grade scale. *Injury Prevention*. 2020; 26:153-158.

13. The NVDRS is a good data source for police killing of civilians

We cross-linked individual-level mortality data from the 2015 NVDRS and 5 open-source data sets (FatalEncounters.org, Mapping Police Violence, the Guardian’s “The Counted,” Gun Violence Archive, and the Washington Post’s “Fatal Force Database.” Of all the individual fatal shootings from these 5 other data bases, NVDRS captured 97%. NVDRS provides a comprehensive national count of fatal police shootings and detailed circumstantial information about these deaths.

Conner A, Azrael D, Lyons VH, **Barber C, Miller M**. Validating the National Violent Death Reporting System as a source of data on fatal shootings of civilians by law enforcement officers. *American Journal of Public Health*. 2019; 109:578-584.

14. Linking public health and public safety data is beneficial, and politically feasible: a success story

In red state Utah, diverse stakeholders backed a state-funded study of firearm suicide. Linked data showed the proportion of suicide decedents who (a) could have passed a background check, (b) had a concealed carry permit, and (c) had been seen for a previous suicide attempt. Informed by the report's findings, the legislature, health care and religious groups, and state agencies all launched major initiatives to reduce firearm suicide. The Utah experience provides a case study in bringing diverse stakeholders—particularly gun owners—together to find common ground and in using linked data to support and guide their efforts.

Paper selected as Editor's Choice for Top Ten Papers of the Year

Barber C, Berrigan JA, Sobelson-Henn M, Myers K, Staley M, Azrael D, Miller M, Hemenway D. Linking public safety and public health data for firearm suicide prevention in Utah. *Health Affairs*. 2019; 38:1695-1701.

15. Researchers should do more to create and improve data systems.

This commentary argues that while injury researchers often complain about the lack of quality data, we don't do nearly enough to create and improve data systems.

Hemenway D. Let's make it a priority to improve injury data. *Injury Prevention*. 2020; 26:395-396.

16. How states can improve their firearms data.

The US firearms data infrastructure is limited and fragmented. In the absence of federal leadership, we propose that states evaluate their data gaps, expand data collection, and improve data presentation and availability.

Durkin A, Willmore CN, Sarnoff CN, **Hemenway D.** The firearms data gap. *Journal of Law, Medicine, and Ethics*. 2020. S248:32-38.

17. ED data miscode many firearm assaults as accidents.

Half of non-fatal gunshot wounds are not unintentional. In this Commentary, we explain why miscoding occurs, and how it can be corrected.

Barber C, Goralnick E, Miller M. The problem with ICD-coded firearm injuries. *JAMA Internal Medicine*. 2021; 181:1132-33.

18. Too many firearm assault injuries are coded as unintentional.

Examining 1227 cases of firearm injury from hospital discharge data, we found 68% to be assaults. But more than a quarter of these were coded as unintentional injuries in hospital discharge data. The Nationwide Emergency Department Sample (NEDS) cannot be used to reliably count intent-specific firearm injuries.

Miller M, Azrael D, Yenduri R, **Barber C**, Bowen A, MacPhaul E, Mooney SJ, Zhou L, Goralnich E, Rowhani-Rahbar A. Assessment of the accuracy of firearm injury intent coding at 3 US hospitals. *JAMA Network Open*. 2022; 5:e2246429.

19-20. Natural Language Processing can be used to correctly classify firearm injury intent in hospital electronic health records; Multiple imputation by super learning may be a good way to assign intent when cases are of undetermined intent.

The natural language processing model was used to evaluate 381 patients with firearm injuries. The model proved more accurate than medical coders in assigning intent.

MacPhaul E, Zhou L, Mooney SJ, **Azrael D**, Bowen A, Rowhani-Rahbar A, Yenduri R, **Barber C**, Goralnick E, **Miller M**. Classifying firearm injury intent in electronic hospital records using natural language processing. *JAMA Network Open*. 2023; 6:e235870.

Carpenito T, **Miller M**, Manjourides J, **Azrael D**. Using multiple imputation by super learning to assign intent to non-fatal firearm injuries. *Preventive Medicine* 2022; 165:107324.

21. Ways to improve US non-fatal firearm injury data systems.

The US currently does not have a system that accurately tracks nonfatal shooting injuries. This paper characterizes the strengths and weaknesses of existing federal data systems (i.e., hospital and police data) and explains how they can be improved. For example, for data from health care agencies, challenges currently being addressed include public access, timeliness, and accuracy of coding of intent (hospitals misclassify many firearm assaults as accidents)..

Barber C, Cook PJ, Parker ST. The emerging infrastructure of US firearms injury data. *Preventive Medicine* 2022; 165:107129.

22. NVDRS correctly classifies 90% of unintentional firearm deaths to children by children (0-14).

Reading the NVDRS (2009-2018) narratives, we found that abstractors too often incorrectly classify cases of accidental gun deaths of children as homicides if the narrative explicitly noted adult negligence as contributing to the shooting death, NVDRS coding guidelines should explicitly state that negligent manslaughter is not a contraindication of unintentional shootings provided the firearm was not used to intentionally harm, threaten or coerce.

Fischer S, Miller M, Barber C, Azrael D. Accuracy of the National Violent Death Reporting System in identifying unintentional firearm deaths to children by children. *Injury Epidemiology*. 2024;11:29.

LEAD:

1. Lead poisoning from firearms may also increase suicide (Massachusetts data)

An overlooked factor connecting firearms and suicide is lead exposure. Data on firearm licensure rates and lead levels come from 350 Massachusetts towns. Firearm suicide (and overall suicide, but not non-firearm suicide) was higher in towns with more licensed gun owners. There was more lead in towns with more firearm licenses and lead was associated with higher rates of suicide by all methods.

Hoover CG, Specht AJ, **Hemenway D**. Firearm licensure, lead levels and suicide in Massachusetts. *Preventive Medicine*. 2023; 166:107377.

2. Elevated child blood levels are associated with household firearm ownership levels (across US states)

In cross-section analysis across US states (2012-2018), two factors significantly associated with high child blood levels were older houses and household firearm ownership.

Hoover C, Fossa AJ, Ranney ML, Hoover GG, Specht AJ, **Hemenway D**, Braun JM. Firearm-related lead exposure and child lead levels in the United States, 2012-2018. *Journal of Pediatrics*. 2024. 269:113975.

MISCELLANEOUS:

1. An armed society is not a trusting society

Working with experts on income inequality, social capital, and mortality, we analyzed the relationship between firearm availability and measures of social trust and civic engagement across U.S. states. We found that states with more guns have lower levels of both mutual trust and civic engagement, after accounting for urbanization, poverty and median household income.

Hemenway, David; Kennedy, Bruce; Kawachi, Ichiro; Putnam, Robert D. Firearm prevalence and social capital. *Annals of Epidemiology*. 2001; 11:484-490.

2-3. Less lethal and less dangerous weapons need to be developed for civilians and for the police

We made the case that more research needs to be done to make firearms safer, more effective, and less lethal.

Hemenway, David; Weil, Douglas S. Phasers on stun: The case for less lethal weapons. *Journal of Policy Analysis and Management*. 1990; 9:94-98.

Hemenway, David; Weil, Douglas S. Less lethal weapons. Op-Ed, Washington Post, May 14, 1990.

4. An editorial for psychiatrists on ways society can reduce firearm violence

This editorial, in a leading psychiatric journal (accompanied by a podcast by Drs. Matthew Miller and David Brent) makes the case that effective legislation, including universal background checks, is urgently needed, and could sustainably reduce our country's firearms death toll.

First author David Brent conducted many of the early case-control studies on the risk a gun in the home poses for adolescent suicide. It is important to have psychiatrists on board in the struggle to reduce firearm violence.

Brent D, **Miller M**, Loeber R, Mulvey E, Birmaher B. Ending the silence on gun violence. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2013; 52:333-38.

5. More guns = more gun crime

Across U.S. states, higher levels of firearm ownership are associated with higher levels of firearm assault, firearm robbery, firearm homicide and overall homicide. The findings do not support the hypothesis that higher population firearm ownership rates reduce firearm-associated criminal perpetration. On the contrary, evidence shows that states with higher levels of firearm ownership have an increased risk for violent crimes perpetrated with a firearm.

This article provides evidence that contradicts the common claim among gun advocates that gun ownership helps reduce crime.

Monuteaux MC, Lee LK, **Hemenway D**, Mannix R, Fleegler EW. Firearm ownership and violent crime in the U.S.: An ecological study. *American Journal of Preventive Medicine*. 2015; 49:207-14.

6. Many special laws protect gun manufacturers, dealers, owners and users

A law article highlights the fact that although hundreds of thousands of guns are stolen each year, the US legal system is currently bankrupt of tools to deter dangerous, unreasonable firearms security. The current essay puts that fact into a broader perspective--that the treatment of gun owner negligence is just one example among many where there are special laws that often protect gun manufacturers, gun dealers, gun owners and gun users.

Hemenway D. Gun exceptionalism. *Florida Law Review Forum*. 2016; 68:45-50.

7. There is much firearms research that could help Emergency Medicine physicians

A national panel of content experts for the American College of Emergency Physicians Research Committee decided on 59 emergency medicine-relevant empirical research questions that could help inform ED physicians in their work. .

Ranney ML, Fletcher J, Alter H, ...**Miller M**...et al. A consensus-driven agenda for emergency medicine firearm injury prevention research. *Annals of Emergency Medicine*. 2017 Feb 28;69(2):227-40.

8. Creating a research agenda to reduce firearm injuries

Cunningham RM, Carter PM, Zimmerman MA, Ranney ML, Walton M, Zeoli AM, Alpern ER, Brandas C, Beidas RS, Ehrlich PF, Goyal MK, Goldstick JE, **Hemenway D**, Hargarten SW, King CA, Massey L, Ngo Q, Pizarro J, Prosser L, Rowhani-Rahbar A, Rivara F, Rupp LA, Siegal E, Savolainen J. Consensus-driven research agenda from FACTS consortium on the prevention of firearm injuries among children and adolescents. *JAMA-Pediatrics*. 2019; 173:780-789.

9. The actual costs of gun violence are enormous.

This scoping review of what is known about the severity of the problem includes not only death, disability and direct medical costs, but includes costs to families, friends, and the community. The more indirect costs include grief, fear, hopelessness and PTSD, along with community efforts to prepare for and prevent the shootings, such as target hardening of schools and active shooter drills.

Hemenway D, Nelson E. The scope of the problem. Gun violence in the USA. *Current Trauma Reports*. 2020; 6:29-35.

10. The number of firearm research articles in PubMed quadrupled 2000-2019

A scoping review of empirical peer-reviewed journal articles in PubMed 2000-2019 showed more than a 300% increase. The number of articles supported by foundations (led by the Joyce Foundation) was greater than the number funded by federal grants. The amount of firearm research has been increasing rapidly in recent years but is still small in relation to the size of the problem.

Gurrey S, McCauley H, Benson M, Prabhu P, Fan MD, Rivara FP, **Hemenway D**, **Miller M**, **Azrael D**, Rowhani-Rahbar A. Firearm-related research articles in health sciences by funding status and type: a scoping review. *Preventive Medicine Reports*. 2021; 24:101604.

11. Gun crime victims report more post-crime emotional and physical problems than non-gun victims.

Using data from the National Crime Victimization Surveys (2009-2019), we examined the likelihood of post-crime emotional and physical problems for the victim. Controlling for type of crime, multiple offenders, and victim demographics, gun crime victims were more likely to suffer at least one of seven emotional symptoms (e.g., anxious, angry, depressed) and at least one of seven physical symptoms (e.g., headaches, drinking disorders, high blood pressure). These post-crime problems are part of the true costs of gun crime.

Vargas EW, **Hemenway D**. Emotional and physical symptoms after gun victimization in the US: 2009-2019. *Preventive Medicine*. 2021; 143:106374

12. There are more shootings on warm days.

Using Chicago data 2012-2016, we found that 10 degrees centigrade higher temperatures were associated with 34% more shootings, controlling for weekends, holidays and other non-school days. Perhaps air-conditioning and summer programs could help keep youth busy and inside.

Reeping R, **Hemenway D**. Chicago weather and shootings. *Injury Epidemiology*. 2020; 7:31.

13. Instead of advocating for one-off laws, we should be looking to create a system that leads to continual reductions in firearm violence.

Why are motor vehicles becoming continuously safer? As the idea of continuous quality improvement became a staple in medicine, we should similarly have a focus on how to create a system that leads to continuous reductions in firearm violence.

Hemenway D, Lee L. A lesson from the continuing 21st century motor vehicle success story. *Injury Prevention*. 2022; 28:480-482.

OVERALL:

1. The United States has a very high rate of firearm death

Using recent data from the World Health Organization (WHO), this paper provides striking evidence on the size of the U.S. problems of gun homicide, overall homicide, gun suicide, and unintentional gun death compared to other advanced countries — for both genders and every age group.

Richardson, Erin G; **Hemenway, David**. Homicide, suicide and unintentional firearm fatality: Comparing the United States with other high-income countries, 2003. *Journal of Trauma*. 2011; 70:238-43.

2. The risks of a gun in the home typically far outweigh the benefits

This article summarizes the scientific literature on the health risks and benefits of having a gun in the home for the gun owner and his/her family and concludes that for most contemporary Americans, the health risk of a gun in the home is greater than the benefit.

Hemenway, David. Risks and benefits of a gun in the home. *American Journal of Lifestyle Medicine*. 2011; 5:502-511.

3. More guns, more violent death

This book chapter summarizes the scientific literature on the relationship between levels of household gun ownership and violent death. It also shows that the majority of suicides for all age groups, and homicides for children and aging adults, occur at home.

Miller, Matthew; Azrael, Deborah; Hemenway, David. Firearms and violent death in the United States. In: Webster DW, Vernick JS, eds. Reducing Gun Violence in America. Baltimore MD: Johns Hopkins University Press, 2013.

4. Better mental health treatment may help but effective legislation is crucial to reduce gun violence

This editorial, in a leading psychiatric journal makes the case that effective legislation, including universal background checks, is urgently needed, and could substantially reduce our country's firearms death toll.

Brent, David; **Miller, Matthew**; Loeber, Rolf; Mulvey, Edward P; Birmaher, Boris. Ending the silence on gun violence. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2013; 52:333-38.

5. Per capita U.S. gun deaths vastly exceed all other high-income countries

We examined 2010 mortality data obtained from the World Health Organization for populous, high-income countries (n = 23). U.S. homicide rates were 7 times higher than in other high-income countries, driven by a gun homicide rate that was over 25 times higher. The overall firearm death rate in the United States from all causes was 10 times higher. Ninety percent of women, 91% of children aged 0 to 14 years, 92% of youth aged 15 to 24 years, and 82% of all people killed by firearms in all these countries were from the United States.

This article updates and expands our previous, highly-cited article that provided the data showing how bad the U.S. is in terms of violent death --- particularly firearm death --- compared to the other advanced nations. It is virtually impossible to see these data and still claim that guns in the U.S. promote safety rather than death.

Grinshteyn E, **Hemenway D**. Violent death rates: The United States compares to other high-income OECD Countries. *American Journal of Medicine*. 2016; 129:266-73.

6. 2003-2015 per capita gun deaths increased in the US, decreased in other high-income countries 2003-2015

This article updates and expands our previous articles that provided the data showing how our firearm deaths compared to the other advanced nations. Things have gotten worse! We examined 2015 mortality data obtained from the World Health Organization for populous, high-income countries. U.S. homicide rates were 7.5 times higher than in other high-income countries, driven by a gun homicide rate that was over 25 times higher. The overall firearm death rate in the United States from all causes was 11 times higher. 92% of women, 97% of children aged 0 to 4 years killed by firearms in all these countries were from the United States.

Even our low gun states had a firearm homicide rate 13.5 times higher than the other high-income countries; firearm homicide among the US white population was 12 times higher than for the entire population of these other countries.

Grinshteyn E, **Hemenway D**. Violent death rates in the US compared to those in the other high-income countries. *Preventive Medicine*. 2019; 123:20-26.

US firearm problems in the quarter century since the Columbine school shooting have gotten worse.

Three key reasons for the large increase (1999-2021) in the firearm homicide rate (70%) and firearm suicide rate (33%) have been the increase in household gun ownership, the increased lethality of the gun stock, and the weakening of federal gun laws. Most important has been the Supreme Courts new interpretations of the Second Amendment. Three reasons for hope in reducing the problem have been improvements in data (e.g. the National Violent Death Reporting System), the increase in research funding, and the increased acceptance of the public health approach to reducing gun violence.

Hemenway D. Twenty-five years after Columbine—firearms and public health in the United States. *New England Journal of Medicine*. 2024: 390:1352-1353.