**Understanding Gun Violence in the United States: A Comprehensive Data Analysis**

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*Abstract* — **Analysis is based on data sourced from reputable sources, including government agencies, research institutions, and non-profit organizations specializing in gun violence research. We prioritized data integrity and reliability, ensuring that our analysis is grounded in the most up-to-date and comprehensive information available.** **Gun violence in the United States is a multifaceted issue with far-reaching implications. Through comprehensive data analysis, this study delves into the complexities of gun-related incidents, examining key factors such as incident demographics, perpetrator profiles, geographic patterns, and legislative influences. Drawing from reliable sources and employing rigorous statistical methodologies, our analysis unveils nuanced insights into the dynamics of gun violence across diverse communities. We highlight disparities in victimization rates, identify high-risk populations, and explore the impact of socioeconomic factors on incidence rates. Additionally, our study assesses the effectiveness of existing gun control measures and evaluates their potential for mitigating violence. Ethical considerations underpin our research, guiding our efforts to present findings in a manner that respects the sensitivity of the issue and fosters informed dialogue. Ultimately, this analysis serves as a critical resource for policymakers, advocates, and stakeholders seeking evidence-based strategies to address gun violence and promote public safety.**

Keywords—Gun violence, United States, Comprehensive data analysis, Incident demographics, legislation, public safety, Socioeconomic factors, Gun control measures, Violence mitigation, Informed dialogue, Evidence-based strategies

# Introduction

USA Gun Violence Data Analysis

The Gun Violence dataset is a comprehensive collection of data on incidents involving weapons in a variety of circumstances. This dataset is an invaluable resource for studying the scope, trends, and dynamics of gun-related occurrences, including their locations, impact, conditions, and other relevant elements. It is useful in the fields of public safety, criminal justice, policy creation, and lobbying, and it provides critical insights into the complicated subject of gun violence.

A data set usually includes details such as the time and date of the occurrence, the location (city, state, and coordinates), the total number of casualties (fatalities and injuries), the type of gun violence event (e.g., mass shooting, suicide, robbery), law enforcement involvement, and various contextual details. The dataset could include information about the victims, suspects, and firearms utilized. Gun violence remains a critical issue in the United States, with profound implications for public health and safety.

In conducting this analysis of gun violence in the United States, our aim was to provide an objective examination of a complex and pressing issue. We recognize the sensitivity surrounding this topic and approach our findings with a commitment to accuracy, impartiality, and empathy for those affected by gun violence.

The dataset can be used to enhance public awareness, educate communities, and promote educated public debate about gun violence and its consequences. Understanding the complexities of gun violence is vital for creating a safer society and encouraging evidence-based solutions to this critical issue. The Gun Violence dataset is critical to attaining these goals and furthering research and policy efforts targeted at decreasing the devastation caused by gun violence. Examine the different types of gun violence incidents included in the dataset, such as mass shootings, homicides, suicides, robberies, and accidents. Are there specific trends or patterns associated with each type of incident. Discuss the potential policy implications of the findings from the analysis. What policy measures or interventions could be implemented to address the underlying causes of gun violence and mitigate its impact on communities. Conduct a geospatial analysis to identify hotspots or clusters of gun violence incidents across different regions or cities in the United States. Explore the demographic characteristics of both victims and perpetrators involved in gun violence incidents.

Frame the analysis within the context of public health and highlight the broader societal impacts of gun violence on individuals, families, and communities.

# Literature Review

The existing literature on USA Gun Violence Data Analysis provides valuable insights into the multifaceted nature of this pervasive issue. Numerous studies have examined incident demographics, highlighting the disproportionate impact on specific populations based on factors such as age, gender, and socioeconomic status. Perpetrator profiles have been scrutinized, revealing patterns and motivations that contribute to gun violence dynamics. Geographic analyses underscore regional disparities, emphasizing the need for targeted interventions. Legislative influences, particularly the effectiveness of gun control measures, have been subject to rigorous evaluation.

We have explored the intricate interplay of socioeconomic factors on gun violence, shedding light on how poverty, education, and employment contribute to the prevalence of incidents. Disparities in victimization rates have been a focal point, revealing systemic inequities that demand attention. The literature also delves into ethical considerations surrounding gun violence research, emphasizing the need for sensitivity and responsible dissemination of findings.

Studies have explored the role of community-level factors, such as neighborhood characteristics, social cohesion, and access to resources, in shaping patterns of gun violence. Neighborhoods with high levels of poverty, unemployment, and social disorganization may experience higher rates of gun violence, highlighting the importance of addressing broader social determinants of health and safety.

Beyond demographic characteristics, researchers have investigated the underlying motivations and risk factors associated with gun violence. These may include factors such as substance abuse, mental health issues, exposure to violence in childhood, access to firearms, and social networks.

Understanding these risk factors is crucial for developing targeted prevention and intervention strategies. These may include issues related to data quality, measurement validity, sample representativeness, and statistical modeling techniques. Addressing these methodological challenges is essential for producing reliable and valid findings that can guide policy and practice.

Intersectionality, which considers how various social identities intersect and interact to shape individuals' experiences and outcomes, has emerged as an important framework in understanding gun violence. Intersectional analyses examine how factors such as race, gender, class, and sexuality intersect to influence vulnerability to gun violence and access to resources and support services.

USA Gun Violence Data Analysis

Collectively, this body of work not only informs our understanding of the complexities of gun violence but also serves as a foundation for evidence-based strategies. Policymakers, advocates, and stakeholders can draw upon this literature to develop informed interventions that address the root causes of gun violence and promote public safety.

# Data Collection

Our methodology section outlines the statistical techniques and analytical approaches employed to analyze the data and derive meaningful insights. This dataset contains 239678 records and 29 columns shows in Table 1. The dataset allows for the research and investigation of a variety of aspects of gun violence, including the number and distribution of incidents, the relationship with sociodemographic variables, its effect on groups, and the success of various prevention and intervention activities. It serves as the basis for policy development based on evidence, supporting legislators, academics, and activists in devising successful methods to reduce the negative societal effects of gun violence.

We obtained a dataset containing relevant information on incidents, gender, state, urban, rural areas, events, age types, density, range, Year.

We considered a range of factors that contribute to gun violence, including incident data, victim demographics, perpetrator information, geographic patterns, legislative and policy factors, and broader social and economic contexts. By considering these factors holistically, we aimed to provide a nuanced understanding of the issue.

We will work with data from 260k firearms occurrences in the United States. The data ranges from January 2013 to March 2018. The information came from gunviolencearchive.org. This database was compiled using public records and news sources. (<https://www.gunviolencearchive.org/>)

These are the detailed information of dataset columns incident\_id: Unique identifier for each incident. Date: Date of the incident. state: State where the incident occurred. city\_or\_county: City or county where the incident occurred. address: Address of the incident. n\_killed: Number of people killed in the incident. n\_injured: Number of people injured in the incident. incident\_url: URL related to the incident. source\_url: URL of the information source. congressional\_district: Congressional district where the incident occurred. gun\_stolen: Information about whether the gun used was stolen. gun\_type: Type of gun(s) used in the incident. incident\_characteristics: Characteristics describing the incident. latitude: Latitude coordinate of the incident location. location\_description: Description of the incident location. longitude: Longitude coordinate of the incident location. n\_guns\_involved: Number of guns involved in the incident. notes: Additional notes or details about the incident. participant\_age: Age of participants. participant\_age\_group: Age group of participants. participant\_gender: Gender of participants. participant\_name: Names of participants. participant\_relationship: Relationship between participants. participant\_status: Status of participants (e.g., victim, suspect). participant\_type: Type of participant (e.g., victim, suspect). sources: Sources providing information about the incident. state\_house\_district: State house district where the incident occurred. state\_senate\_district: State senate district where the incident occurred.

|  |  |
| --- | --- |
| **Columns** | **Data type** |
| date | date |
| state | string |
| city\_or\_county | string |
| address | string |
| n\_killed | int64 |
| n\_injured | int64 |
| incident\_url | string |
| source\_url | string |
| incident\_url\_fields\_missing | bool |
| congressional\_district | float64 |
| gun\_stolen | string |
| gun\_type | string |
| incident\_characteristics | string |
| latitude | float64 |
| location\_description | string |
| longitude | float64 |
| n\_guns\_involved | float64 |
| notes | string |
| participant\_age | string |
| participant\_age\_group | string |
| participant\_gender | string |
| participant\_name | string |
| participant\_relationship | string |
| participant\_status | string |
| participant\_type | string |
| sources | string |
| state\_house\_district | float64 |
| state\_senate\_district | float64 |

Table 1: List of Variables

# Methodology

## Data Processing

Data preprocessing involved handling null values, removing repeated values, and normalizing numerical features. Categorical variables were encoded, and outliers were addressed to ensure the quality of the dataset for analysis.

Our methodology section outlines the statistical techniques and analytical approaches employed to analyze the data and derive meaningful insights.

Analysis utilized a combination of statistical techniques, data visualization tools, and qualitative insights to identify trends, correlations, and potential causal factors.

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After performing data preprocessing on a DataFrame named `df`. Here's an overview of what each line does:

USA Gun Violence Data Analysis

1. `df.dropna()`: This function removes rows containing any missing (NaN) values from the DataFrame `df`. By default, it removes any row where at least one element is missing. This is a common step in data preprocessing to ensure data quality and avoid issues with missing values in subsequent analyses.

2. `df.drop\_duplicates(keep=False)`: This function removes duplicate rows from the DataFrame `df`. By setting `keep=False`, it removes all duplicate rows, keeping only the first occurrence of each unique row. This is useful for removing redundant data and ensuring that each observation in the dataset is unique.

Overall, these preprocessing steps help clean and prepare the data for analysis by removing missing values and duplicate entries, which can affect the accuracy and reliability of the analysis results.

## Exploratory Data Analysis(EDA)

Exploratory Data Analysis was performed to gain initial insights into the dataset. Descriptive statistics, visualizations, and correlation analyses were utilized to understand the distribution of variables and relationships within the data.

By using a combination of visualization and transformation methods, we were able to gain a more comprehensive understanding of cases. The use of bar charts, line graphs, and scatter plots helped to identify patterns and trends in the data that could be used to make informed decisions. The use of Pandas and Python allowed for efficient data transformation and removal of irrelevant data, ensuring the accuracy and relevance of the analysis.

Below “Fig. 1”, is the result where we can see total cases have been registered in each state. By seeing this we get to know Florida has registered more number of cases.

To generate this we ensures data cleanliness and prepares the data for visualization by aggregating information at the state level and then creates a bar chart to visualize the distribution of gun violence incidents across different states.

Drops any rows with missing values (NaN) from the DataFrame df. Removes duplicate rows from the DataFrame while keeping the first occurrence of each duplicated row and removing subsequent duplicates. Groups the data by the 'state' column.

“Fig. 1”, Calculates the sum of the 'incident\_id' column within each group, representing the total number of incidents for each state. It shows Florida has high incidents. Resets the index of the resulting DataFrame to make the 'state' column accessible for plotting.

A blue bars on a white background

Description automatically generated

Figure 1: Cases registered in each state.

“Fig. 2”, is the result where we compare and contrast gun violence incidents between urban (city) and rural (county) regions. In this result we can see Chicago has a greater number of gun violence incidents are recorded.

A graph with blue and green bars

Description automatically generated

Figure 2: Gun violence incidents between urban and rural regions.

Below “Fig. 3”, determine whether there is a link among the existence of particular representative and either the severity or frequency of occurrences most of them are arrested.

A graph of a number of people

Description automatically generated with medium confidence

USA Gun Violence Data Analysis

Figure 3: Determine whether there is a link among the existence of particular representative and either the severity or frequency of occurrences.

“Fig. 4”, result determine whether particular demographics are particularly susceptible or prone to participating in such situations majority of cases caused in Institution/Group/Business.

A colorful pie chart with numbers and text

Description automatically generatedFigure 4: Determine whether particular demographics are particularly susceptible or prone to participating in such situations.

Below “Fig. 5”, output shows whether cases using stolen guns differ from those involving legally owned guns most of the are occurred in 2016.

*A screenshot of a computer screen

Description automatically generated*

Figure 5: Determine whether cases using stolen guns differ from those involving legally owned guns.

By seeing the below “Fig. 6”, plot robbery is the main catergory where we are seeing more cases are registered and also, we identify participant relation type in violent events.

A blue and purple squares

Description automatically generated

Figure 6: To identify participant relation type in violent events.

Below “Fig. 7”, show that Adult 18+ are committing more crimes and also, we can see the other ages are particularly engaged in these types of violations.

**A graph with blue squares

Description automatically generated with medium confidence**

Figure 7: Identify what particular ages are particularly engaged in these types of situations.

By going through the below “Fig. 8”, result we get to know that Tennessee State has the highest people got murdered and also, we get to know overall amount of people murdered in each state.

A colorful graph of lines

Description automatically generated with medium confidence

Figure 8: Find the overall amount of people murdered in each state.

In “Fig. 9”, After applying the logic and we get to know more female age group plays the biggest part in this violence.

A graph of a person and person

Description automatically generated

USA Gun Violence Data Analysis

Figure 9: Identify which age group plays the biggest part in this violence

By seeing the below “Fig. 10”, result we get to know which year did the most cases occur it seems like 2017 has more cases.

A graph with different colored bars

Description automatically generated

Figure 10: In which year did the most cases occur.

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