# Visualizing Police Shootings Across the United States

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https://riyamathur1.github.io/Data-Visualization-Project/

***Abstract*—This project is motivated by a commitment to social justice and the need to scrutinize law enforcement practices across the United States. Utilizing a comprehensive dataset that records police shootings since 2015, this analysis aims to illuminate the dynamics and trends within these incidents. By delving into the data, the project seeks to contribute to informed public discourse, providing a data-driven foundation to understand the scope and nature of police-involved shootings. Specifically, the project's goals were to analyze the distribution of police shootings over time, explore demographic characteristics of the victims, and observe the geographic distribution of these shootings in the United States. The results showed that police shootings have steadily increased from 2015 to 2024. The demographic analysis revealed that Black individuals are killed at over twice the rate of White Americans, indicating a clear racial bias in these shootings. Additionally, the data indicates that police shootings occur most frequently in California, Texas, and Florida, highlighting the need for better police training in these states.**

## I. Introduction

In the United States, it is estimated that police officers fatally shoot over 1,000 individuals annually. Since 2015, there have been approximately 10,000 instances of police-involved shootings, with no mandatory reporting to higher authorities, resulting in significant accountability gaps. Police brutality and systemic racism within law enforcement have long been critical issues, sparking national debates and movements advocating for reform. High-profile cases of police violence, particularly against Black individuals and other minorities, have underscored the urgent need for greater transparency and accountability in law enforcement practices.

In 2020, the killing of George Floyd by a police officer in Minneapolis ignited protests and nationwide calls against police brutality and racial injustice. The widespread demonstrations highlighted the public's demand for systemic change and accountability within law enforcement agencies. These events brought renewed attention to the persistent issues of police violence and the disproportionate impact on minority communities.

In response to these issues, the Washington Post has documented each individual shot and killed by police since 2015. This project leverages that dataset to offer an in-depth exploration of these incidents, enhancing transparency and public understanding of police-involved shootings. By analyzing this data, the project aims to contribute to the ongoing discourse on police practices and to support efforts for meaningful reform.

The project's objectives are as follows:

1) Analyze the distribution of police shootings over time to highlight any specific trends.
2) Explore the demographic trends among those involved in police shootings.
3) Investigate whether factors such as mental illness, fleeing, or gender play a role in the frequency of police shootings.
4) Observe the geographic distribution of police shootings to identify regions with higher occurrences.

By achieving these objectives, the project seeks to provide a comprehensive understanding of the scope and nature of police-involved shootings in the United States, ultimately supporting the call for improved policies and practices within law enforcement.

## II. Related Work

My research drew inspiration and guidance from several sources, each contributing distinctively to the conceptualization and execution of my data visualization project.

The Washington Post's visualization of mass shootings [14] in America was particularly influential. Their innovative approach of using figures of people and weapons to represent data, while I ultimately chose traditional visualizations for my project, sparked my interest in exploring unique representation methods in future work.

Another key influence was the K-12 Shooting database [9], which features line charts, bar charts, and choropleth maps. These visual elements are similar to those in my project, and provided a useful benchmark for effective data representation.

Kostiantyn Isaienkov's analysis on Kaggle, US Police Shootings: Visualization and Analysis [8], using the same dataset as my project, was also very instrumental. It offered insights into alternative visualizations, particularly concerning the age distribution of victims, which I considered for my visual representations.

Additionally, Mapping Police Violence [11] suggested impactful design elements, such as the prominent display of annual fatalities, which I plan to incorporate into future updates to enhance the communicative impact of my visualizations.

Lastly, The Washington Post's police shootings database [15] not only provided the dataset for my project but also served as a model for effective visualization, especially in portraying racial disparities in police violence. The proportional representation of victim demographics was a compelling

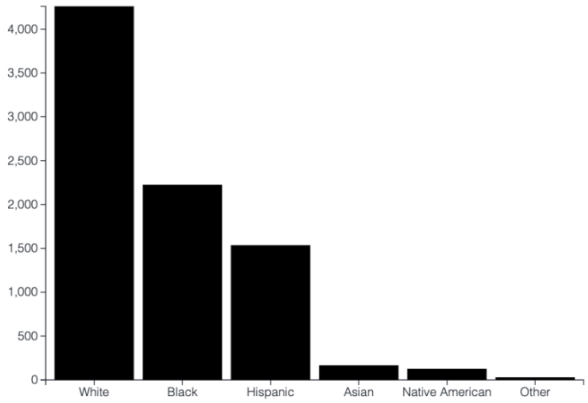


Fig. 1. This bar chart displayed the absolute number of police shootings by race, which inadvertently suggested that white individuals were the most frequently shot group.

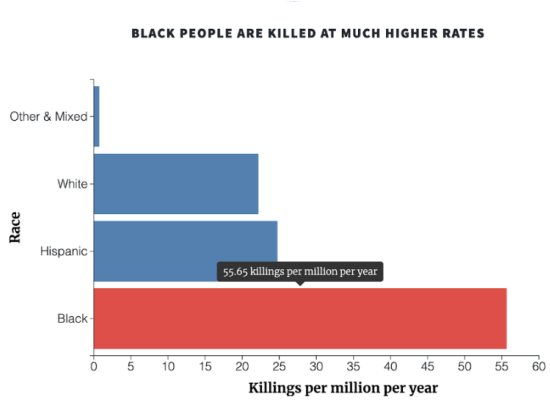


Fig. 2. While black people only account for a small part of the US population, they are killed at over twice the rate of White Americans.

aspect that I adapted to highlight racial bias within my visualizations.

In the technical component of these visualizations, several JavaScript libraries were used:

- D3.js (Version 6) [6]: D3.js facilitated the creation of dynamic, responsive visualizations tailored to the dataset I used.
- Popper.js (Version 2) [17]: This positioning engine was crucial for managing the tooltips, ensuring they are displayed appropriately.
- Tippy.js (Version 6) [18]: Building on Popper.js, Tippy.js enabled customizable tooltips, enhancing the interactivity and user engagement of my visualizations.
- d3-svg-annotation (Version 2.5.1) [16]: This tool was used for adding annotated insights directly onto my choropleth map.

## III. Approach

The primary goal of this project was to analyze and visualize data concerning police-involved shootings in the United States. One key approach was to employ visual representations to highlight disparities in police shootings across different races. Initially, the project utilized a bar chart to represent the raw numbers of police shootings by race.

To provide a more accurate representation of the data, reflecting societal context, the bar chart was modified to depict the rate of police shootings per million by race. This adjustment highlighted that, although the raw numbers were higher for white individuals, Black individuals were disproportionately affected when adjusted for population size.

I used Python scripts for preprocessing the dataset, which included cleaning (removing duplicates, filling missing values, correcting inconsistencies), and calculating specific metrics. For the race distribution visualization, shooting rates per million were computed for each racial group by calculating the number of shootings against population figures.

Several challenges were encountered, particularly with the web implementation. Initial difficulties included SVG containers and tooltips not displaying correctly. To resolve these issues, I undertook a debugging process for the CSS and JavaScript code to eliminate any rendering conflicts. Furthermore, integrating Tippy.js for tooltips proved instrumental. Tippy.js allowed for more flexible and reliable tooltip management, ensuring that they rendered correctly across different devices and screen sizes.

Another significant issue I ran into was related to the choropleth map, which initially did not display the data correctly. The root of the problem was traced back to discrepancies in data references within the GeoJson file, where my dataset used state abbreviations (e.g., CA for California, WA for Washington), whereas the GeoJson file used fully spelled-out state names. The resolution involved converting the state abbreviations in my dataset to their full names, aligning with the GeoJson format, which subsequently allowed the data to render correctly and completely.

## IV. Results

Each visualization in this project was deliberately crafted to align with specific project objectives, providing a clear and comprehensive understanding of police-involved shootings.

Objective 1: Analyze Trends Over Time

The analysis of the distribution of police shootings over time reveals notable trends. Figure 3 illustrates the number of police shootings recorded each month from 2015 to 2024. The data shows a steady increase in the number of incidents over the years. This suggests a troubling upward trend in police-involved shootings. Figure 4 further breaks down the annual distribution for 2023, showing significant monthly fluctuations. For instance, the highest number of shootings in 2023 occurred in the summer months, indicating potential seasonal patterns.

Objective 2: Explore Demographic Trends

Exploring the demographic trends among those involved in police shootings reveals significant disparities. Figure 2 presents the rate of police shootings per million people by race, highlighting that Black individuals are killed at more than twice the rate of White Americans. This disparity points to a clear racial bias in police-involved shootings. Additionally,

Figure 5 categorizes the victims by age range, showing that younger adults, particularly those under the age of 40, are most frequently affected. These findings underscore the disproportionate impact of police violence on minority communities and younger populations.

Objective 3: Investigate Influencing Factors

Investigating the influence of factors such as mental illness, fleeing behavior, and gender provides deeper insights into the dynamics of police shootings. Figure 6 shows pie charts depicting the percentage of victims who were armed, fleeing, or had a mental illness. The data reveals that a significant proportion of victims had mental health issues, highlighting the critical need for better training and protocols for handling such situations. The charts also indicate that while most victims were male, a notable number were attempting to flee at the time of the incident, suggesting that fleeing behavior might increase the risk of being shot by police.

Objective 4: Observe Geographic Distribution

The geographic distribution of police shootings is depicted in Figure 7, which presents a choropleth map of the United States. This map identifies regions with higher occurrences of police-involved shootings. States like California, Texas, and Florida show the highest numbers of incidents, emphasizing the need for targeted policy reforms and improved police training in these areas. The map also highlights that certain states with smaller populations, such as Rhode Island, have relatively fewer incidents, suggesting a potential correlation between population size and the frequency of police shootings.

To measure the success of this project, I utilized peer and instructor feedback alongside an increase in user understanding. By thoroughly assessing whether my visualizations met the initial project objectives, both before and after implementing revisions, I was able to refine and enhance the overall impact of the project. Feedback sessions were particularly valuable, helping me understand the key takeaways people gained from my project and identify areas for further improvement.

## V. Discussion

Overall, the approach taken in this project has shown promise. The visualizations effectively display shooting trends from 2015 to 2024, enhanced by interactive elements and tooltips that make it convenient for users to explore the data. The bar chart visualizing racial distribution particularly highlights the racial bias in police shootings and concisely presents the demographics of the victims, as well as the geographic distribution of incidents.

An improved approach could include enhanced user interaction and the implementation of scrollytelling. Although tooltips and interactivity are already integrated, these features could be expanded. For example, the choropleth map could be refined to highlight specific states based on the number of shootings, enhancing user engagement. Additionally, integrating a dynamic headline where users can select a race or year to view specific data—such as the number of Black individuals killed in 2020—would not only capture user attention but also emphasize the severity of the issue.

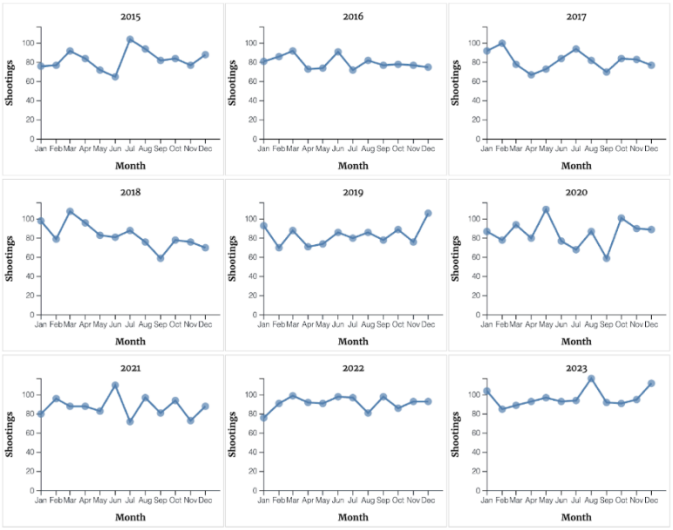


Fig. 3. Trends in Shootings from 2015 to 2023. This chart depicts the number of shootings recorded each month over a span of nine years, illustrating seasonal variations and annual trends in the data.

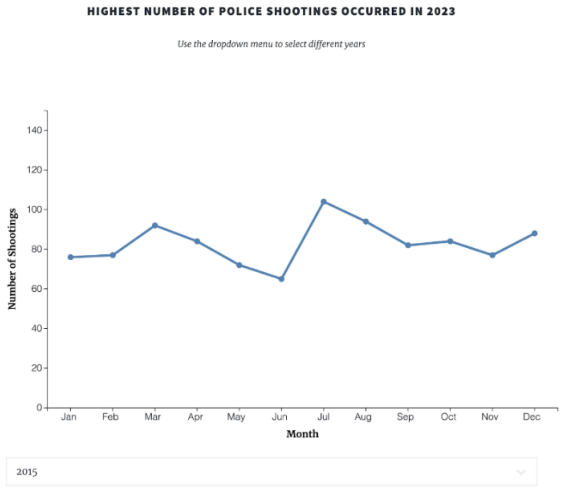


Fig. 4. Annual Distribution of Police Shootings in 2023. The chart displays the monthly fluctuation in the number of police shootings, highlighting significant variations throughout the year. This visualization allows for year-to-year comparisons through a dropdown menu feature. Note that the most police shootings occurred in 2023.

## VI. Future Work

If I were to restart this project, I would focus on conveying a clearer message about the bias and severity of police shootings in the United States. This would involve a careful consideration of the most effective visualization techniques for each type of data presented. For example, the variable indicating whether a victim was armed showed many instances where the weapon was unspecified. This points to a potential lack of proper police training and decision-making. Displaying this data using a tree map would allow users to form their own opinions on whether the shootings were justified. This format could offer a more nuanced understanding of the circumstances surrounding each

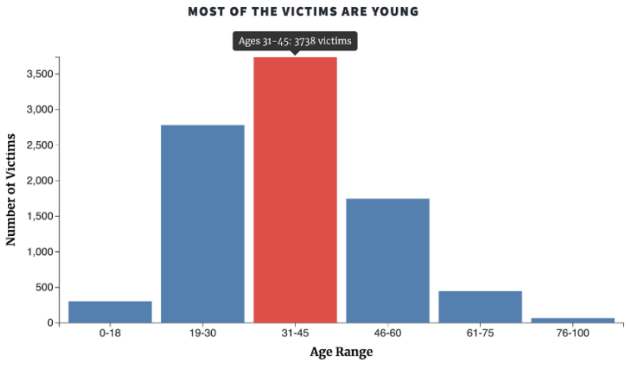


Fig. 5. This bar chart illustrates the number of victims of police shootings in the United States by age range from 2015 to 2024, indicating a significant incidence of police shootings among younger adults.

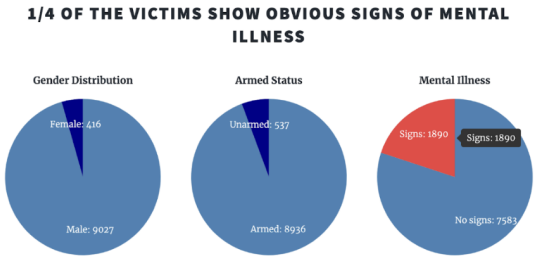


Fig. 6. Pie Charts Depicting Gender, Armed Status, and Mental Illness Among Police Shooting Victims (2015-2024), highlighting a significant prevalence of mental illness.

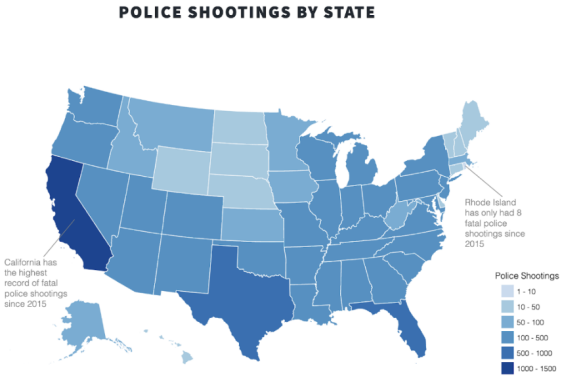


Fig. 7. Choropleth map of police shootings by state from 2015 to 2024, highlighting the distribution across the United States with notable extremes in California and Rhode Island.

incident, potentially leading to more informed discussions on police practices and reforms.

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