# Gun Violence in America

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Our webpage: https://bcviscourse.github.io/project-visrulz-finalproject/

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visualization; guns; violence

## Introduction
The purpose of this project is to visualize gun violence in America, in particular mass shootings. As most know, the United States has some of the highest rates of gun related deaths compared to countries of similar earnings. Of the total number of gun related deaths, less than 2 percent of deaths are due to mass shootings yet this has a very prominent place in people's minds due to heavy media coverage. However, there has been an overall increase in the number of mass shootings. This is particularly relevant as we hear more stories about deadly shootings occurring and as more people's lives are affected. There seems to be a lack of existing visualizations that effectively convey the impact and trends of such shootings over time. The motivation of our project lies in analyzing gun violence in America, gun regulations, and the change in mass shootings over time. Since this is a topic of rising importance for policymakers, academics, and students alike, we hope to compile a set of visualizations that effectively convey the story and meaning behind these numbers, and thus, promote the message of our project.

## Related Works

Mass shootings are a very popular topic in the media currently. It is no surprise, therefore, that mass shootings and gun related violence have been the focus of many visualizations by professionals and amateurs alike. Vox media[1] released on article on August 31, 2019 with 16 maps and charts looking at the relationship between gun violence and America's gun laws. A visualization published on Periscopic[2] highlighted the impact of gun killings by showing the total number of "stolen years" or years that victims of gun violence may have lived to had they not been murdered. Our group previously explored the geographic distribution of mass shootings and the change in the number of victims over time. Due to all the coverage that mass shootings and gun violence has received, there is a plethora of data relating to gun violence to be explored. We take a few ideas of these related works as a source of inspiration, but mostly aim to implement our own creative thoughts.

## Approach

Our approach to tackling the problem is creating a series of visualizations that will tell a story of gun violence, regulations, mass shootings and shooters in the United States. The main data set we focus on is acquired from the Stanford MSA database on mass shootings[3] in the United States.

As a way to compare U.S. gun related deaths to other countries we will use the data from How U.S. Gun Deaths Compare to Other Countries[4]. We will also use the data sets: Gun Laws By State 2019[5] and State-by-State Firearm Law Data[6] to pull information on the gun regulations for each statement. To supplement the gun regulation data, we will use Stats of the States - Firearm Mortality[7], to compare the number of regulations a state has to the number of recorded gun related deaths. Our final data sets will both be pulled from the Gun Violence Archive: Number of Deaths in 2019[8] and Mass Shootings in 2019[9]. The main dimensions we will focus on from these data sets include (following the order above): number of victims due to mass shootings by state sorted by year, number of gun related deaths by countries of the world, gun laws by state, firearm mortality by state, number of gun related deaths in 2019 and the number of deaths due to mass shootings in 2019.

Our goal is to take the reader on a visual journey through the problem of gun violence in America. We first start with the big picture and then hone in to our subject of interest: the phenomenon and growth of mass shootings. To begin, we will compare the number of gun related deaths in the U.S. to other high income nations. Then, we will compare how many gun related deaths in the U.S. are due to mass shootings. Afterwards, the reader will see a geographical representation of the number of victims due to Mass shootings across America from 1966-2016. Next, we will take a look at the regulations by state and their respective gun death rate. Finally, we will compare the mental health of the shooters.

The outcome of this project is to have different visuals on each page supplemented by text outlining relevant information and minimal instructions. Some of the visual techniques we implement are D3 and Vega lite maps with tooltips, linking and brushing with a timeline, and moving and dragging across a scatter plot. We also included a stacked bar chart that would allow us to explore the mental health of the shooters.

We hope to allow the feel emotions throughout our journey by starting with the big picture of what gun violence in America looks like, then honing into what is popular within the media space (mass shootings), and finally ending with a call to action.

## Designs

**Figure 1:** Our first visualization is a D3 bar chart, its purpose being to show the big picture of our story. It compares the United States to other high-income countries in terms of gun death rate per 100,000 thousand people. The number of deaths are encoded by the length of the bars. The purpose of this visualization is to provide a quick glimpse at how countries compare to each other, so it is a static display. It comes with D3 annotations as well as a tooltip.

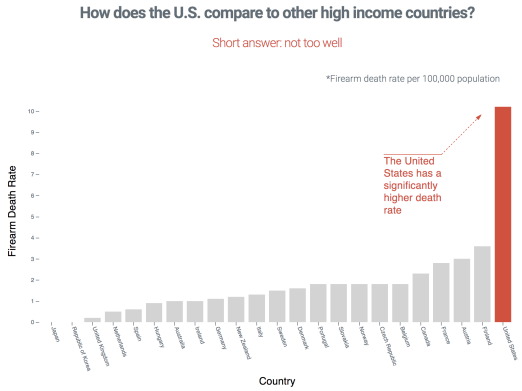



**Figure 2:** This visualization will be a geographical map that displays the mass shootings that have happened from the year 1966-2016. The radius of the circles encodes the number of victims at the mass shooting. Hovering over the circle displays a tooltip with more information. The map is accompanied by a brushing feature that allows the user to filter the data by date.

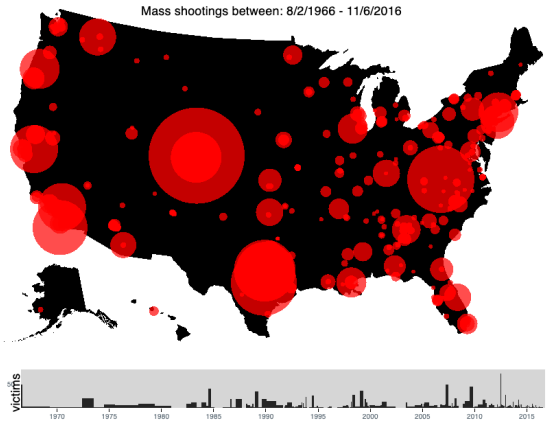



**Figure 3:** This visualization looks at the number of gun regulations per state in comparison to the mortality rate by population. Hovering over a state on the left shows the user the amount of regulations while the right shows the mortality rate.

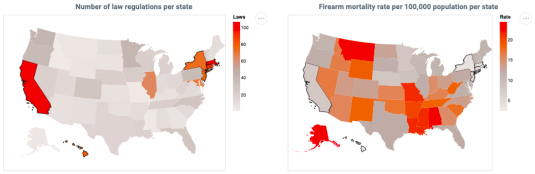


**Figure 4:** This visualization follows the one above it as a supplement. It shows the trend between number of gun regulations and mortality rate. In addition, a user can click on a data point that will link them to the gun laws of that state. Selecting an area on the scatter plot will filter the table showing the most common gun regulations on the right.

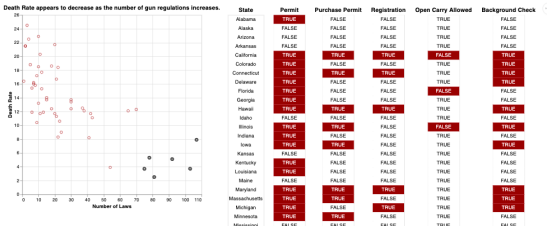



**Figure 5:** This visualization looks at the profile of shooters. It will be a stacked bar chart of year versus the percentage of victims. The stacked layers are categorized by whether the shooter has a history of mental illness or not.

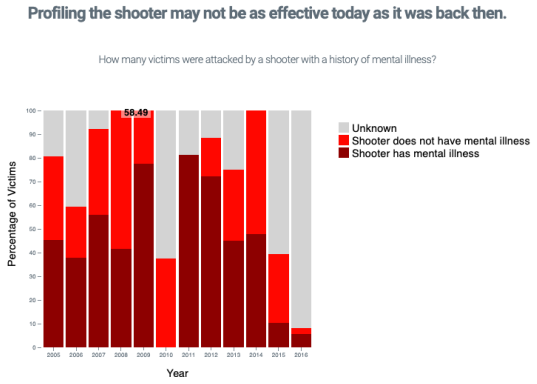
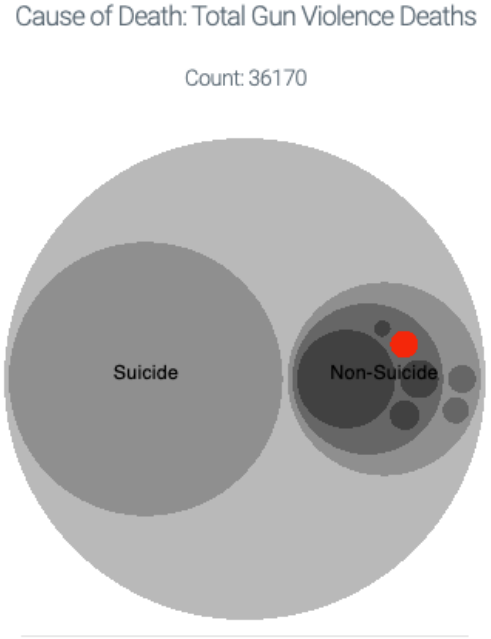



**Figure 6:** This visualization looks at different acts gun violence takes the form of. It will be a bubble chart that displays categories like death by suicide, death by mass shooting and so on in the form of scaled circles.



## Evaluation

The design feedback sessions helped us to further refine our project and make it more user-friendly. We took ideas and feedback from Professor Kim and our classmates to improve on functionality. For example, we added brushing to our timeline to allow users to explore the data over specific periods of time rather than having a simple, static bar chart. Moreover, we received feedback that the stacked area chart had overlapping layers in some sections, which meant it was not truly stacked. Due to the data we were working with, we decided to switch to a stacked bar chart in order to ensure true stacking. These changes added more functionality and truth to our overall vision.

In terms of improving our story-line, we followed Dr. Kim's advice to add pictures and videos. The way we accomplished this was by adding parallax images which made the message more effective and guided the user on a visual journey through the data. As a final step, we decided to add more data to our bubble chart visualization as a way to show the reader how gun violence acts are distributed among different categories; this makes the visualization even more informative than before.

We had other users try our visualizations and noted which features they were unable to discover while interacting with the visualization. In particular, it was difficult for many people to use all the functionalities of the scatter plot. Therefore, we chose to create a collapsible that contained directions on how to use the chart efficiently in hopes that it would facilitate the user experience.

Looking at our web page now, we feel more confident. The iteration and refinement helped us narrow down what we wanted, and helped make our visualizations more effective.

## Results and Discussion

The main purpose of our project was to look at the sources and effects of mass shootings while also imploring the readers to think about what changes could be made to reduce the number of deaths due to shootings. Our visualizations helped address some of these questions of where the real contributing issues stem from in mass shootings by telling a story through images and exploratory analysis. We started off with a broad overview of firearm death rates among multiple countries and continued to funnel down into United States data and finally directly into the personal health of shooters. Structuring the exploration this way allowed us to create smooth transitions between topics that will help focus the reader's attention from topic to topic. The interactions allow the reader to explore many aspects of gun violence from where the most mass shootings have occurred over time to gun regulations per state. The interactive visualizations allows the reader to make his or her own assumptions while the text serves as a guide about potential questions and solutions.

There were many lessons we learned from working on this project, one of them being that sometimes charts on their own are not enough to tell a story. We initially constructed our website as a series of charts and text, but once we added effective titles, images, captions, and GIFs for the user to scroll through, the impact of the message had a much greater effect. Additionally, we learned that it is better to focus on making the interactivity of each visualization obvious rather than having something that is less clear and writing a long list of instructions for the user to follow. It is important to nudge the reader in the right direction instead of hitting them with a barrage of directions.

Some of the limitations of the work are mostly due to time and the span of data. We initially wanted to do more pro-

filing on the shooter, but it ended up taking too much time, so that would be something interesting to look at in the future. Mental illness is one of the more talked about issues, but it would be informative to also look at gender, race, or age. An opportunity for future work could be to broaden the scope to other countries. It would be interesting to see what gun regulations look like in other countries and whether number of gun deaths is related to quantity or quality of policies. It would be interesting to compare gun violence in high earning vs low earning countries. As a start though, our project gives good insight into some of the causes and contributing factors of mass shootings.

## Works Cited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