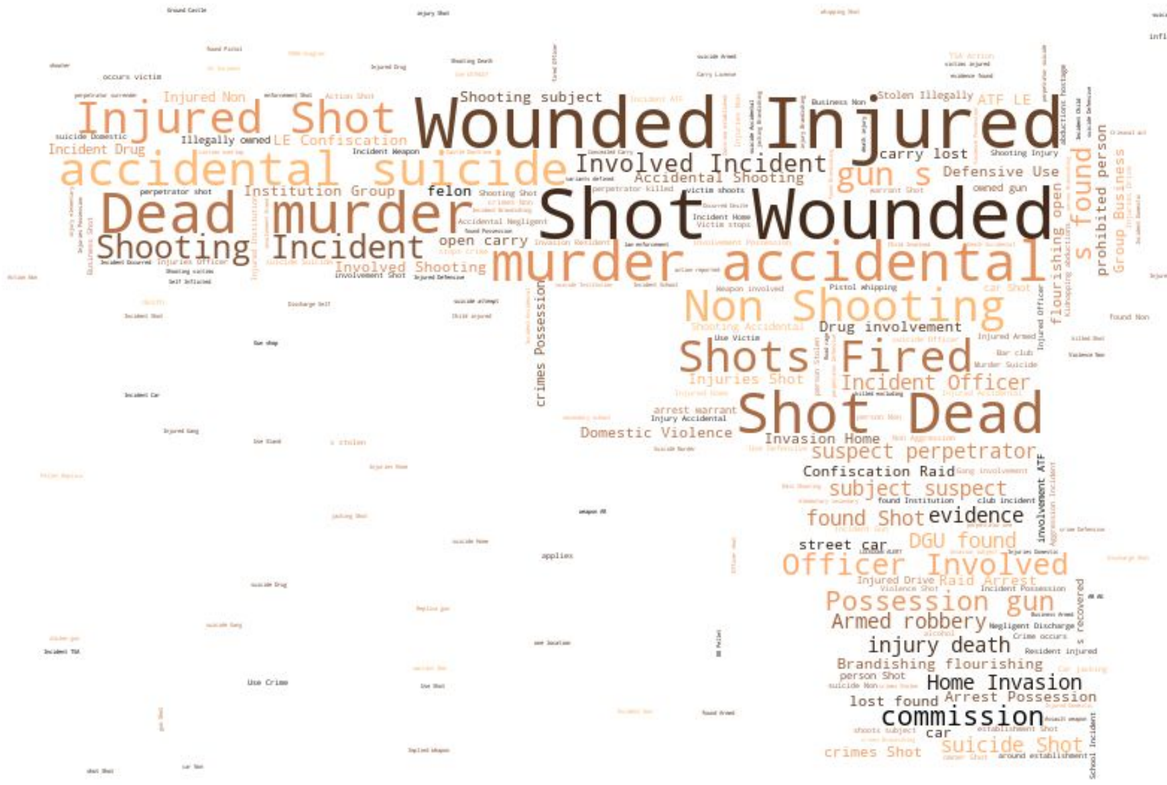
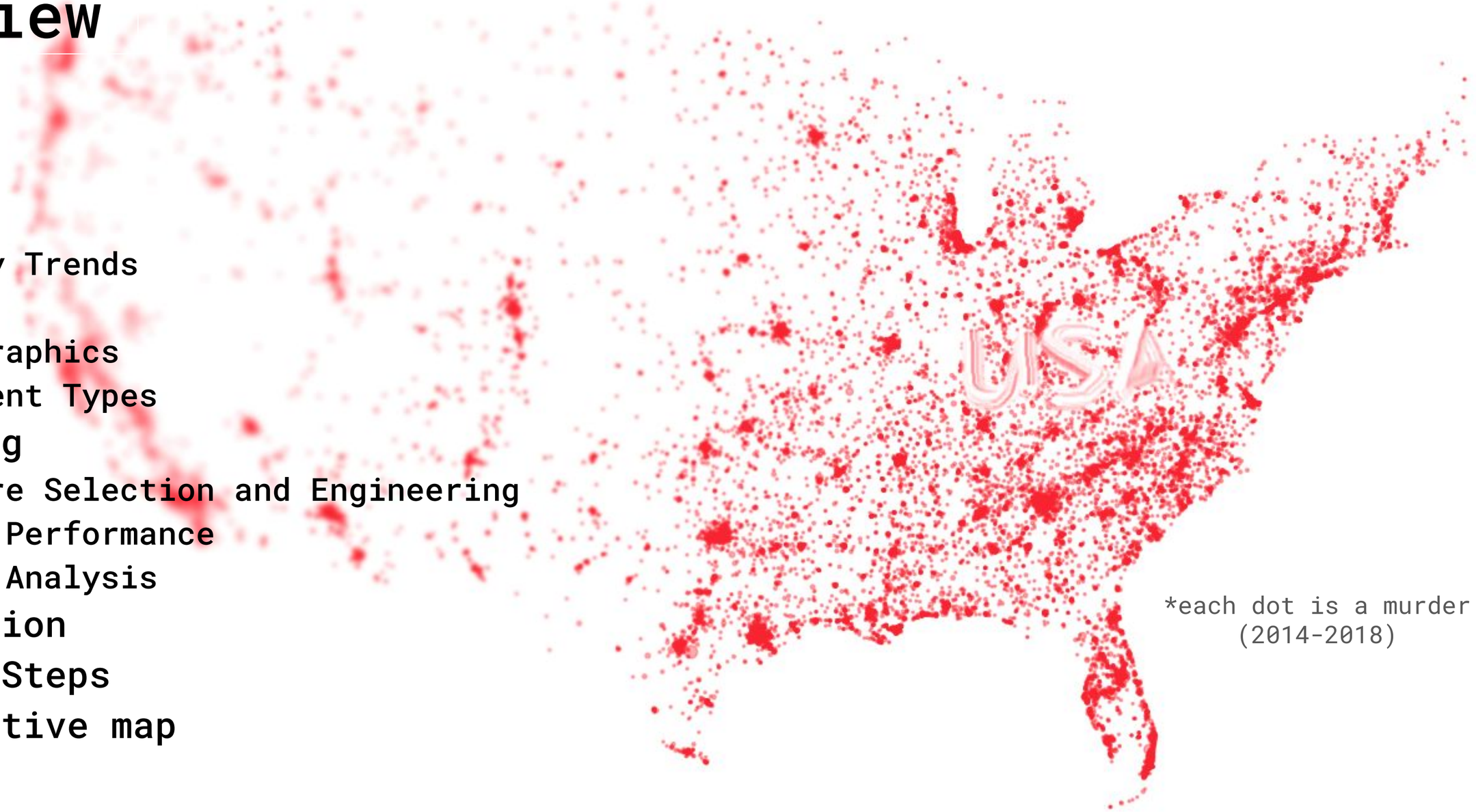
VIOLENCE IN AMERICA


Injured Shot
Wounded Injured
accidental suicide
Involved Incident
Dead murder
Shot Wounded
Shooting
Incident
murder accidental
Non Shooting
Shots Fired
Shot Dead
Suspect perpetrator
Confiscation Raid
subject suspect
found Shot
evidence
DGU found
Officer Involved
Possession gun
Armed robbery
injury death
Brandishing flourishing
Home Invasion
commission
Suicide Shot
crimes Shot
Domestic Violence
Invasion Home
Drug involvement
Defensive Use
Institution Group
LE Confiscation
Illegally owned
Incident Drug
Shooting subject
Accidental Shooting
carry lost
gun s
found
prohibited person
Group Business
crimes Possession
Injuries Shot
Incident Officer
arrest warrant
Injury Accidental
Involved Shooting
open carry
felon
Stolen Illegally
ATF LE
Injured Non
Pistol whipping
Weapon involved
Shooting Accidental
Use Victim
Injured Officer
Injured Armed
Murder Suicide
Bar club
Injured Bar
Found Non
Found Armed
Injured Defensive
Injured Gang
Injured Accidental
Injured Drive
Raid Arrest
Violence Shot
Incident Possession
Negligent Discharge
Crime occurs
Resident injured
Arrest Possession
Suicide Drug
Suicide Gang
Suicide Note
Suicide Armed
Suicide Domestic
Suicide Attempt
Suicide Bomber
Suicide Victim
Suicide Shooting
Suicide Death
Suicide Car
Suicide Bombing
Suicide Vest
Suicide Drive
Suicide Involved
Suicide Accident
Suicide Suicide
Suicide Involvement
Suicide Incident
Suicide Officer
Suicide Scene
Suicide Involved
Suicide Shot
Suicide Shooting
Suicide Victim
Suicide Bomber

Overview

- Data
- EDA
  - Yearly Trends
  - State
  - Demographics
  - Incident Types
- Modeling
  - Feature Selection and Engineering
  - Model Performance
  - Model Analysis
- Conclusion
- Future Steps
- Interactive map



*each dot is a murder (2014-2018)

The Gun Violence Archive

(39.2806°, -76.6354°)

Shooting occurred over a $10 debt deceased victims allegedly owed the perpetrator.

State: Maryland
Killed:2
Injured: 2
Date: 2013-08-20

(39.2639°, -76.6318°)

shot victim to test a bulletproof vest, missed vest and killed victim

State: Maryland
Killed:1
Injured: 0
Date: 2014-07-16

GVA is a non-profit organization that founded in 2013. Its primary goal is to provide free online public access to accurate information about gun-related violence in the United States:

- comprehensive data on gun-related incidents, including shootings, deaths, injuries, and other gun-related crimes.
- easily accessible to the public, researchers, and policymakers through their website
- real-time updates on gun violence incidents across the country
- a neutral stance on gun policies while focusing on accurate data collection and reporting

Gun Violence Dataset

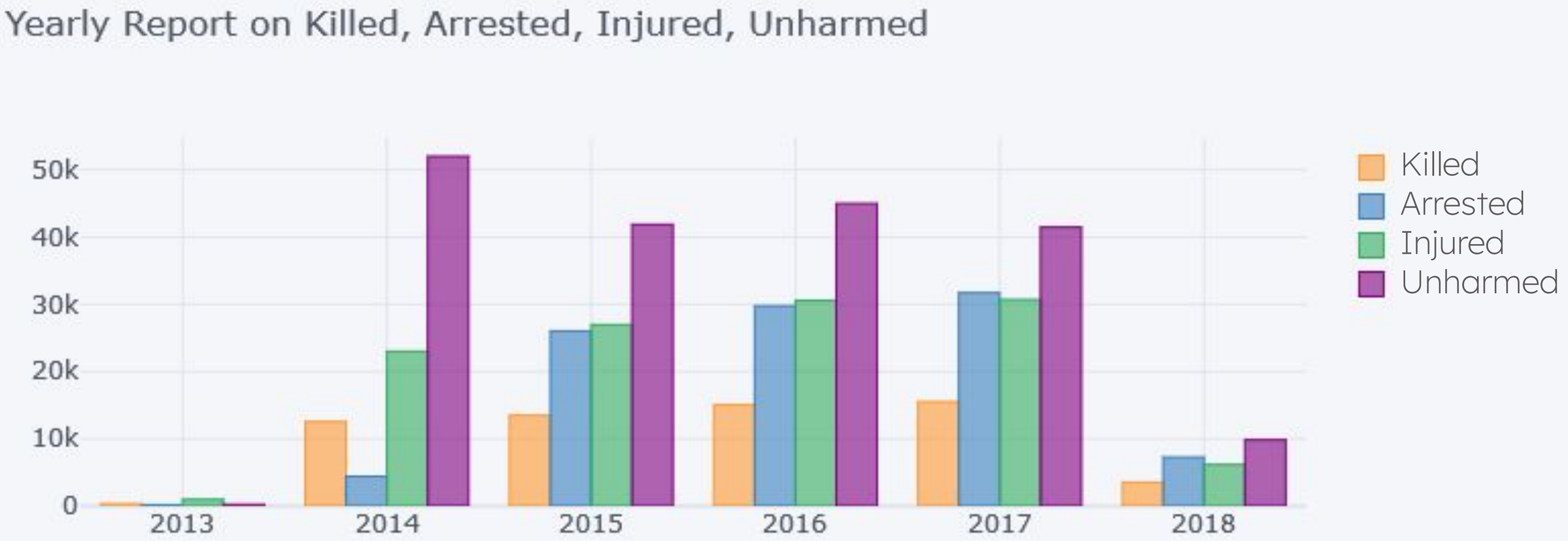
The data on gun violence includes statistics on homicides, suicides, and mass shootings. By examining these categories, we can gain insights into the demographics and circumstances surrounding gun- related incidents from 2013 to 2018. Some limitations of the data:

- Web scraped shooting incidents in the US between January 2013 and March 2018
- Contains fields such as incident ID, date, location, number of people killed and injured.
- Also, includes links to incident details and news stories, as well as participant information and characteristics of the incidents.
- Dataset is not exhaustive for 2013 or 2018.

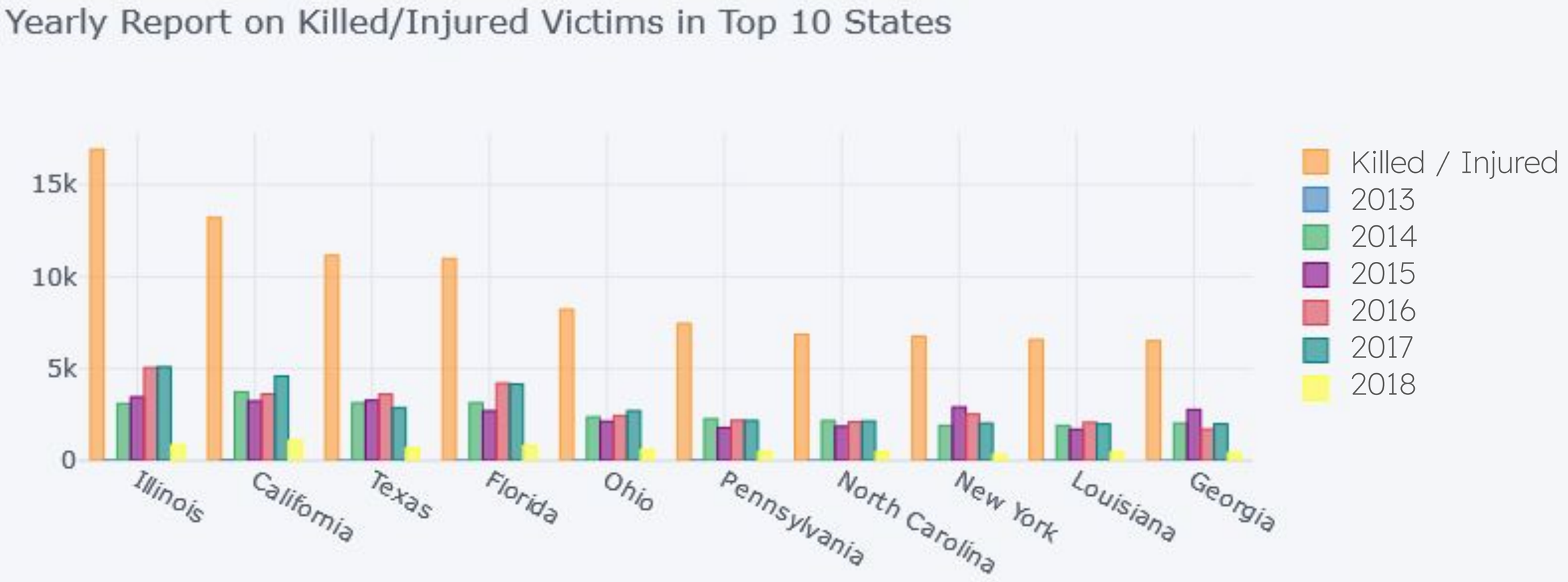
Problem Statement

Analyze the factors contributing to gun violence incidents, identify trends in the data by demographics, location or time, and develop models to predict gun violence casualties based on various attributes such as location and incident characteristics.

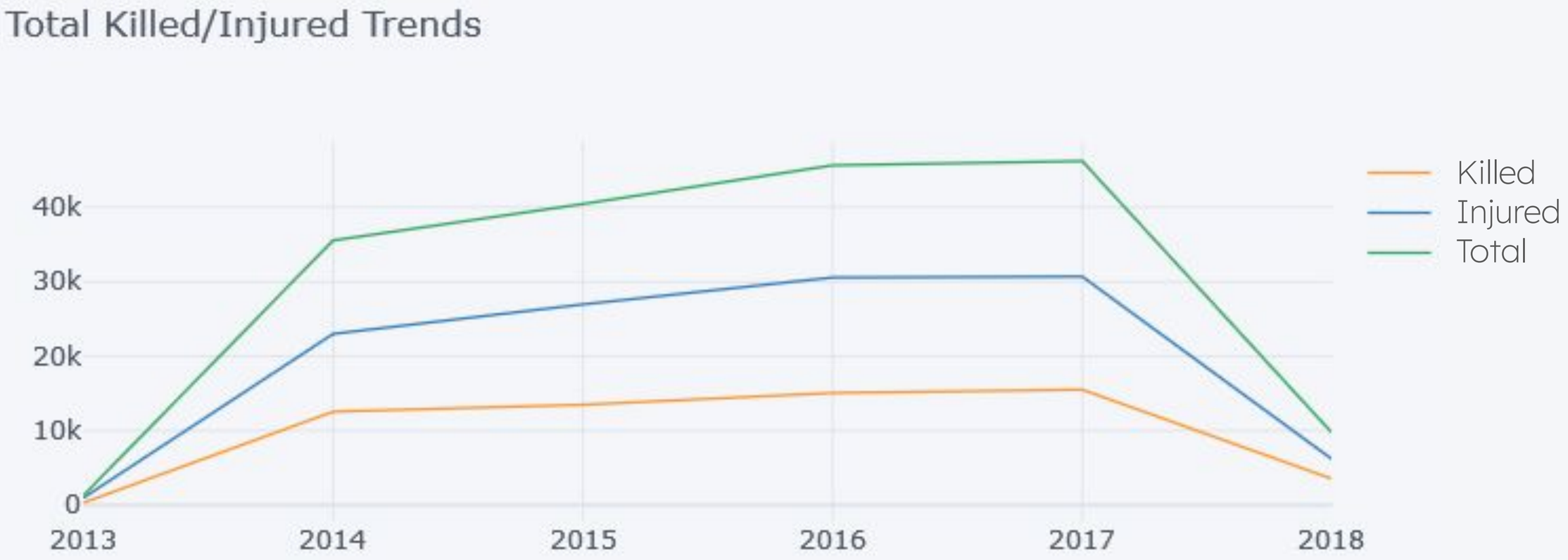
Yearly Trends in Shooting Incidents



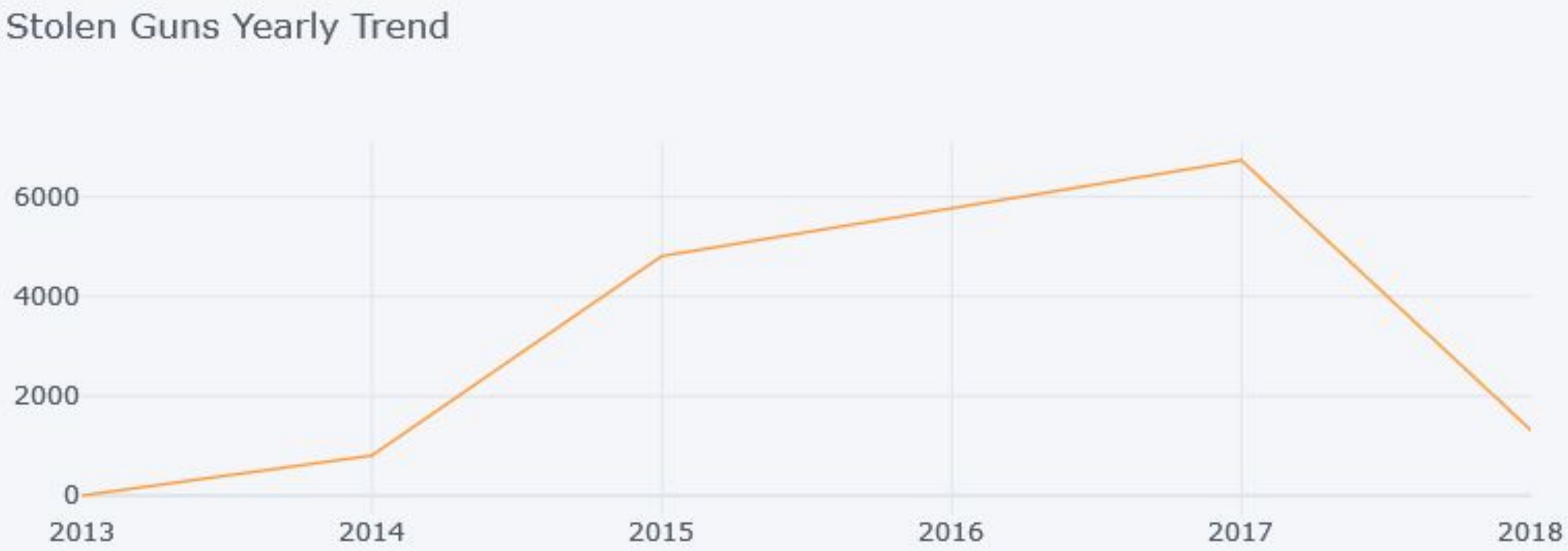
Yearly Trends in Shooting Incidents



Yearly Trends in Shooting Incidents

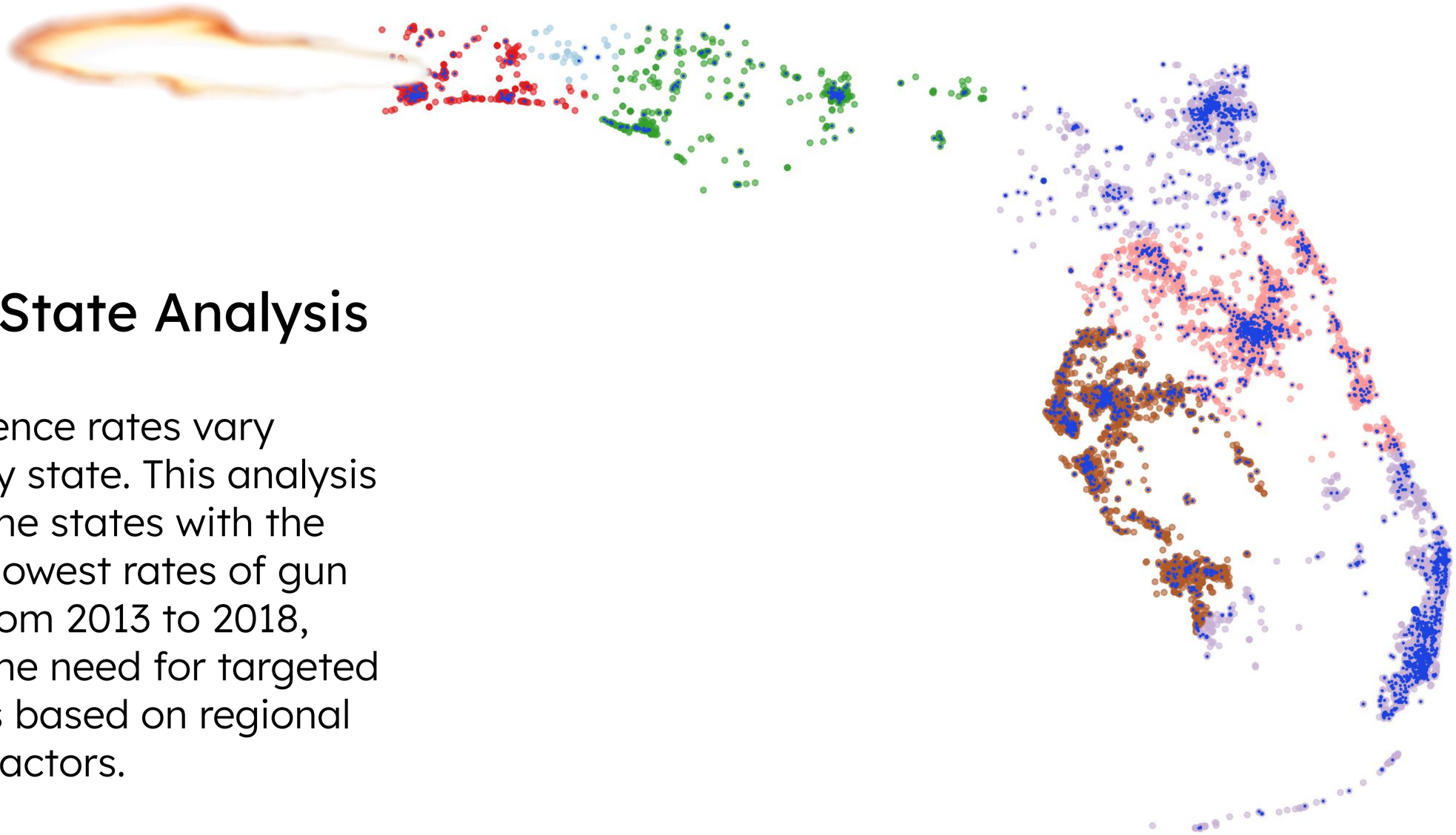


Yearly Trends in Shooting Incidents



State-by-State Analysis

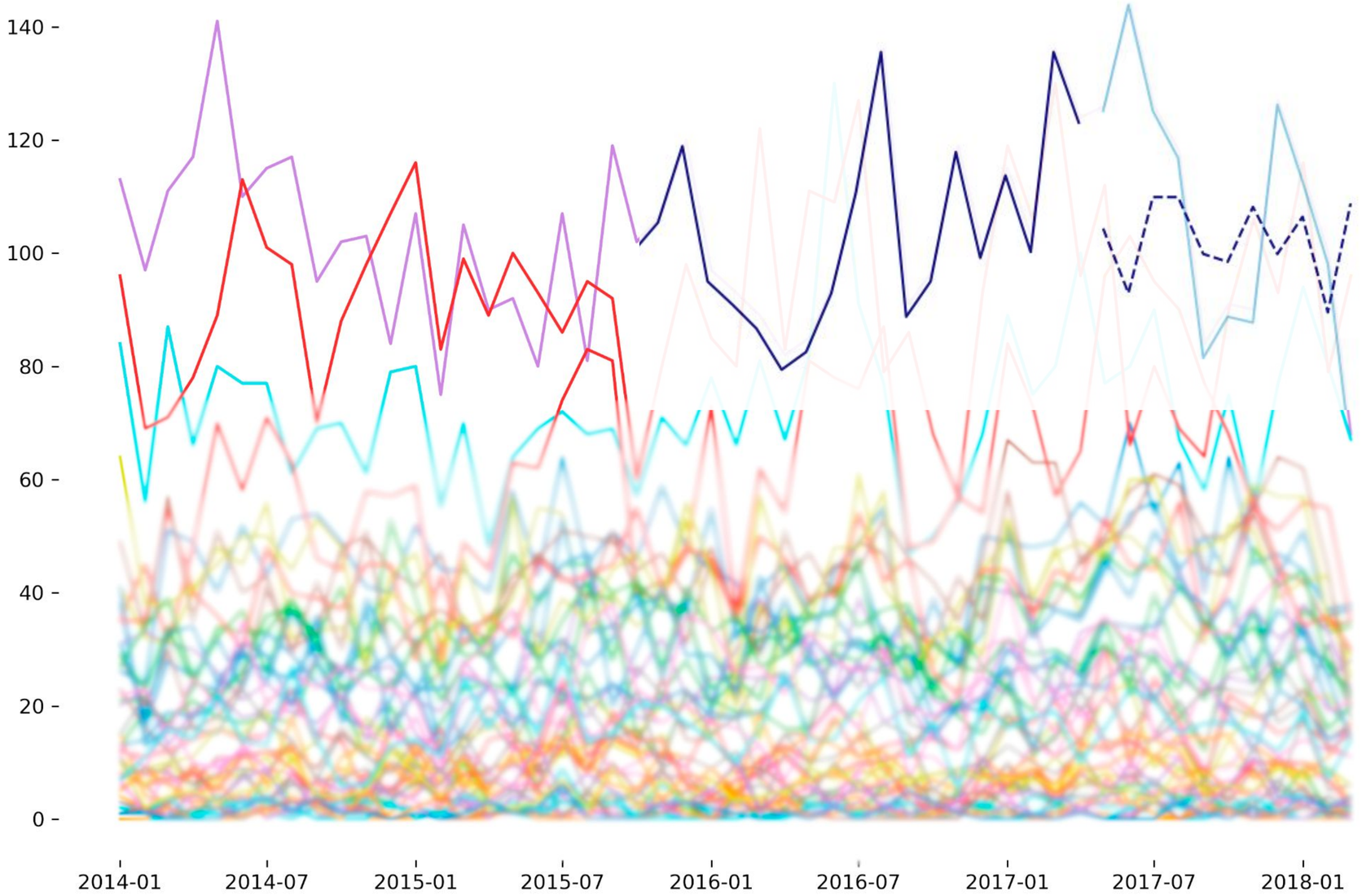
Gun violence rates vary significantly by state. This analysis highlights the states with the highest and lowest rates of gun violence from 2013 to 2018, emphasizing the need for targeted interventions based on regional factors.



* Florida

Could clustering help?

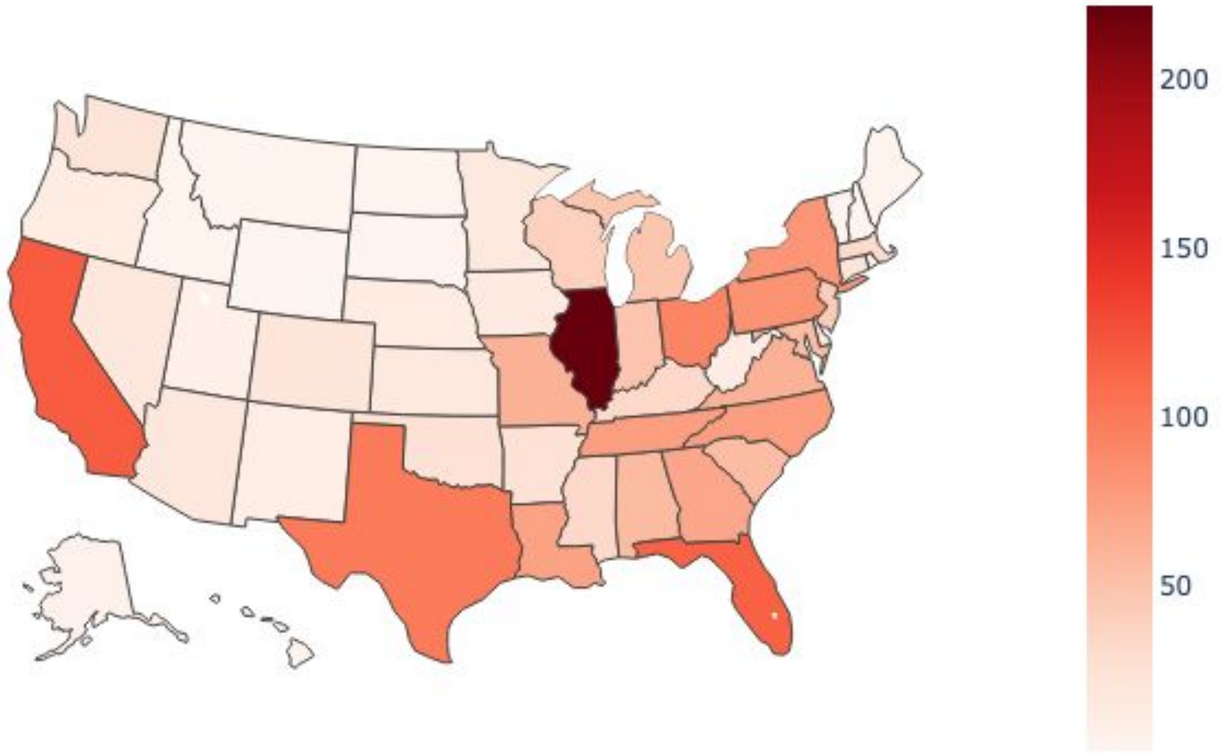
THIS IS NOISE



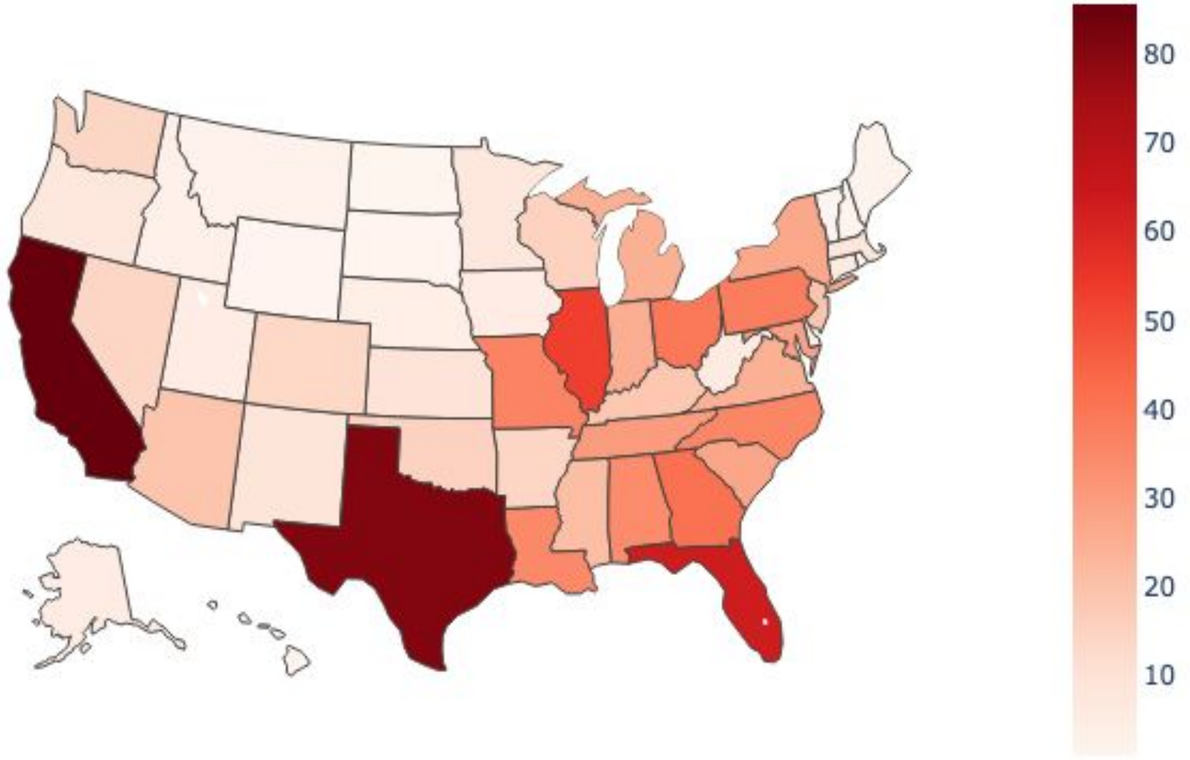
The broken line represents an attempt to predict California violence using time series analysis, which has shown limited accuracy. This indicates the complexity and variability in predicting such incidents.

STATEWIDE MONTHLY STATISTICS

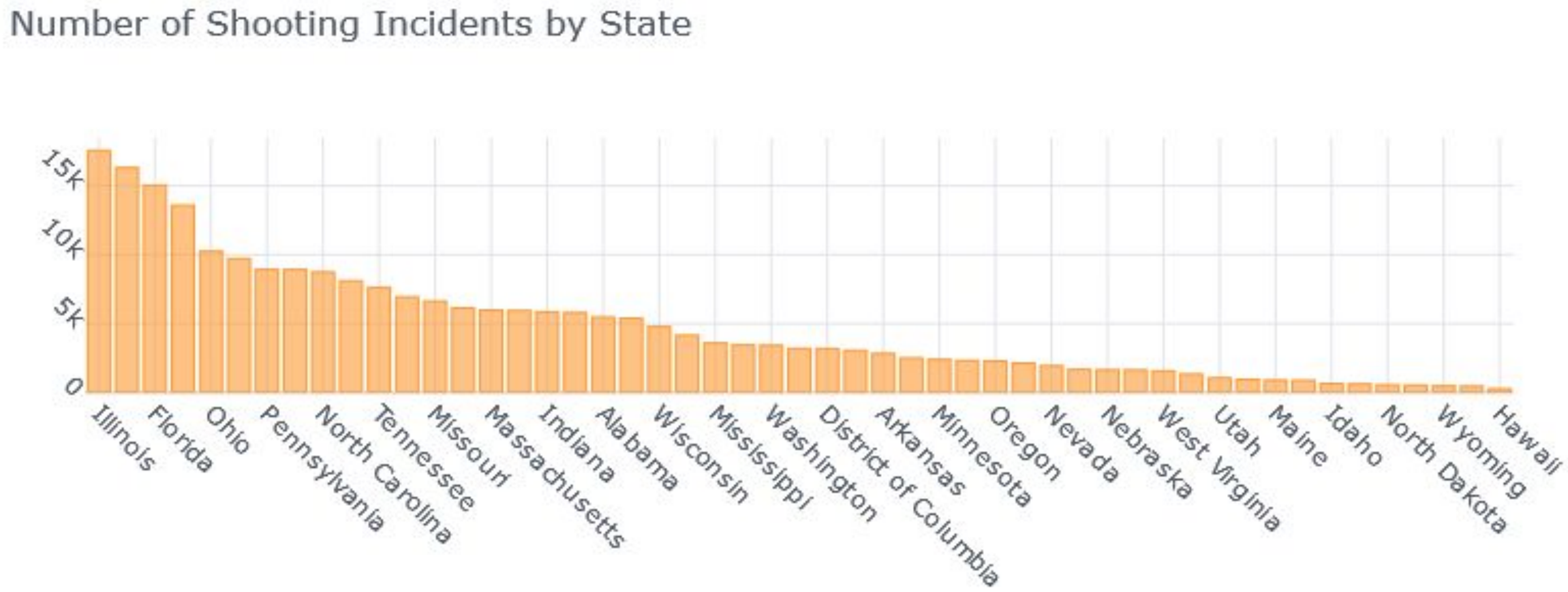
INJURED



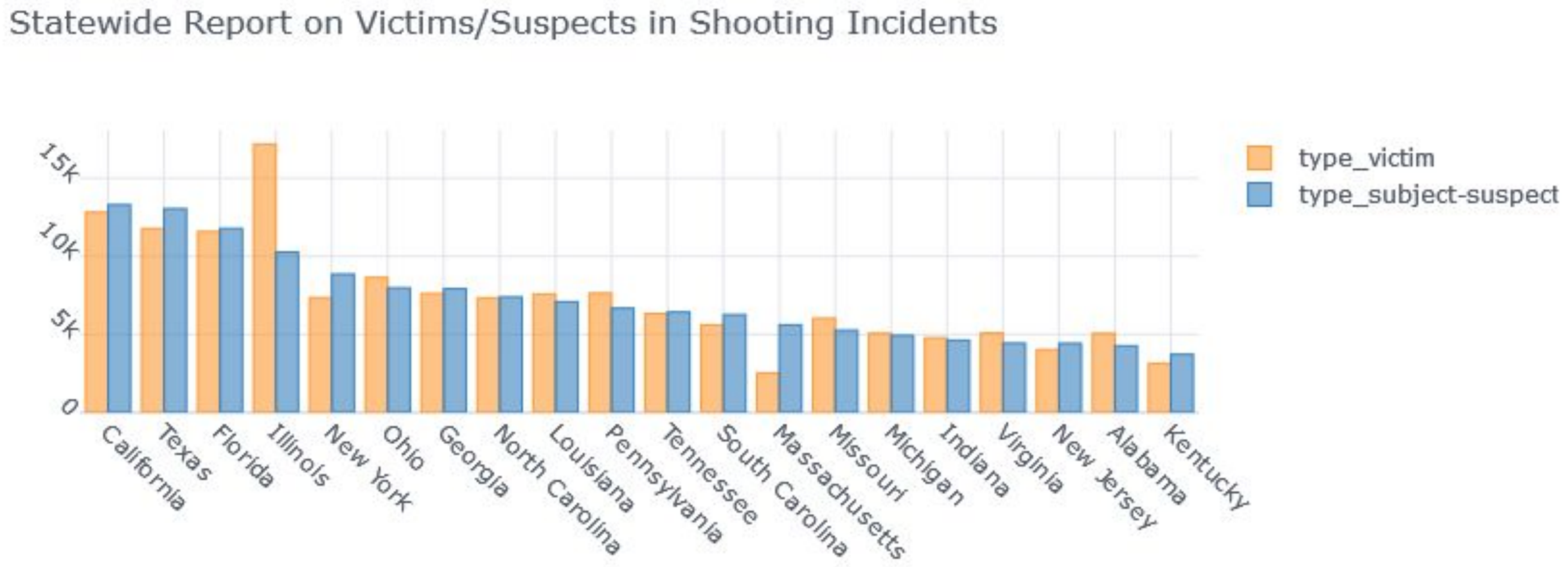
KILLED



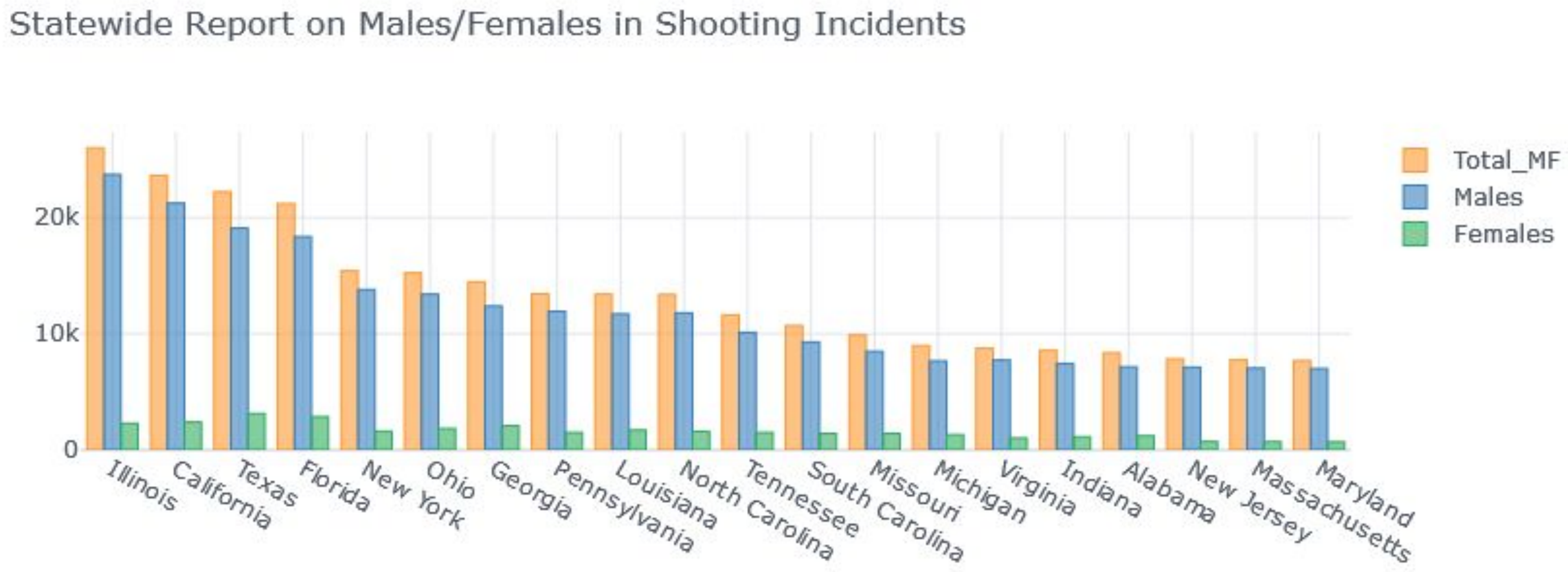
Statewide Trends in Shooting Incidents



Statewide Trends in Shooting Incidents

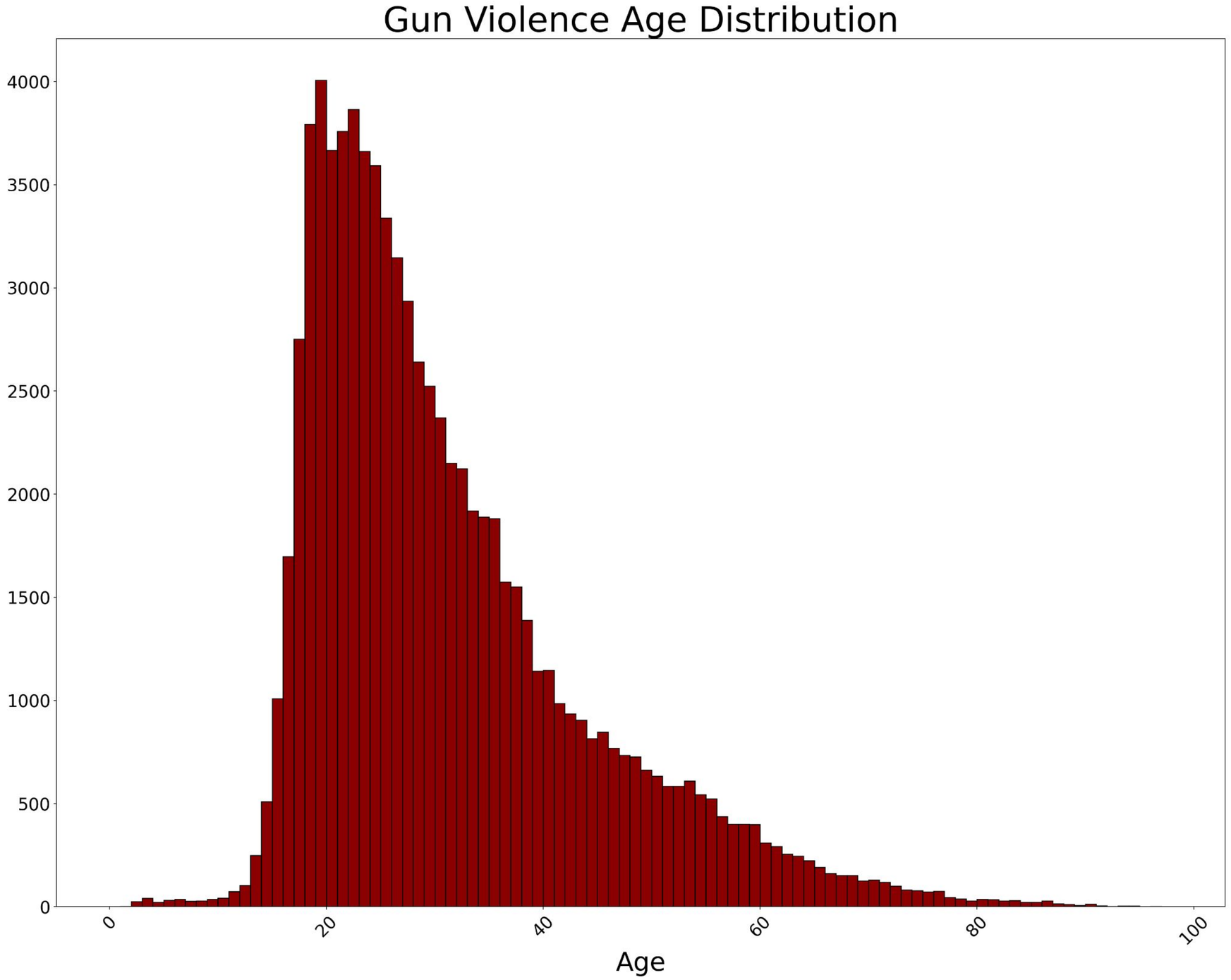


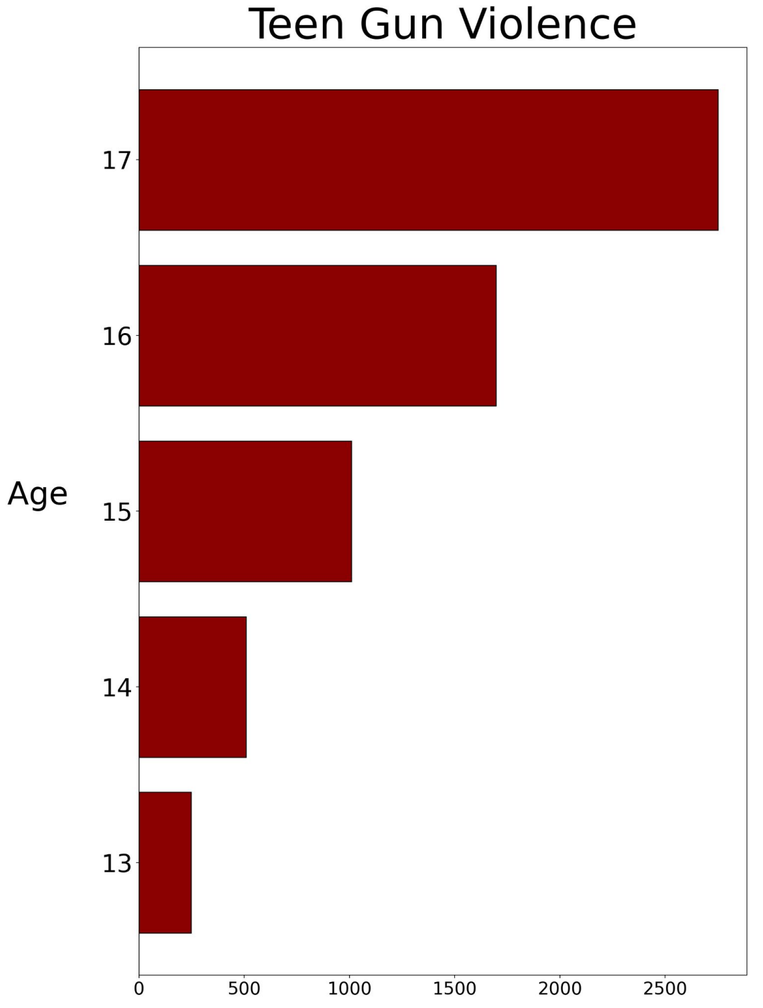
Statewide Trends in Shooting Incidents



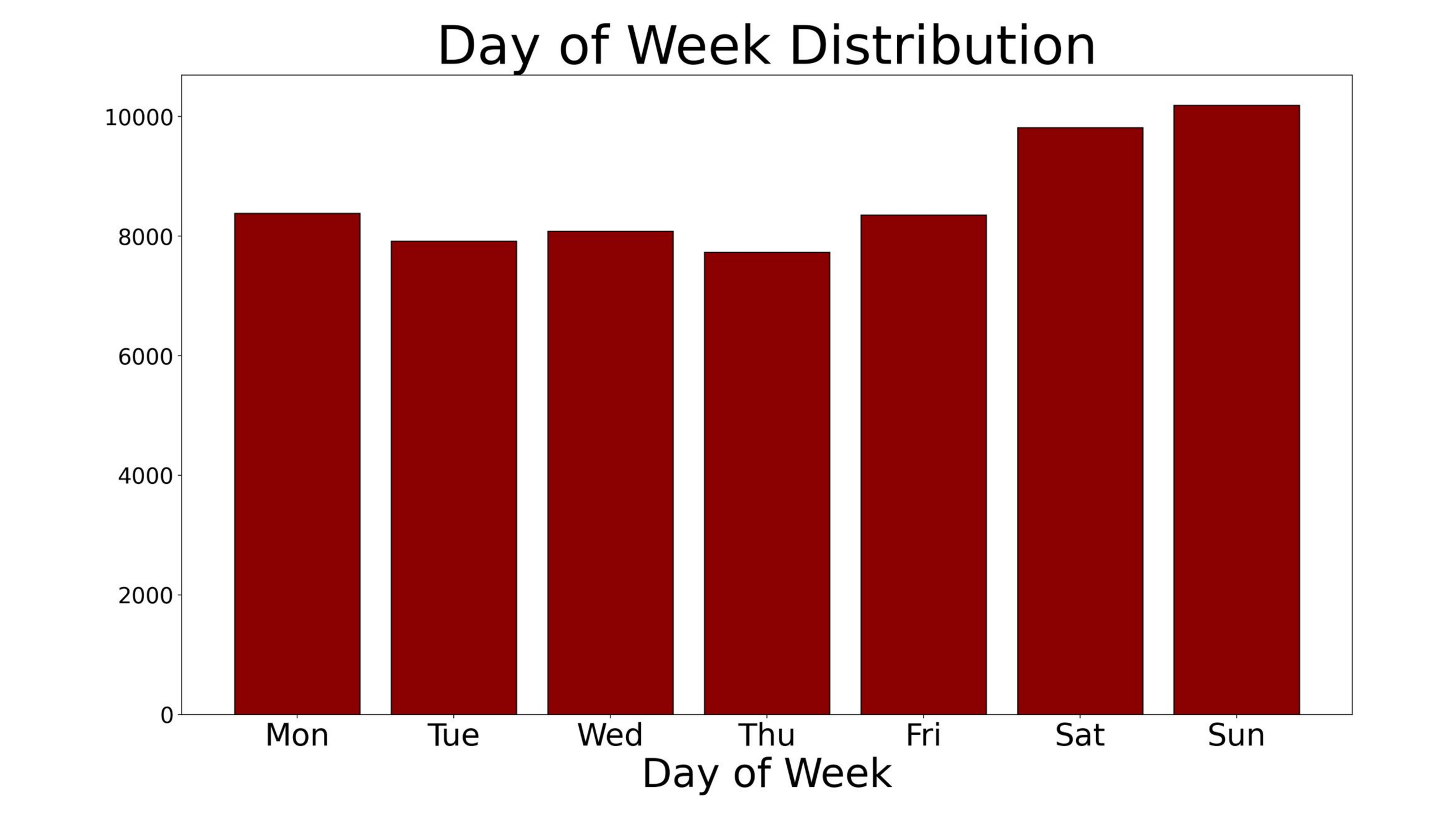
Demographic Insights

Examining demographics of gun violence victims and perpetrators provides valuable insights. Factors such as age and gender play a crucial role in understanding the complexities of gun violence in the United States during this timeframe.





Gender	Percentage
Male	93%
Female	7%


Day of Week Distribution
10000
8000
6000
4000
2000
0
Mon
Tue
Wed
Thu
Fri
Sat
Sun
Day of Week

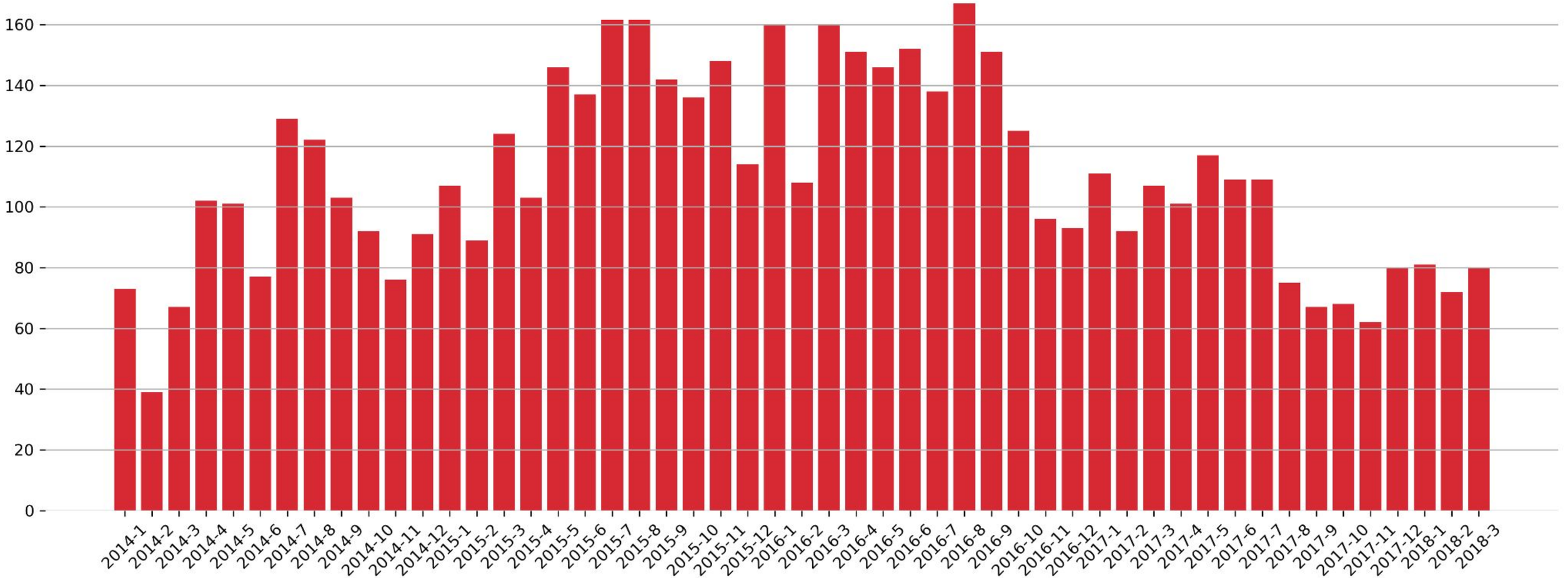
GANG ACTIVITY

The chart shows a decline in gang activity, which may be influenced by government initiatives such as gun buyback programs aimed at reducing illegal firearms on the streets.

Source:

NYPD and Bronx DA take 165 guns off streets with buyback program

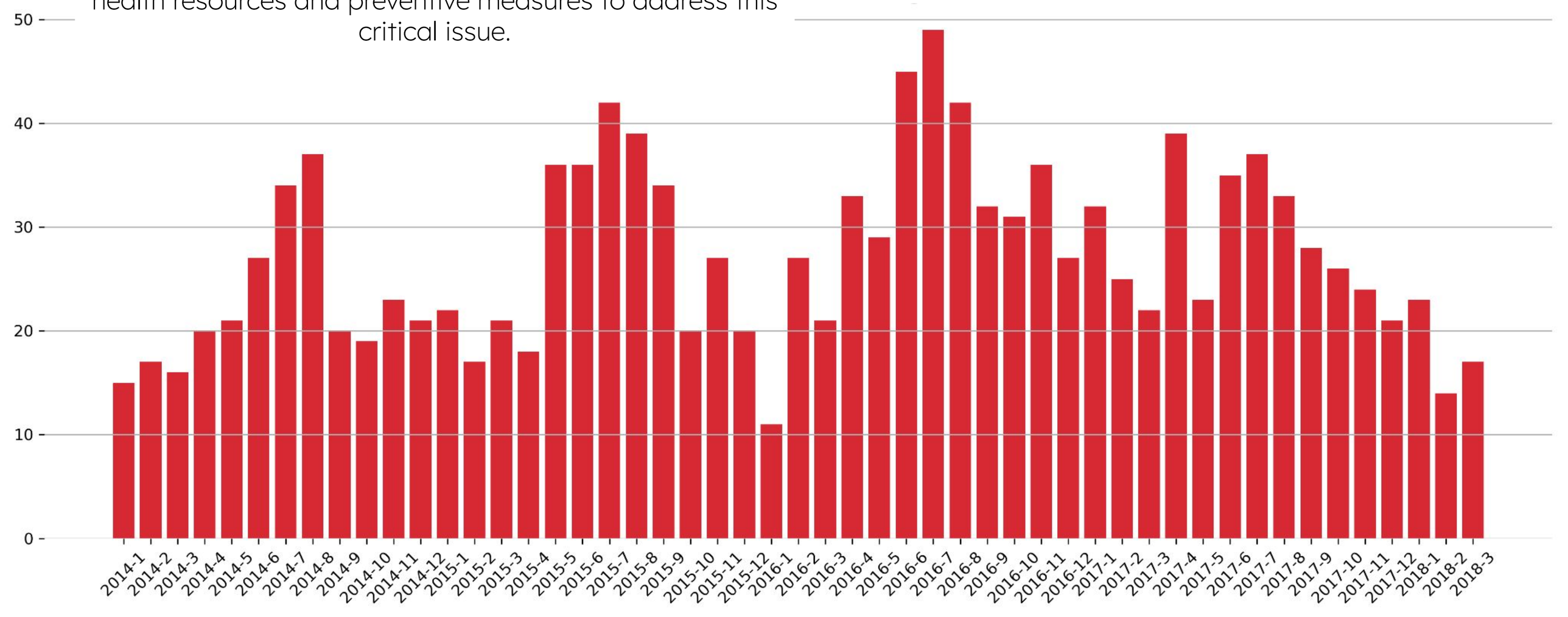
https://www.nydailynews.com/2016/08/07/nypd-and-bronx-da-take-165-guns-off-streets-with-buyback-program/



SUICIDES

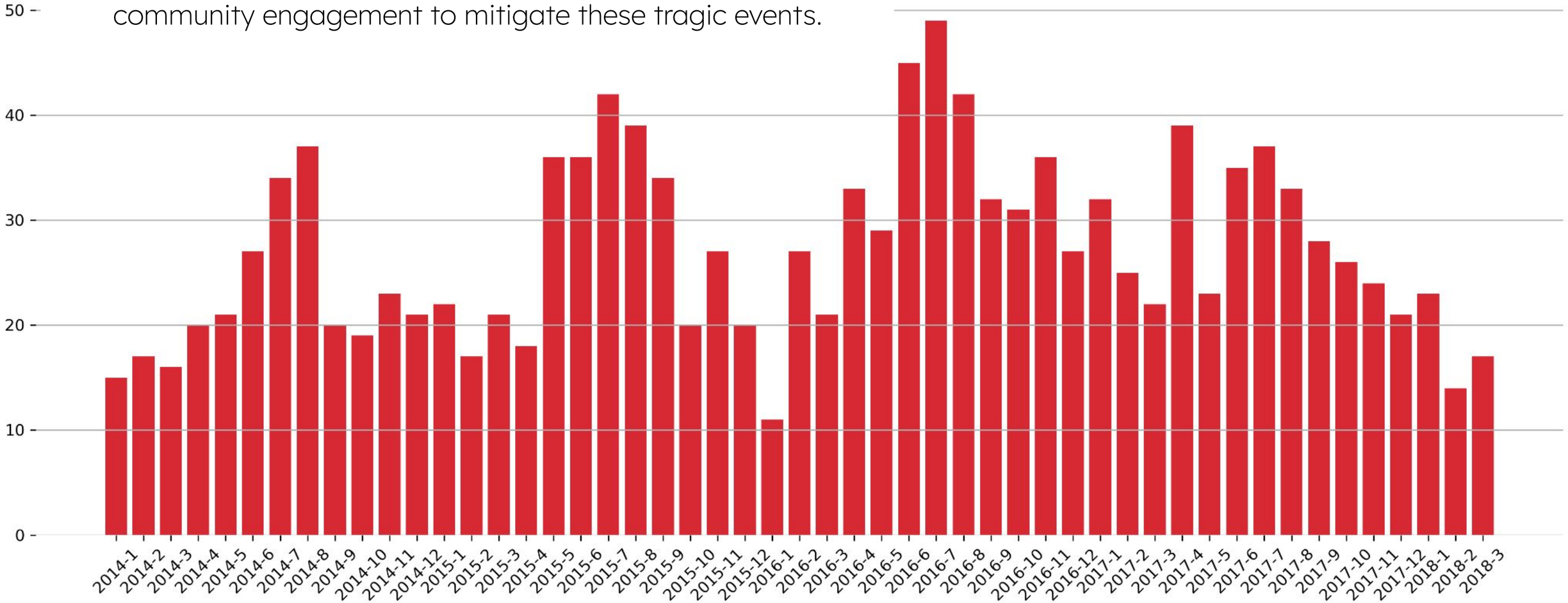
A significant portion of gun violence incidents are suicides. From 2013 to 2018, data reveals that nearly 60% of gun deaths were suicides. This highlights the need for mental health resources and preventive measures to address this critical issue.

Fact:
almost all suicide attempts resulted in death



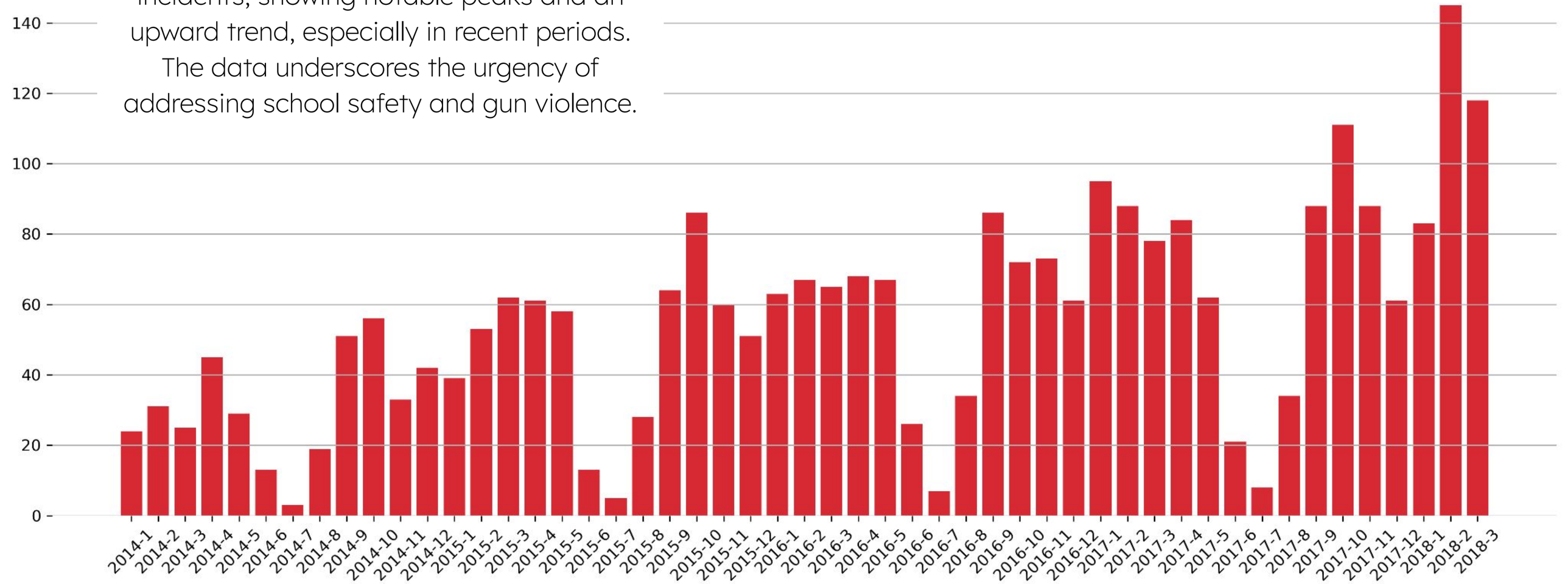
MASS SHOOTINGS

Mass shootings have garnered significant media attention and public concern.
Analyzing data from 2013 to 2018 reveals patterns in locations and motivations, urging the need for policy changes and community engagement to mitigate these tragic events.



SCHOOL SHOOTINGS

School shootings have seen a concerning rise over recent years, as illustrated in the chart. This graph tracks the monthly number of incidents, showing notable peaks and an upward trend, especially in recent periods. The data underscores the urgency of addressing school safety and gun violence.



Modeling

- Models
  - Linear Regression
  - Logistic Regression

Feature Selection and Engineering

Feature:

- Location Information
- Perpetrator information
- Number of guns and types of guns
- Incident characteristic flags
- Incident notes

Engineering:

- TF-IDF vectorized location description
- Missing age imputed via average age
- Missing gun count imputed to be 1
- Removed flags that revealed the outcome
- TF-IDF vectorized

Model Performance

Linear Regression

Target: Number of casualties

- **Train R2:** 0.538
- **Test R2:** 0.294
- **Accuracy** (when prediction is rounded): **77.3%**

Logistic Regression

Target: If there are casualties

- **Train Accuracy:** 89.9%
- **Test Accuracy:** 89.6%

Notable Positive Indicators for Gun Violence Casualties: Linear Regression

Feature	Coefficient
Note Contains: **vape**	5.64
Incident Type: **Terrorism Involvement**	1.79
Incident Type: **Hate crime**	1.03
Incident Type: **Bar club incident - in or around establishment**	0.35
Incident Type: **House party**	0.31
State: **Alaska**	0.22
State: **Arizona**	0.19
Incident Type: **Gang involvement**	0.19
Incident Type: **Domestic Violence**	0.18
Gun Type: **28 gauge**	0.17
State: **California**	0.17
Gun Type: **44 Mag**	0.11

Notable Positive Indicators for Gun Violence Casualties: Logistic Regression

Feature	Coefficient
Note Contains: **party**	4.28
Note Contains: **teen**	3.66
State: **Alaska**	1.01
Gun Type: **44 Mag**	0.92
Incident Type: **BB Pellet Replica gun**	0.86
Incident Type: **Bar club incident - in or around establishment**	0.66
State: **Arizona**	0.47
Gun Type: **30-06 Spr**	0.40
State: **California**	0.35
State: **Maryland**	0.30
Incident Type: **Gang involvement**	0.30
Incident Type: **House party**	0.23

Notable Negative Indicators for Gun Violence Casualties: Linear Regression

Feature	Coefficient
State: **Wyoming**	-0.47
State: **Massachusetts**	-0.22
State: **Iowa**	-0.21
Incident Type: **Carjacking**	-0.21
Incident Type: **Road_rage**	-0.20
State: **New Hampshire**	-0.20
State: **Maine**	-0.17
Incident Type: **Institution Group Business**	-0.17
Incident Type: **Defensive Use Victim stops crime**	-0.13
Incident Type: **Political Violence**	-0.12
Incident Type: **Under the influence of alcohol or drugs (only applies to the subject/suspect/perpetrator)**	-0.11

Notable Negative Indicators for Gun Violence Casualties: Logistic Regression

Feature	Coefficient
Note Contains: **bank**	-4.28
Note Contains: **robbed**	-4.03
State: **Wyoming**	-2.27
State: **Maine**	-1.78
State: **New Hampshire**	-1.75
State: **Vermont**	-1.70
State: **Massachusetts**	-1.66
Incident Type: **Institution_Group_Business**	-1.32
Incident Type: **Police_Targeted**	-0.98
Incident Type: **Road_rage**	-0.83
Incident Type: **Under the influence of alcohol or drugs (only applies to the subject/suspect/perpetrator)**	-0.79

Conclusions & Insights

In summary, gun violence in the United States from **2013 to 2018** reveals complex trends. From the overwhelmingly male gender distribution, to the increasing frequency of school shootings, to the dangers of gun violence at house parties and bars. At least we know that our odds of getting shot are lowest on thursday!

We recommend focusing on education and support for males between the ages of 12 and 26, who were the overwhelming majority of perpetrators of gun violence.

Future Impact and Considerations

- Incorporate data on socioeconomic factors like poverty rates, education levels, unemployment.
- Creating a timeline of policy changes and analyzing trends before and after their enactment.
- Continue efforts to fill in missing data for past years (like 2018) and maintain consistent data collection through the pandemic years and beyond.

Thank you!

Do you have any questions?