Twenty years later: The Federal Assault Weapons Ban curtailed public mass shootings

Alex Lundberg, James A. Fox, Hassan Mohammad, Maryann Mason, David Victorson, Ruben Parra-Cardona, Lori A. Post

Submitted to: JMIR Public Health and Surveillance
on: June 06, 2024

Table of Contents

Twenty years later: The Federal Assault Weapons Ban curtailed public mass shootings

Alex Lundberg[1] PhD; James A. Fox[2] PhD; Hassan Mohammad[3]; Maryann Mason[1] PhD; David Victorson[4] PhD; Ruben Parra-Cardona[5] PhD; Lori A. Post[1] PhD

[1]Buehler Center for Health Policy & Economics Feinberg School of Medicine Northwestern University Chicago US
[2]Northeastern University New York US
[3]Buehler Center for Health Policy & Economics Northwestern University Chicago US
[4]Medical Social Sciences Feinberg School of Medicine Northwestern University Chicago US
[5]Steve Hicks School of Social Work University of Texas at Austin Austin US

Corresponding Author:
Alex Lundberg PhD
Buehler Center for Health Policy & Economics
Feinberg School of Medicine
Northwestern University
9-933 Rubloff Building
420 E Superior St
Chicago
US

Abstract

Background: Assault weapon and large capacity magazine bans are potential tools for policymakers to prevent public mass shootings. However, the efficacy of these bans is a continual source of debate. In an earlier study, we estimated the impact of the Federal Assault Weapons Ban (FAWB) on the number of public mass shooting events. This study provides an updated assessment with three additional years of firearm surveillance data to characterize the longer-term effects.

Objective: To estimate the impact of the FAWB on trends in public mass shootings from 1966 to 2022.

Methods: We use linear regression to estimate the impact of the FAWB on the five-year simple moving average of annual, public mass shootings, defined by events with four or more deaths in a 24-hour period, not including the perpetrator. The study period spans 1966 to 2022. The model includes indicator variables for both the period of the FAWB (1995-2004) and the period after its removal (2005-2022). These indicators were interacted with a linear time trend. Estimates controlled for the national homicide rate. After estimation, the model provided counterfactual estimates of public mass shootings if (1) the FAWB were never imposed and (2) if the FAWB remained in place.

Results: The overall upward trajectory in the number of public mass shootings substantially fell while the FAWB was in place. These trends are specific to events in which the perpetrator used an assault weapon or large capacity magazine. Estimates suggest the FAWB prevented five public mass shootings while the ban was active. A continuation of the FAWB/LCMB would have prevented up to thirty-eight public mass shootings.

Conclusions: The FAWB, which included a ban on large capacity magazines, was associated with fewer public mass shooting events, fatalities, and nonfatal gun injuries. Gun control legislation is an important public health tool in the prevention of public mass shootings. Clinical Trial: n/a

(JMIR Preprints 06/06/2024:62952)
DOI: https://doi.org/10.2196/preprints.62952

Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✓ **Please make my preprint PDF available to anyone at any time (recommended).**
Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.

Only make the preprint title and abstract visible.
No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**
Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain v
Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <a href="http

Original Manuscript

Twenty years later: The *Federal Assault Weapons Ban* curtailed public mass shootings

Alexander Lundberg, PhD,[1] James A. Fox, PhD,[2] Hassan Mohammad,[3] Maryann Mason, PhD,[4] David Victorson, PhD, Ruben Parra-Cardona, PhD, Lori Ann Post, PhD[5]

Author Affiliations

1. Alexander Lundberg, PhD
   Northwestern Feinberg School of Medicine
   9-933 Rubloff Building
   420 E Superior St.
   Chicago, Il 60611

   Corresponding author
   Phone: 312-503-4559
   E-mail: alexander.lundberg@northwestern.edu

2. James A. Fox, PhD
   Professor Emeritus
   Northeastern University
   Boston, MA

3. Hassan Mohammad
   Firearm Surveillance Intern
   Buehler Center for Health Policy & Economics
   Northwestern University

4. Maryann Mason, PhD
   Associate Professor of Emergency Department
   Northwestern Feinberg School of Medicine

5. David Victorson, PhD
   Professor of Medical Social Sciences
   Northwestern Feinberg School of Medicine

6. Ruben Parra-Cardona
   Professor and Associate Dean
   Steve Hicks School of Social Work
   University of Texas at Austin

7. Lori Ann Post, PhD
   Professor of Emergency Medicine
   Director of the Buehler Center for Health Policy and Economics
   Northwestern Feinberg School of Medicine

ABSTRACT

Keywords

Assault weapons, FAWB, Federal Assault Weapons Ban, firearms, guns, large capacity magazine, LCM, gun policy, public mass shootings

Background

Assault weapon and large capacity magazine bans are potential tools for policymakers to prevent public mass shootings. However, the efficacy of these bans is a continual source of debate. In an earlier study, we estimated the impact of the Federal Assault Weapons Ban (FAWB) on the number of public mass shooting events. This study provides an updated assessment with three additional years of firearm surveillance data to characterize the longer-term effects.

Objective

To estimate the impact of the FAWB on trends in public mass shootings from 1966 to 2022.

Methods

We use linear regression to estimate the impact of the FAWB on the five-year simple moving average of annual, public mass shootings, defined by events with four or more deaths in a 24-hour period, not including the perpetrator. The study period spans 1966 to 2022. The model includes indicator variables for both the period of the FAWB (1995-2004) and the period after its removal (2005-2022). These indicators were interacted with a linear time trend. Estimates controlled for the national homicide rate. After estimation, the model provided counterfactual estimates of public mass shootings if (1) the FAWB were never imposed and (2) if the FAWB remained in place.

Results

The overall upward trajectory in the number of public mass shootings substantially fell while the FAWB was in place. These trends are specific to events in which the perpetrator used an assault

weapon or large capacity magazine. Estimates suggest the FAWB prevented five public mass shootings while the ban was active. A continuation of the FAWB/LCMB would have prevented up to thirty-eight public mass shootings.

Conclusions

The FAWB, which included a ban on large capacity magazines, was associated with fewer public mass shooting events, fatalities, and nonfatal gun injuries. Gun control legislation is an important public health tool in the prevention of public mass shootings.

Introduction

Public mass shootings constitute a fraction, less than 1%, of the approximately 20,000 annual firearm homicides [1-5]. However, their notoriety commands national attention, propelling debates on gun policy and fueling the ongoing quest among policymakers to stop these events [6-38]. The Federal Assault Weapons Ban (FAWB), enacted by Congress in August 1994 with a provision for sunset in September 2004 [39], prohibited the manufacture or sale of specific semiautomatic firearms categorized as "assault weapons" [40].

The definition of an assault weapon can be a source of confusion. Semiautomatic weapons (rapid fire) and assault weapons (AW) (second grip plus other features) are often mistakenly conflated [41-44]. Semiautomatic weapons will automatically load another cartridge into a chamber but require a handler to manually release and press the trigger to fire each round. Automatic weapons further allow a handler to hold the trigger for continuous fire [45]. The FAWB explicitly noted some of the most commonly purchased assault weapons [40]. The ban covered firearms having a detachable magazine and at least two of the following: a telescoping stock, a pistol grip that protrudes conspicuously, a bayonet mount, a flash suppressor, or a grenade launcher. Semiautomatic pistols and shotguns were similarly banned contingent on the presence of other specific attachments.

The FAWB also prohibited the manufacture and sale of “large capacity magazines” (LCMs) defined as holding more than ten bullets [46]. The LCM ban may have been more impactful than the assault weapons ban, as several studies have shown a negative association between LCM bans and casualty counts at the state level [46-51]. These and other studies have also examined the broader effect of the FAWB on various outcome measures [52-54].

This study focuses on the impact of the FAWB on public mass shootings. The approach differs from previous research in three aspects: 1) a focus on public mass shooting events as the primary outcome variable; 2) counterfactual estimates of the number of events that would have occurred had the FAWB never been implemented; and 3) analogous estimates if the FAWB were

continued. Because assailants often aim to maximize casualties, the restrictions imposed by the FAWB may have had a greater impact on public mass shootings than on other types of mass shootings (e.g., family annihilation) [55, 56]. Assault weapons and LCMs facilitate the rapid discharge of rounds, increasing the potential for higher casualty counts [46]. Our previous research indicated a significant increase in public mass shooting events, fatalities, and injuries following the expiration of the FAWB.

Most FAWB studies focus on the reduction in fatalities or injuries as outcomes variables, but Koper et al. (2001) and Post et al. (2021) examined whether the FAWB resulted in fewer mass shooting events [52, 57]. Koper (2001) tempered his FAWB research findings “because the ban's long-term effects could differ from the short-term impacts revealed by this study” [52]. To that end, this study extends our prior research with three additional years of data. We also present results on the number of events in which the perpetrator used a firearm potentially classified as an assault weapon.

Methods

To define a public mass shooting, we adopt the Federal Bureau of Investigation definition of a massacre, in which four or more people (apart from an assailant) are killed within a single event [58]. We added the requirement for a shooting to have occurred in a public setting and committed within a 24 hour timeframe, as in Fox et al. [59-61]. Data were sourced from the Violence Project, which maintains a database on mass shooting events in the US from 1966 onward.

We used linear regression to estimate the impact of the FAWB on the five-year simple moving average (SMA) [62, 63]. The SMA model estimates the mean value for public mass shooting events for each year:

$$E_t = \beta_0 + \beta_1 fawb + \beta_1 fawb \cdot t + \beta_2 postfawb + \beta_3 postfawb \cdot t + \beta_4 t + \beta_5 ho\, m_t + e_t . \quad (1)$$

The dependent variable, E_t, is the five-year SMA of public mass shootings in year *t*. The indicators *fawb* and *postfawb* are set to one, respectively, for the years 1995-2004 and 2005-2022. Because the FAWB was enacted in late 1994, we coded 1995-2004 as years under the ban. Lastly, hom_t denote the national population and homicide rate in year *t*. Statistical inference was based on the α=0.05 level with hetersokedasticity-robust standard errors.

We conducted two counterfactual exercises. The first estimated the number of the public mass shootings that would have occurred from 1995-2004 if the FAWB had not been adopted. The second projected forward the number of events that would have occurred had the FAWB remained in place for 2005-2022. The difference between the predicted values from these exercises and the actual number of events provided, respectively, estimates of the number of events prevented by the FAWB and the number of events created by its removal.

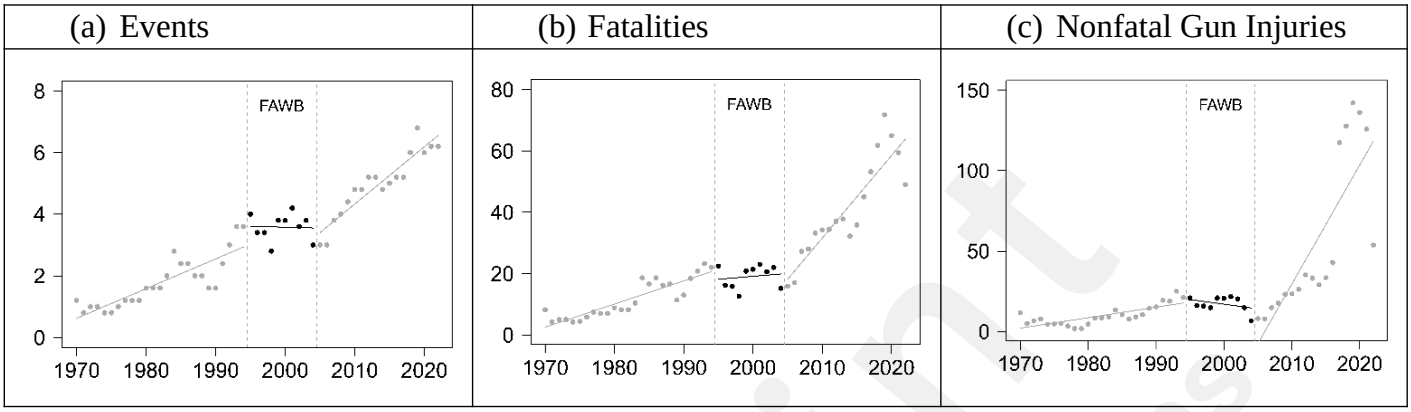
Results

The data contained 184 public mass shooting events from 1966-2022. The years prior to the FAWB contained 55 events. The period of the ban, defined as 1995-2004, contained 34 events, and the period after the ban contained 95 events.

Figure 1, panel (a), plots the five-year simple moving average (SMA) of events over the sample period. The first data point therefore begins in 1970. The figure shows an increase in events over time. The maximum five-year SMA of 6.8 occurred in 2019. However, trend lines vary significantly for the periods before, during, and after the FAWB. In particular, the trend was negative for the FAWB period but positive before and after the ban. Figure 1, panel (b), presents analogous trends for the five-year SMA of fatalities in public mass shootings, while panel (c) presents trends for non-fatal gun injuries. The trendline for fatalities was slightly positive during the FAWB, but the magnitude of the slope was much lower than for either period around the ban. The trendline for

injuries sloped down during the FAWB, while it sloped up in either period around the ban.

Figure 1. Trends in the 5-Year Moving Average of Events, Fatalities, and Nonfatal Gun Injuries



The trend lines in Figure 1 are based solely on year as a covariate. With a focus on events, Table 1 presents the results from the full regression model (1). The ordinary least squares regression fit line returned a slope coefficient of 0.10 for the years 1966-1994. While the FAWB was in place from 1995-2004, the slope was -0.06. The slope became positive again after the removal of the ban. In fact, at 0.20, the slope was nearly twice the magnitude of the period before the ban. Table 1 presents the full results of the regression model.

Table 1. Regression Output

	E_t
fawb	327.00***
	(109.94)
postfawb	-201.92***
	(42.60)
fawb·t	-0.16***
	(0.06)
postfawb·t	0.10***
	(0.02)
year	0.10***
	(0.01)
hom	-0.23**
	(0.08)
constant	-188.50***
	(28.16)
n	53

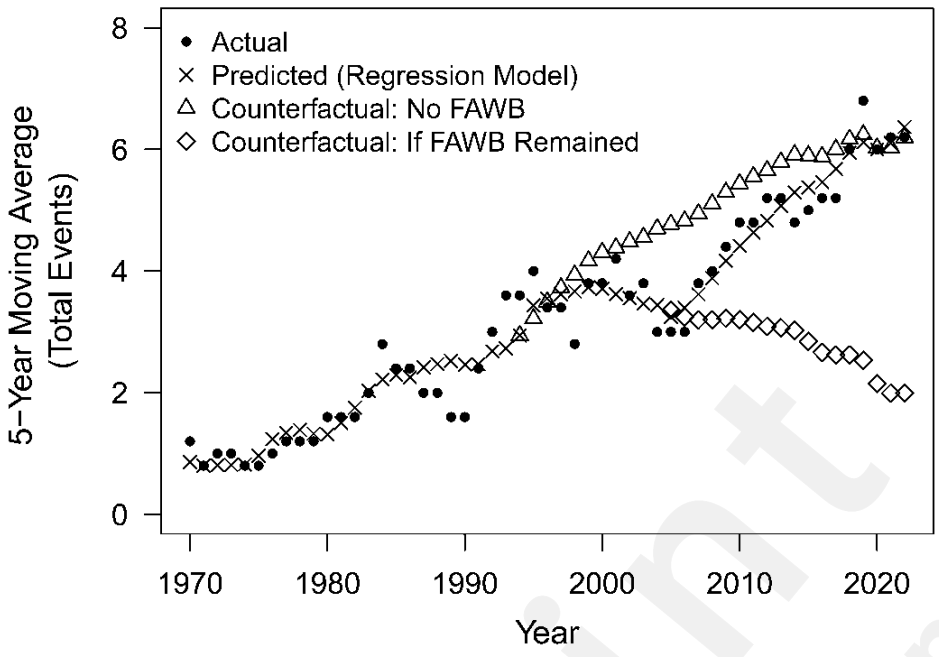
Adjusted R^2	0.95
F-Statistic	137.32^{***} (df = 6; 46)

Note: *p<.05, **p<.01,***p<0.001.

Figure 2 presents the counterfactual exercises from the regression model. The first counterfactual trend shows the estimated five-year moving SMA of events if the FAWB had never been imposed. Estimates are denoted by triangles, and they are much higher than the actual moving average of events from 2000 until roughly 2021. The exercise indicates a significant increase in events if the FAWB had not been imposed. The sum of the annual differences between the counterfactual and actual SMAs from 1995-2004 suggests the FAWB prevented five public mass shootings.

The second counterfactual exercise shows the estimated five-year SMA of events if the FAWB had continued until 2022. Estimates are denoted by diamonds. The results starkly diverge from the actual moving average of events. The counterfactual estimates began an immediate downward trend after the FAWB, while the actual moving average quickly trended upward. The sum of the annual differences between the counterfactual and actual moving averages from 2005-2022 suggests a continuation of the FAWB may have prevented up to thirty-eight events over the period.

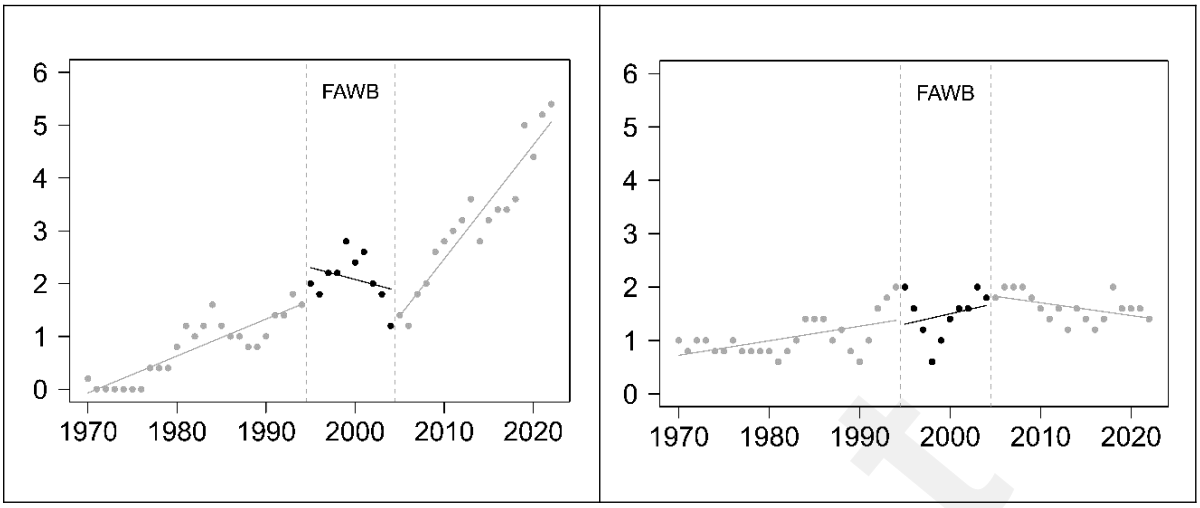
Figure 2. Counterfactual Estimates for the Absence and Continuation of the FAWB



Data from the Violence Project also contain detailed information on the firearms used in events. Figure 3 contains trendlines, similar to Figure 1, but for events in which either an assault weapon was used and or not. To derive these categories, we first set a filter to exclude weapons collected by police but recorded as not used in the shooting. We coded “yes” for an assault weapon whenever at least one weapon in the event was designated as either an assault weapon or had a large capacity magazine. However, for every revolver, we reclassified any missing value for large capacity to “no,” as these firearms cannot be modified to large capacity. We also consulted with firearm experts to classify remaining missing values in the database. We note that these categories should be viewed as proxies to coverage under the FAWB given the complexity of the legislation. See the Introduction for details on the types of weapons covered by the ban.

Figure 3. Trends in the 5-Year Moving Average of Events in which an Assault Weapon Was Used or Not.

(a) Assault Weapon	(b) No Assault Weapon



Despite some natural limitations in the proxy measure of an assault weapon (or LCM), the results are consistent with the hypothesis that the FAWB reduced public mass shooting events. In Figure 3, panel (a), the SMA of events in which the perpetrator used at least one assault weapon trended upward outside of the FAWB and downward during the FAWB. In comparison from panel (b), trends in the SMA for events in which no assault weapon was used were relatively flat, and the magnitudes of the SMAs were much smaller.

Discussion

The results suggest the FAWB had a sizeable impact on the number of public mass shootings in the United States. From 1966 to 2022, public mass shootings trended upward. However, the trend was interrupted while the FAWB was in place. Furthermore, counterfactual exercises suggest (1) events would have been higher if the FAWB had not been imposed, and (2) events would not have risen so rapidly after 2004 if the FAWB had remained in place. Our first counterfactual is consistent with but smaller than Koper's finding: five versus nine fewer events during the 10-year FAWB [31, 45, 49, 52, 53]. The triangulation of these results is meaningful because each study relied on different data sources and statistical approaches.

Compared to our first study, the second counterfactual estimate of how many mass shootings could have been prevented if the FAWB remained in place is greater (38 versus 30 fewer events). However, this increase is driven exclusively by a longer sample period, as the additional three years

of data arrived when the rate of events was at a record high. Finally, the results in Figure 3 show a dramatic increase in the rate of events in which an assault weapon was used after the FAWB was lifted.

Two points from our initial study deserve repetition. First, the increase in public mass shootings events cannot be attributed to population growth, as the rate of events has outpaced population growth. The US population grew by approximately 70% from 1966-2022, while the five-year moving average of events more than quintupled [64]. The regression results also control for year, which is almost perfectly collinear with population over the sample period. Second, the negative sign on the homicide rate covariate implies the rise in public mass shootings is not simply a function of the overall homicide rate.

DiMaggio et al. [65] also reported a decrease in events during the ban using shorter sample period with fewer events. Gius [66] found the FAWB was associated with fewer mass shooting deaths in a model combining state and federal bans. While, Koper, Roth, and colleagues did not find an effect, the absence may be explained by the inclusion of all gun homicides, whose substantially higher numbers could wash out any effect on the subset of public mass shootings [52, 53]. In more recent work, Koper et al. [25,29] find assault weapons and other high capacity semiautomatics are used in a high percentage of mass murders (up to 57%), which raises plausibility that the FAWB indeed reduced the rate of public mass shootings.

The FAWB may have worked through its two primary mechanisms: a ban on assault weapons and a ban on LCMs. For example, Webster et al. [51] and Klaveras et al. [46] found that state LCM bans were associated with fewer public mass shootings and deaths per event. Because our study focused on the FAWB, we cannot differentiate between the two mechanisms of action. We note, however, that both mechanisms can affect the ability of an assailant to maximize death counts in a public mass shootings. Both may therefore be important deterrents.

We focused on the moving average of events because the FAWB carried several limitations.

First, the ban contained a grandfather clause in which any previous owner of banned weapons was allowed to retain them [67]. Second, many weapons remained in the community because the ban was unaccompanied by a buyback program [53]. Third, gun legislation allows buyers who acquire weapons from gun shows or directly from another owner are not required to pass background checks [68, 69]. While guns are registered at the point of sale from an arms dealer, most states do not regulate the transfer of arms from one owner to the next, nor do they require a background check [70-75]. The effects of the FAWB may have been stronger without these limitations. For example, Australia, England, Canada, and New Zealand implemented gun buyback programs that dramatically reduced gun deaths [76-80]

The trend analysis in Figure 1 revealed a dramatic upward shift across events, fatalities, and nonfatal gun injuries after the FAWB was lifted. One potential confounder would be the adoption of "new media" [81-83]. Even late adopters significant rose as the FAWB was lifted. In contrast to legacy media (print newspapers, radio, and televised news), new media shifted from passive consumption to interactivety with mass communication via new technology, impacting how, when, and where we consume news, as well as the quality of news [81-84]. Some individuals may be more inspired to commit mass shootings after the FAWB sunsetted in 2004 because they get more press coverage. Potential mass shooters also have more opportunities to interact with hate groups online, an observation across multiple mass shooting gun archives [85-87]. "Echo chambers" of limited, skewed information have at times fueled violent extremism among groups online [88]. Many perpetrators emulate previous perpetrators and research previous mass shootings online prior to an attack [89]. This emulation has fueled concerns about contagion effects, but statistical evidence on contagion, at least on a short-term horizon, is weak to nonexistent [59, 90]. Conflation of the terms "copycat" and "contagion" can explain the apparent discrepancy. "Copycat" attacks can result from emulation among perpetrators, but "contagion" refers to an elevated risk of subsequent attacks within a specific time window.

The use of social media, a subset of new media, by perpetrators should not be oversimplified [91, 92]. While many perpetrators “leak” their thoughts and intentions through social media, “leakage” existed through different outlets previously [93]. Still, new media, including the subset of social media, have undoubtedly shaped the discourse around public mass shootings. Ongoing research will continue to provide insight on the relationship between media and public attacks themselves.

This study extends our prior research by incorporating three additional years of data, spanning from 2020 to 2022, a period which coincides with the onset and progression of the COVID-19 pandemic—the largest global health crisis in recent history [94, 95]. It is highly likely that the COVID-19 pandemic curtailed public mass shootings because its onset corresponds with the a conspicuous absence of public mass shootings. Every database tracking public mass shootings shows an increase of public mass shootings over time with a notable dip at the start of the COVID-19 pandemic [85-87, 96]. In fact, the last public mass shooting occurred on March 15, 2020 in Springfield, Missouri, 1-3 weeks before state government agencies imposed mandatory stay-at-home orders [97]. Subsequently, the United States experienced an unprecedented hiatus of 10 months, or 300 days, devoid of public mass shootings—a remarkable departure from the preceding two decades [85, 87]. Several factors likely explain the interruption. For example, stay-at-home orders, social distancing, quarantines, and bans on large gatherings may have reduced opportunities to successfully carry out a mass shooting. The rate of events rebounded in 2022 to a level consistent with the rate at the onset of the pandemic.

Finally, a decrease in fatalities and nonfatal gun injuries during the FAWB is intuitive because the combination of assault weapons and LCMs allow mass shooters to rapidly discharge dozens of rounds within minutes. The use of an assault rifle in combination with an LCM doubled the fatalities and increased nonfatal gun injuries by 81% compared to public mass shootings without [98]. Moreover, consistent with other investigators, Koper (2020) found that fatal mass shootings with

LCMs have 60-67% higher fatality counts than mass shootings without [46, 99, 100]. What is less intuitive is why the FAWB resulted in fewer events. Why would the ban dissuade mass shooters from committing a mass shooting? One possible explanation would be a desire among mass shooters to maximize death and injury. Assault weapon and LCM bans limit the ability to achieve the goal. Furthermore, mass shooters may value the more active, intimate role in homicide offered by a firearm relative to a more passive approach, such as a bomb or arson. Finally, perpetrators may want to emulate prior events in terms of the weapons and locations of an attack, and increasing numbers of high profile events involve the use of an assault weapon.

Limitations

This study found a statistically significant difference in incidence of public mass shootings during the FAWB. However, because the assault weapon and LCM bans in the FAWB occurred simultaneously, we cannot separately analyze the impact of one component of the legislation from the other. Several limitations also stem from the reduced ability to track the implications of the FAWB as time moved farther away from the sunset of the legislation. For example, due to data availability, estimates did not control for the manufacture and sale of firearms in the United States, but the escalation of firearm sales coincided with the end of the FAWB [101]. Part of this increase is explained by the removal of the FAWB, but part of the increase is explained by external factors. The estimates do not control for changes in media saturation over time. As noted above, new media had displaced mass communication while the FAWB was in place. The adoption of new media continued to expand substantially after the legislation expired [102, 103]. This shift may be important because the internet is a likely conduit for mass shooters to become famous through additional mass communication channels, research and emulate prior events, connect to other extremist individuals, and learn how to plan attacks [91, 104-106]. This study cannot identify the extent to which internet usage contributed to the growth in mass shootings after 2004.

Conclusion

Public mass shootings are a unique type of firearm homicide [56]. These events may respond to different factors and policies than other types of firearm homicide [56]. Building upon research conducted shortly after the FAWB ended, our study corroborates the impact that the FAWB had on mitigating the frequency of public mass shootings during its enforcement period. Furthermore, our analysis suggests that had the FAWB persisted, as many as thirty-eight public mass shootings could have been averted since 2005. The efficacy of the FAWB is supported by a body of research with diverse data sources, definitions, and analytical methods. Although a federal ban will not completely eliminate gun violence, the results of this and 20 years of other studies confirm that a ban can substantially reduce the frequency, lethality, and nonfatal gun injuries of public mass shootings.

References

1. Laine C, Bornstein SS. Firearm injury: an escalating health crisis. Annals of internal medicine. 2023;176(3):398-9.
2. Christensen AJ, Cunningham R, Delamater A, Hamilton N. Introduction to the special issue on Gun violence: addressing a critical public health challenge. Journal of Behavioral Medicine. 2019 August 01;42(4):581-3. doi: 10.1007/s10865-019-00075-8.
3. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. Centers for Disease Control and Prevention, National Centers for Injury Prevention and Control; 2022.
4. Duwe G. Patterns and prevalence of lethal mass violence. Criminology & Public Policy. 2020;19(1):17-35.
5. Drake B. Mass shootings rivet national attention, but are a small share of gun violence. Fact Tank Washington, DC: Pew Research Center. 2013.
6. Bowers TG, Holmes ES, Rhom A. The nature of mass murder and autogenic massacre. Journal of Police and Criminal Psychology. 2010;25(2):59-66.
7. DeLisi M, Scherer AM. Multiple homicide offenders: Offense characteristics, social correlates, and criminal careers. Criminal Justice and Behavior. 2006;33(3):367-91.
8. Schildkraut J, Elsass HJ, Meredith K. Mass shootings and the media: Why all events are not created equal. Journal of Crime and Justice. 2018;41(3):223-43.
9. Levin J, Wiest JB. Covering mass murder: An experimental examination of the effect of news focus—killer, victim, or hero—on reader interest. American behavioral scientist. 2018;62(2):181-94.
10. Schildkraut J, Muschert GW. Media Salience and Mass Murder: Examining Frame Changing Across Mass Shooter Events, 2000-2012. Assessing and Averting the Prevalence of Mass Violence: IGI Global; 2019. p. 129-53.
11. Porfiri M, Sattanapalle RR, Nakayama S, Macinko J, Sipahi R. Media coverage and firearm acquisition in the aftermath of a mass shooting. Nature Human Behaviour. 2019:1.
12. Bushman BJ. Narcissism, fame seeking, and mass shootings. American behavioral scientist. 2018;62(2):229-41.
13. Zhang Y, Shah D, Foley J, Abhishek A, Lukito J, Suk J, et al. Whose Lives Matter? Mass Shootings and Social Media Discourses of Sympathy and Policy, 2012–2014. Journal of Computer-Mediated Communication. 2019;24(4):182-202.
14. Joslyn MR, Haider-Markel DP. The direct and moderating effects of mass shooting anxiety on political and policy attitudes. Research & Politics. 2018;5(3):2053168018794060.
15. DeAngelis F. Mass Shootings in America: Understanding the Debates, Causes, and Responses: ABC-CLIO; 2018. ISBN: 1440856257.
16. Barry CL, Webster DW, Stone E, Crifasi CK, Vernick JS, McGinty EE. Public Support for Gun Violence Prevention Policies Among Gun Owners and Non–Gun Owners in 2017. American journal of public health. 2018;108(7):878-81.
17. Silva JR, Capellan JA. The media's coverage of mass public shootings in America: Fifty years of newsworthiness. International Journal of Comparative and Applied Criminal Justice. 2019;43(1):77-97.
18. Dorris L, Murphy AL. No more politics over people: The role of helping professions in the prevention of mass shootings and gun-related violence. Traumatology. 2023;29(1):87.
19. Fridel EE. Comparing the impact of household gun ownership and concealed carry legislation on the frequency of mass shootings and firearms homicide. Justice quarterly. 2021;38(5):892-915.
20. Greene-Colozzi EA, Silva JR. Contextualizing firearms in mass shooting incidents: A study of guns, regulations, and outcomes. Justice quarterly. 2022;39(4):697-721.
21. Hemenway D. A public health approach to firearms policy. Policy Challenges in Modern Health Care. 2005:85.
22. Hemenway D. Firearm legislation and mortality in the USA. The Lancet. 2016;387(10030):1796-7.
23. Hemenway D, Miller M. Public health approach to the prevention of gun violence. N Engl J Med. 2013;368(21):2033-5.

24. Hemenway D, Monuteaux MC. Future directions for firearm injury intervention, policy, and research. Pediatric Firearm Injuries and Fatalities: The Clinician's Guide to Policies and Approaches to Firearm Harm Prevention. 2021:223-34.
25. Hemenway D, Nolan EP. The scientific agreement on firearm issues. Injury prevention. 2017;23(4):221-5.
26. Iwama J, McDevitt J. Rising gun sales in the wake of mass shootings and gun legislation. The Journal of Primary Prevention. 2021;42:27-42.
27. Lankford A, Silver J. Why have public mass shootings become more deadly? Assessing how perpetrators' motives and methods have changed over time. Criminology & Public Policy. 2020;19(1):37-60.
28. Laqueur HS, Wintemute GJ. Identifying high-risk firearm owners to prevent mass violence. Criminology & Public Policy. 2020;19(1):109-27.
29. Luca M, Malhotra D, Poliquin C. The impact of mass shootings on gun policy. Journal of public economics. 2020;181:104083.
30. McMillan J, Bernstein M. Beyond gun control: Mapping gun violence prevention logics. Sociological perspectives. 2022;65(1):177-95.
31. Nagin DS, Koper CS, Lum C. Policy recommendations for countering mass shootings in the United States. Criminology & Public Policy. 2020;19(1):9-15.
32. Post LA, Mason M. The perfect gun policy study in a not so perfect storm. American Public Health Association; 2022. p. 1707-9.
33. Ridgeway G, Rosenberger JL, Xue L. Statisticians engage in gun violence research. Statistics and Public Policy. 2021;8(1):73-9.
34. Semenza D, Wade B. The Gun Control Debate and Its Policy Implications for Reducing Firearm Violence in Communities of Color. The Dark Side of Reform: Exploring the Impact of Public Policy on Racial Equity. 2022:15.
35. Siegel M, Goder-Reiser M, Duwe G, Rocque M, Fox JA, Fridel EE. The relation between state gun laws and the incidence and severity of mass public shootings in the United States, 1976–2018. Law and human behavior. 2020;44(5):347.
36. Smith CE. Gun policy: Politics and pathways of action. Violence and gender. 2020;7(2):40-6.
37. Spitzer RJ. The politics of gun control: Routledge; 2020. ISBN: 1003049370.
38. Vegter A, Middlewood AT. The massacre generation: Young people and attitudes about mass shooting prevention. Social Science Quarterly. 2022;103(4):820-32.
39. Public Safety and Recreational Firearms Use Protection Act, US Congress, 103th Congress, Second Session Sess. (1994).
40. United States. Congress. House. Committee on the Judiciary. Subcommittee on Crime and Criminal Justice. Public Safety and Recreational Firearms Use Protection Act : hearing before the Subcommittee on Crime and Criminal Justice of the Committee on the Judiciary, House of Representatives, One Hundred Third Congress, second session, on H.R. 3527 ... April 25, 1994. Washington: U.S. G.P.O. : For sale by the U.S. G.P.O., Supt. of Docs., Congressional Sales Office; 1995. iv, 271 p. p. ISBN: 016046983X.
41. Jacobs JB, Fuhr Z. The Safe Act: New York's Ban on Assault Weapons and Large Capacity Magazines. Crim L Bull. 2017;53:4.
42. Wallace EG. Assault Weapon Myths. S Ill ULJ. 2018;43:193.
43. Kopel D, Lowy J, Rostron A. Heller and "Assault Weapons". 2018.
44. Pfau MW. Defining the deadly: definitional argument and the assault weapons ban controversy. Argumentation and Advocacy. 2020:1-19.
45. Koper CS, Johnson WD, Nichols JL, Ayers A, Mullins N. Criminal Use of Assault Weapons and High-Capacity Semiautomatic Firearms: an Updated Examination of Local and National Sources. J Urban Health. 2018 06;95(3):313-21. PMID: 28971349. doi: 10.1007/s11524-017-0205-7.
46. 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(12):1754-61.
47. Kleck G. Large-capacity magazines and the casualty counts in mass shootings: the plausibility of linkages. Justice Research and Policy. 2016;17(1):28-47.

48. Abbasi J. Large-Capacity Magazine Bans Linked With Fewer Mass Shootings, Deaths. JAMA. 2020;323(2):108-9.
49. Koper CS. Assessing the potential to reduce deaths and injuries from mass shootings through restrictions on assault weapons and other high-capacity semiautomatic firearms. Criminology & Public Policy. 2020;19(1):147-70.
50. Towers S, Wallace D, Hemenway D. Temporal trends in public mass shootings: high-capacity magazines significantly increase fatality counts, and are becoming more prevalent. medRxiv. 2019.
51. Webster DW, McCourt AD, Crifasi CK, Booty MD, Stuart EA. Evidence concerning the regulation of firearms design, sale, and carrying on fatal mass shootings in the United States. Criminology & Public Policy. 2020;19(1):171-212.
52. Koper CS, Roth JA. The impact of the 1994 federal assault weapon ban on gun violence outcomes: an assessment of multiple outcome measures and some lessons for policy evaluation. Journal of quantitative criminology. 2001;17(1):33-74.
53. Koper CS, Woods DJ, Roth JA. An updated assessment of the federal assault weapons ban: impacts on gun markets and gun violence, 1994-2003. University of Pennsylvania, June. 2004.
54. Gius M. An examination of the effects of concealed weapons laws and assault weapons bans on state-level murder rates. Applied economics letters. 2014;21(4):265-7.
55. Fox JA, Levin J. Mass murder in America: Trends, characteristics, explanations, and policy response. Homicide studies. 2022;26(1):27-46.
56. Fox JA, Levin J. Mass confusion concerning mass murder. The Criminologist. 2015;40(1):8-11.
57. Post L, Mason M, Singh LN, Wleklinski NP, Moss CB, Mohammad H, et al. Impact of firearm surveillance on gun control policy: regression discontinuity analysis. JMIR Public Health and Surveillance. 2021;7(4):e26042.
58. Fox JA, Fridel EE. Keeping with tradition: Preference for the longstanding definition of mass shooting. Mother Jones. 2021;1966(180):1,293.
59. Fox JA, Sanders NE, Fridel EE, Duwe G, Rocque M. The contagion of mass shootings: The interdependence of large-scale massacres and mass media coverage. Statistics and Public Policy. 2021;8(1):53-66.
60. Fox JA, Gerdes M, Duwe G, Rocque M. The newsworthiness of mass public shootings: What factors impact the extent of coverage? Homicide studies. 2021;25(3):239-55.
61. Fox JA, Levin J, Fridel EE. Extreme killing: Understanding serial and mass murder: Sage Publications; 2023. ISBN: 1071862642.
62. Nau R. Forecasting with moving averages. Fuqua School of Business, Duke University. 2014:1-3.
63. Paroli M, Sirinian MI. Predicting SARS-CoV-2 infection trend using technical analysis indicators. Disaster Medicine and Public Health Preparedness. 2021;15(1):e10-e4.
64. Population Trends [database on the Internet]. US Census Bureau. [cited October 16, 2023]. Available from: https://www.census.gov/.
65. DiMaggio C, Avraham J, Berry C, Bukur M, Feldman J, Klein M, et al. Changes in US mass shooting deaths associated with the 1994–2004 federal assault weapons ban: Analysis of open-source data. Journal of trauma and acute care surgery. 2019;86(1):11-9.
66. Gius M. The impact of state and federal assault weapons bans on public mass shootings. Applied Economics Letters. 2015;22(4):281-4.
67. Webster DW, Vernick JS, McGinty EE, Alcorn T. Regulating Gun Sales: An Excerpt from Reducing Gun Violence in America: Informing Policy with Evidence and Analysis: JHU Press; 2013. ISBN: 1421411725.
68. Jacobs JB, Fuhr Z. The potential and limitations of universal background checking for gun purchasers. Wake Forest JL & Pol'y. 2017;7:537.
69. Braga AA, Brunson RK, Cook PJ, Turchan B, Wade B. Underground gun markets and the flow of illegal guns into the Bronx and Brooklyn: a mixed methods analysis. Journal of urban health. 2020:1-13.
70. Braga AA, Hureau DM. Strong gun laws are not enough: the need for improved enforcement of secondhand gun transfer laws in Massachusetts. Preventive medicine. 2015;79:37-42.
71. Miller M, Hepburn L, Azrael D. Firearm acquisition without background checks: results of a national

survey. Annals of internal medicine. 2017;166(4):233-9.
72. Lee LK, Fleegler EW, Farrell C, Avakame E, Srinivasan S, Hemenway D, et al. Firearm laws and firearm homicides: a systematic review. JAMA internal medicine. 2017;177(1):106-19.
73. Zeoli AM, Mccourt AD, Paruk JK. Effectiveness of Firearm Restriction, Background Checks, and Licensing Laws in Reducing Gun Violence. The ANNALS of the American Academy of Political and Social Science. 2022;704(1):118-36.
74. Webster DW, Wintemute GJ. Effects of policies designed to keep firearms from high-risk individuals. Annual review of public health. 2015;36:21-37.
75. Siegel M, Pahn M, Xuan Z, Ross CS, Galea S, Kalesan B, et al. Firearm-related laws in all 50 US states, 1991–2016. American Journal of Public Health. 2017;107(7):1122-9.
76. Chapman S, Alpers P, Agho K, Jones M. Australia's 1996 gun law reforms: faster falls in firearm deaths, firearm suicides, and a decade without mass shootings. Injury Prevention. 2006;12(6):365-72. doi: http://dx.doi.org/10.1136/ip.2006.013714.
77. Reuter P, Mouzos J. Australia: A massive buyback of low-risk guns. Evaluating gun policy: Effects on crime and violence. 2003:121-56.
78. McLeod RS, Moore EE, Crozier JA, Civil ID, Ahmed N, Bulger EM, et al. A public health approach to prevent firearm related injuries and deaths. Annals of surgery. 2021;274(4):533-43.
79. Mata A. Kevlar for the innocent: Why modeling gun regulation after Great Britain, Australia, and Switzerland will reduce the rate of mass shootings in America. Cal W Int'l LJ. 2014;45:169.
80. Rocque M, Duwe G, Siegel M, Fox JA, Goder-Reiser M, Fridel EE. Policy solutions to address mass shootings. Regional Gun Violence Research Consortium of the Rockefeller Institute of Government. 2021;11.
81. Flew T. New media: An introduction. Victoria: Oxford University Press. 2007.
82. Lister M, Dovey J, Giddings S, Grant I, Kelly K. New media: A critical introduction: Routledge; 2008. ISBN: 0203884825.
83. Manovich L. The language of new media: MIT press; 2002. ISBN: 0262296918.
84. Rafaeli S. From new media to communication. Sage annual review of communication research: Advancing communication science. 1988;16(1):110-34.
85. Peterson J, Densley J. The Violence Project. In: Center TVPPR, editor. 8.0 ed. Hamlin University: Digital marketing by thrive; 2024.
86. Follman M, Aronsen G, Pan D. US Mass Shootings, 1982–2023: Data From Mother Jones' Investigation. In: Progress MJatFfN, editor. Internet: Mother Jones; 1982-present.
87. Fox JA. Database of mass killings and shootings in the US. In: University AUTN, editor. Internet2024.
88. O'Hara K, Stevens D. Echo chambers and online radicalism: Assessing the Internet's complicity in violent extremism. Policy & Internet. 2015;7(4):401-22.
89. Peterson J, Densley J. The violence project: How to stop a mass shooting epidemic: Abrams; 2021. ISBN: 1647002273.
90. Fox JA. Trends in US Mass Shootings: Facts, Fears and Fatalities. Journal of Contemporary Criminal Justice. 2024;40(1):65-81.
91. Peterson J, Densley J, Spaulding J, Higgins S. How Mass Public Shooters Use Social Media: Exploring Themes and Future Directions. Social Media+ Society. 2023;9(1):20563051231155101.
92. Peterson JK, Densley JA, Hauf M, Moldenhauer J. Epidemiology of Mass Shootings in the United States. Annual Review of Clinical Psychology. 2024;20.
93. Peterson J, Erickson G, Knapp K, Densley J. Communication of intent to do harm preceding mass public shootings in the United States, 1966 to 2019. JAMA network open. 2021;4(11):e2133073-e.
94. Piret J, Boivin G. Pandemics throughout history. Frontiers in microbiology. 2021;11:631736.
95. Liu Y-C, Kuo R-L, Shih S-R. COVID-19: The first documented coronavirus pandemic in history. Biomedical journal. 2020;43(4):328-33.
96. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. Acta bio medica: Atenei parmensis. 2020;91(1):157.
97. Moreland A, Herlihy C, Tynan MA, Sunshine G, McCord RF, Hilton C, et al. Timing of state and territorial COVID-19 stay-at-home orders and changes in population movement—United States, March 1–

May 31, 2020. Morbidity and Mortality Weekly Report. 2020;69(35):1198.
98. Webster D. Policies That Reduce Gun Violence: Restricting Large Capacity Magazines. Internet: Johns Hopkins Bloomberg School of Public Health, 2021 May 24, 2021. Report No.
99. Rutledge R. Reducing Mass Shootings by Restricting Large-Capacity Magazines: Will Congress Make a Change? Available at SSRN 4394588. 2023.
100. Cook PJ, Donohue JJ. Regulating assault weapons and large-capacity magazines for ammunition. JAMA. 2022;328(12):1191-2.
101. Thrush G. U.S. Gun Production Triples Since 2000, Fueled by Handgun Purchases2022 October 16, 2023. Available from: https://www.nytimes.com/2022/05/17/us/politics/gun-manufacturing-atf.html.
102. Newell J, Pilotta JJ, Thomas JC. Mass media displacement and saturation. The International Journal on Media Management. 2008;10(4):131-8.
103. Livingstone S. Young people and new media: Childhood and the changing media environment. Young People and New Media. 2002:1-278.
104. Silva JR. Mass shooting films: Myths, academic knowledge, and popular criminology. Victims & Offenders. 2019;14(2):239-64.
105. Silva JR, Greene-Colozzi EA. Fame-seeking mass shooters in America: Severity, characteristics, and media coverage. Aggression and Violent Behavior. 2019;48:24-35.
106. Meindl JN, Ivy JW. Mass shootings: The role of the media in promoting generalized imitation. American journal of public health. 2017;107(3):368-70.