Analyzing the Mother Jones Mass Shooting Database

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July 2023

Abstract

This study investigates the characteristics of mass public shootings in the United States using the Mother Jones Mass Shooting Database. We investigate trends in the frequency of mass shootings and trends in the number of fatalities and injuries per shooting as well as other things. The key findings indicate the following: while the frequency of mass shootings has increased substantially, the number of fatalities and injuries per shooting has not; mass shootings happen in workplaces far more than anywhere else; most weapons used in mass shootings are legally purchased; most mass shooters have signs of prior mental health problems.

1 Introduction

Over the past few years, mass shootings in the United States have drawn increased attention from citizens as well as policy makers. There are various ways that people have suggested to deal with these events such as more strict firearm regulation, increased security/police presence, increased monitoring of mental health problems, and many more. This paper seeks to provide an analysis of trends in the data in regards to mass shootings, answering questions of whether or not they have become more frequent, more deadly, ages of the shooters, types of mass shootings committed, the location of mass shootings, etc.

2 Methods

In this paper, we summarize the extent of the problem of mass shootings in the U.S., drawing on data from the Mother Jones Mass Shooting Database, which has tracked mass shootings in the United States since 1982 [1]. Using R Statistical Software, we analyze trends in mass shootings, the demographic characteristics of mass shooters, geography of mass shootings, types of weapons used, etc [2]. We exclude data from 2023 for frequency comparisons because, as this is being written, the year has not ended yet, and thus might bias potential findings.

In the first couple of sections, other than when we explain the change in definition and how it affects the frequency of mass shootings, we use the conventional 4 or more killed definition of a mass public shooting. In the other sections, where changed across time periods are not analyzed, we use Mother Jones' 3 or more killed definition.

3 Results

3.1 The Frequency of Mass Shootings

Table 1 shows the frequency of mass shooting incidents by decade. As is shown, the annual number of mass shooting incidents stayed relatively flat at around 1.5 - 2.4 per year from 1982 through 2011. However, during the 2012 - 2022 period, they increased rapidly to 7.5 incidents per year, representing a 5-fold increase over the 1982 - 1991 period.

Table 1: The Frequency of Mass Shooting Incidents by Decade

Time Period	Mean Incidents Per Year	Std. Dev.
1982 - 1991	1.5	0.76
1992 - 2001	2.1	1.4
2002 - 2011	2.4	1.2
2012 - 2022	7.5	3.4

This large increase in shootings is partially due to the fact that, post-2013, the definition of a mass shooting was changed in the Mother Jones database from 4 or more people killed in a public place to 3 or more people killed in a public place [3]. To account for this, I show the mass shootings in the database with 4 or more victims killed.

Table 2: How Much Can a Change in Definition Explain the Rise in Mass Shootings?

Definition	Incidents	Percentage of "inconsistent"
3+ killed (inconsistent)	137	-
4+ killed (consistent)	114	83.2%

As can be seen in Table 2, if the 4 or more fatalities definition of a mass shooting had stayed consistent, then there would have been 114 mass shootings through 2022, instead of the 137 reported with the inconsistent definition. This represents a 16.8% decrease in the number of mass shootings. While this is somewhat useful, it does not allow us to gauge the extent of the problem consistent with the new definition of mass shooting, 3 or more people killed,

because incidents pre-2013 are not included as mass shootings in the Mother Jones database.

Table 3: The Frequency of Mass Shooting Incidents by Decade, Correction for the Change in Defintion

Time Period	Mean Incidents Per Year	Std. Dev.
1982 - 1991	1.5	0.76
1992 - 2001	2.1	1.4
2002 - 2011	2.4	1.2
2012 - 2022	5.4	2.0

Applying the same framework as Table 1, we find that the mean number of mass shooting incidents per year in the 2012 - 2022 drops from 7.5 (Table 1) to 5.4 (Table 3), representing a 28% decrease. While this simple change in definition can explain at least some of the rise in mass shootings, it can certainly not explain all of it as mean shootings per year are still substantially elevated over the 1982 - 1991 period.

3.2 The Deadliness and Injuriousness of Mass Shootings

In this section, we investigate how the both the deadliness and injuriousness of mass shootings has evolved. Using the same method as the last section (looking at changes between decades), we report the mean number of fatalities per shooting. To keep things consistent, we exclude shootings that have less than 4 fatalities.

Table 4: Average Number of Fatalities Per Shooting by Decade

Time Period	Fatalities	Shootings	Fatalities Per Shooting
1982 - 1991	124	12	10.3
1992 - 2001	126	21	6.0
2002 - 2011	187	22	8.5
2012 - 2022	568	59	9.6

As can be seen in the table, the average number of people killed in a given shooting has decreased since the 1982 - 1991 period. However, since the volume of mass shootings has grown, the total number of fatalities as a result of mass shootings has increased.

Turning to injuries per shooting, we see that there has not been a substantial increase in the number of peopled injured per mass shooting. The number of shootings in the 2012 - 2022 period is lower than that in Table 4 due to the fact that one of the shootings, the Tulsa medical center shooting, does not

have precise data on the number of people injured, instead the case is coded as having "fewer than 10 [injuries]" [1]. The other case which we exclude is the Las Vegas Strip massacre, which culminated in 58 deaths and 546 injuries, far more than any other shooting in U.S. history (the next most injurious shooting was the Aurora theater shooting, in which 70 people were injured). If that case is included, then the total number of injuries rises to 1,061, and the average number of injuries per shooting rises to 18.6 for the 2012 - 2022 period.

Table 5: Average Number of Injuries Per Shooting by Decade

Time Period	Injuries	Shootings	Injuries Per Shooting
1982 - 1991	118	12	9.8
1992 - 2001	160	21	7.6
2002 - 2011	149	22	6.8
2012 - 2022	515	57	9.0

3.3 The Demographics of Mass Shooters

How has the age distribution of mass shooters changed over the course of the last four decades? Have shooters gotten older or younger?

Figure 1: Mean Age of Mass Shooters by Year

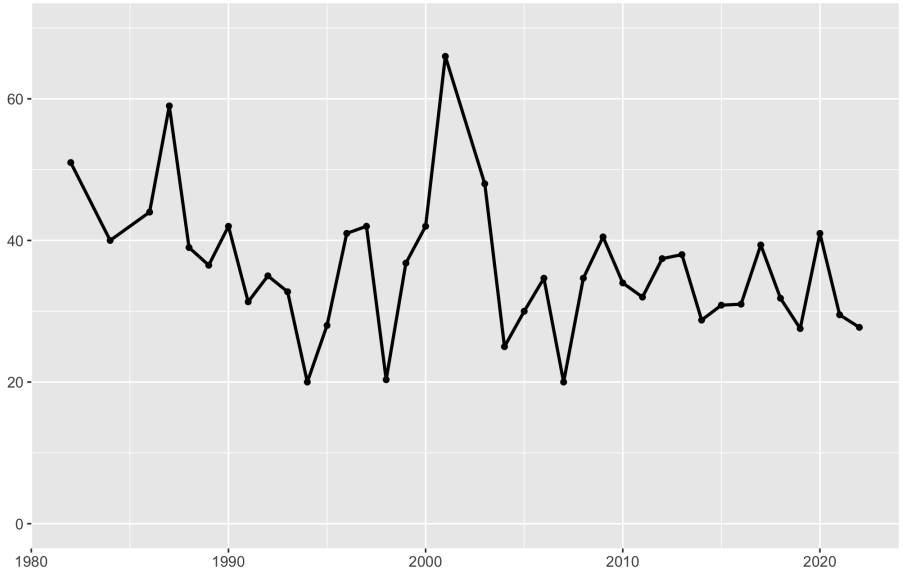


Figure 1 shows the average age of mass shooters by year. We find that, from the early 1980s to mid-1990s, the average age of mass shooters substantially

decreased from about 40-50 years of age to about 20-30 years of age. From the mid-1990s on, however, the average age of mass shooters has stayed flat, or has even steadily increased.

Furthermore, the data indicates that the vast majority of mass public shooters are not 18 - 20 years of age. Out of 143 shootings in the data set, 14 (9.7%) were committed by 18 - 20 year-olds. This is important because many have called for raising the age required to buy rifles and shotguns to 21. In some sense, that position may be justified, given that the vast majority of 18 - 20 year old mass shooters used rifles or shotguns during their attacks. However, 4 out of the 14 used handguns along with their rifles.

Next, we show the the number of shooters by race/ethnicity. We remove cases where the race of the shooter is either not coded as anything ("-" in the data set) or is coded as "unclear." As can be seen by the table (Table 6), whites were responsible for the majority of mass shootings over the period 1982 - 2023. However, since whites comprised the majority of the population during this period (ranging from 80.0% in 1980 to 60.1% in 2019), the data suggests that they are actually *under-represented* among mass shooters [4].

Table 6: Mass Shooters by Race/Ethnicity

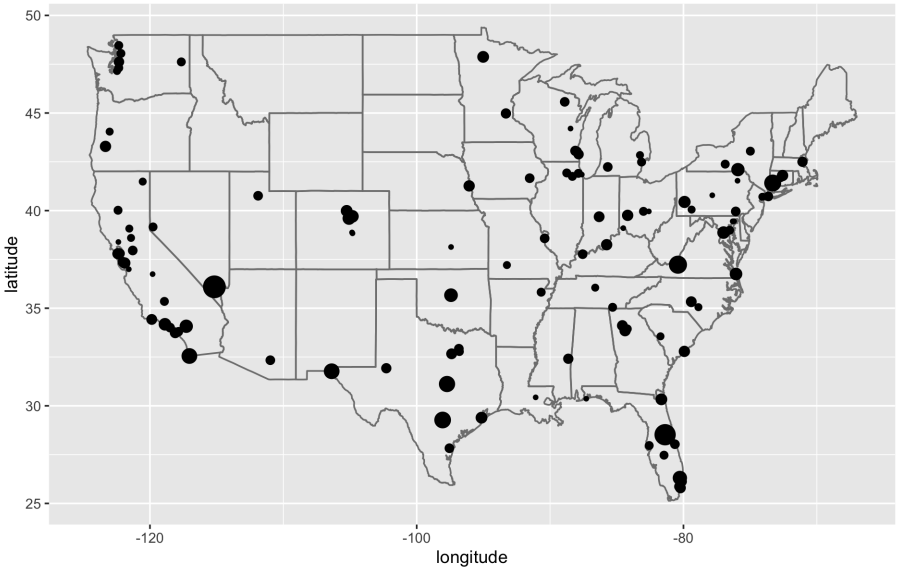
Race	Number of Shooters	% of Total
White	75	57.7
Black	25	19.2
Latino	12	9.2
Asian	10	7.7
Other	5	3.8
Native American	3	2.3

3.4 The Location of Mass Shootings

In this section, we present data pertaining to the locations of mass shootings. Figure 2 shows the distribution of mass shootings across the continental U.S. As can be seen, the distribution of mass shootings across U.S. states looks fairly similar to the distribution of the U.S. population across U.S. states, with states such as California, Texas, and Florida having many mass shootings. The size in dots represent the number of fatalities that a given shooting had. Again, it appears, aside from a few outliers (e.g., Nevada, Virginia), that larger states also tend to have suffered from some of the largest mass shootings. It also seems that the *number* of mass shootings appears to be a function of the population of each state, with many low-population Midwestern states experiences no or just one mass shooting since the data set began.

However, this does not capture all mass shootings in the database because, as of when this is being written, the last 17 incidents have no latitudinal or longitudinal coordinates, and thus we are unable to plot them on the map.

Figure 2: The Distribution of Mass Shootings Across the US



Next, we examine the physical location of these shootings, with the goal of trying to understand which types of places are most attractive to mass shooters. In Table 7, we show the physical locations of mass shootings.

Table 7: Mass Shootings by Location

Location	Number of Incidents	% of Total
Other	54	37.8
Workplace	52	36.3
School	22	15.4
Religious	8	5.6
Military	6	4.2
Airport	1	0.7

As can be seen, the vast majority of shootings (75.1%) occur in workplaces or locations coded as 'other' in the database. Schools are next on the list, and have indeed cultivated the most public attention out of any type of mass shooting, giving rise to laws and policies such as The Gun-Free Schools Act and "Zero Tolerance," which aim to prevent them. Unfortunately, there is little to no high-quality evidence for the effectiveness of policies, as, although extremely tragic, student homicides at school are very rare [5].

3.5 Characteristics of Weapons Used

This section reports the characteristics of the types of weapons used in mass shootings. We report the legality of guns obtained during the shootings. For the legality of the weapons used, we exclude cases where the incident has no data ("-" in the data set) or the weapon used is coded as "TBD." There are several other incidents that we exclude as well, which complicate the data. Firstly, the shooter who committed the Texas First Baptist Church massacre "passed federal criminal background checks [but] the US Air Force failed to provide information on his criminal history to the FBI." So, he technically did purchase the guns legally but would have been prohibited if the Air Force had reported his criminal background, which complicates things. Secondly, the shooter who committed a massacre at a military base in Chattanooga, TN possessed some weapons that were purchased legally and others that were not [1].

Table 8: Legality of Weapons Used in Mass Shootings

Legality	N	% of Total
Legal	96	81.4
Illegal	16	13.6
Unknown	6	5.0

In total, out of all the shootings that have information about the legality of the weapons that were purchased, 81.4% of weapons were obtained legally, 13.6% were obtained illegally, and in 5% of shootings the legal status of the weapon was unknown (Table 8). This may suggest that measures such as universal background check laws may not be enough to abate the rise in mass shootings across the U.S given that many prospective shooters will pass such checks due to a lack of criminal history.

3.6 Mental Health Comorbidities of Mass Shooters

As the title suggests, this section deals with the mental health status of mass shooters in the Mother Jones Data set. Firstly, we show the percentages of mass shooters that were described as showing signs of mental illness or not in the data set. We filter out cases that are coded as "TBD" or "-" in the dataset, but include cases where the mental health status of the shooter was unknown. These changes leave the sample to N = 110.

We then perform a negative binomial regression to assess whether a shooter that was described as showing signs of mental illness was more likely to kill more people than shooters who did not show signs of mental illness. A negative binomial regression model is used because the response variables are counts and the data is over dispersed (Figure 3). In the poisson models for both response variables, the residual deviance divided by the null deviance is 3.63

for the fatality model and 10.89 for the injury model. Statisticians typically recommend use of the negative binomial model for quotients > 1 [6].

Table 9: Presence of Mental Health Issues Among Mass Shooters

Mental Health Comorbidity?	N	% of Total
Yes	68	61.8
No	17	15.5
Unclear	25	22.7

As shown in Table 9, the majority of cases where information is known about the mental health status of the shooter, they have prior signs of mental health problems. This may suggest that increased monitoring of mental health problems and easier access of mental health resources could potentially mitigate mass shootings.

Figure 3: The Distribution of Mass Shooting Fatalities and Injuries

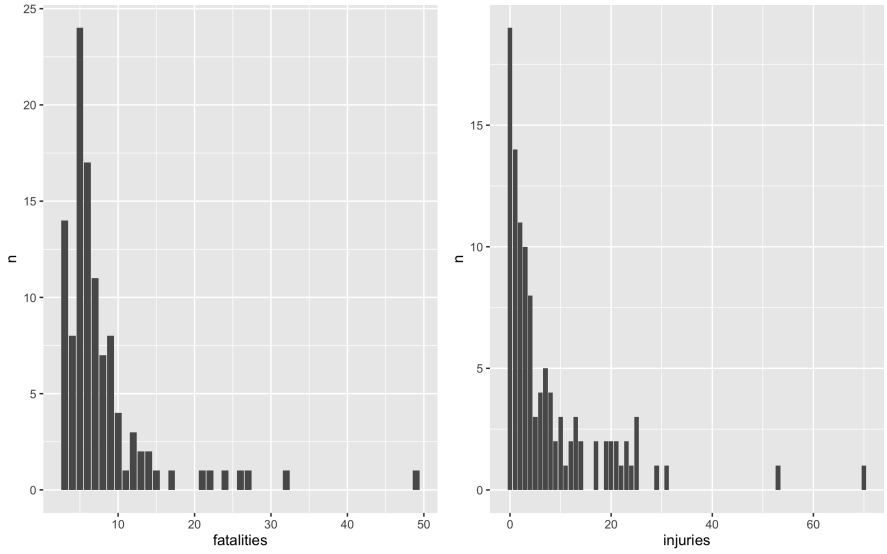


Table 10: Does the Mental Health Status of the Shooter Predict More Fatalities or Injuries?

	Dependent variable:	
	fatalities	injuries
	(1)	(2)
Constant	2.005***	1.842***
	(0.099)	(0.200)
MH dummy	0.108	0.324
	(0.125)	(0.253)
Observations	110	110
Log Likelihood	−319.805	−338.364
θ	3.647*** (0.660)	0.656*** (0.097)
Akaike Inf. Crit.	643.610	680.727
Note:	*p<0.1; **p<0.05; ***p<0.01	

The result from the negative binomial regression indicates that mental health status has no effect on the number of people the shooter kills (Table 10). The coefficient is positive, but insignificant (p = 0.38). The same thing is true for the number of injuries (p = 0.20).

4 Conclusion

This study sought to examine the characteristics of mass shootings in the U.S. across a nearly four-decade period of time. We found that the frequency of mass shootings has increased dramatically, and this increase is almost all concentrated within the last decade. Meanwhile, mass shootings tend to be no more deadly nor injurious today than they used to be.

References

[1] M. Follman, G. Aronsen, and D. Pan, "Us mass shootings, 1982–2023: Data from mother jones' investigation," 2023.

[2] R Core Team, *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria, 2021.

[3] J. A. Fox and E. E. Fridel, "Keeping with tradition: preference for the longstanding definition of mass shooting," *Journal of mass violence research*, vol. 1, no. 2, pp. 17–26, 2022.

[4] W. H. Frey, "The nation is diversifying even faster than predicted, according to new census data," 2020.

[5] R. Borum, D. G. Cornell, W. Modzeleski, and S. R. Jimerson, "What can be done about school shootings? a review of the evidence," *Educational Researcher*, vol. 39, no. 1, pp. 27–37, 2010.

[6] P. S. OMARI-BAAH, *Investigating Models for Overdispersed Count Data and its Applications*. PhD thesis, Montana State University, 2018.