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# Predicting Gun Deaths in the United States for the Year of 2019

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## *Gun Violence in America*

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# Problem Statement

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There has been series of gun violence across the 50 states in the USA. Records have shown that gun deaths score among the highest cause of deaths in the USA. As part of solution to the menace, the homeland security decided to conduct a research to predict gun deaths in the US for the year 2019 using data from 2014 - 2018.



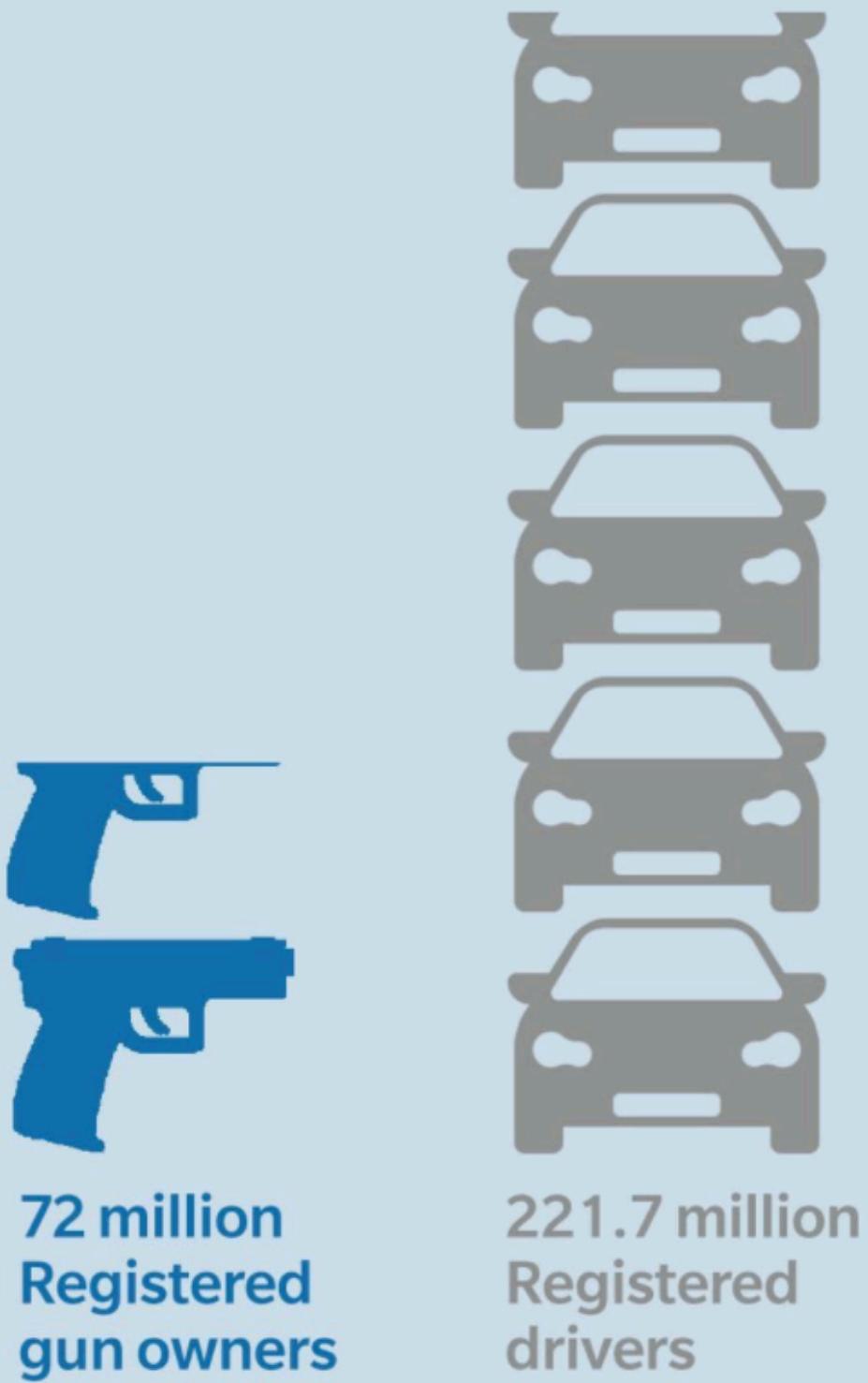
## *Gun Violence in America*

# Background

- Every day, more than 100 Americans are killed with guns and more than 200 are shot and wounded.<sup>1</sup>
- Firearms are the leading cause of death for American children and teens.<sup>2</sup>
- American taxpayers pay a daily average of \$34.8 million for medical care, first responders, ambulances, police, and criminal justice services related to gun violence.<sup>3</sup>

## Guns vs. Cars

There are three times as many drivers as gun owners, yet yearly gun deaths (40k) surpass deaths from car accidents (39k).



SOURCES: CDC, NSC, U.S. DEPARTMENT OF TRANSPORTATION

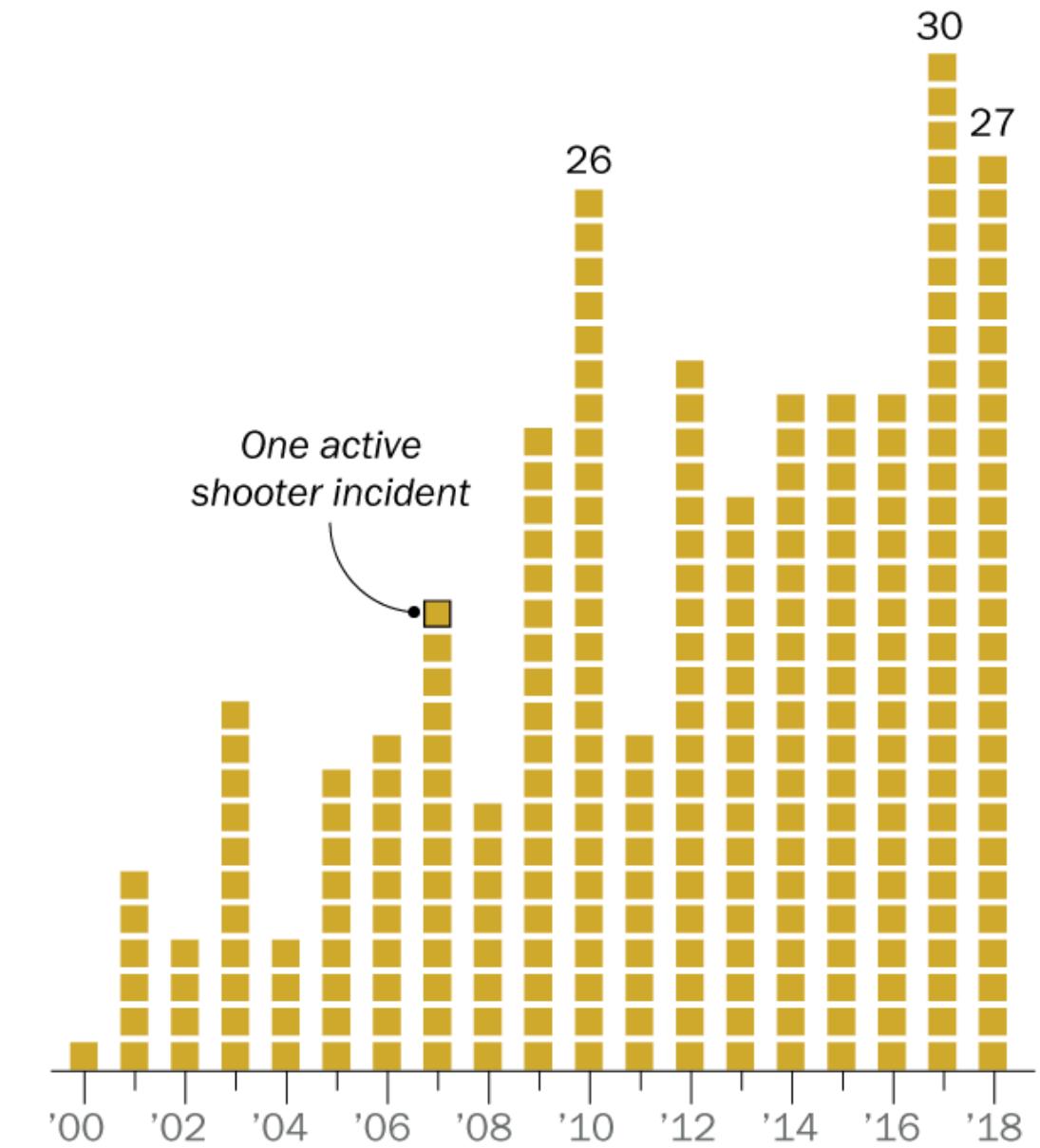


## *Gun Violence in America*

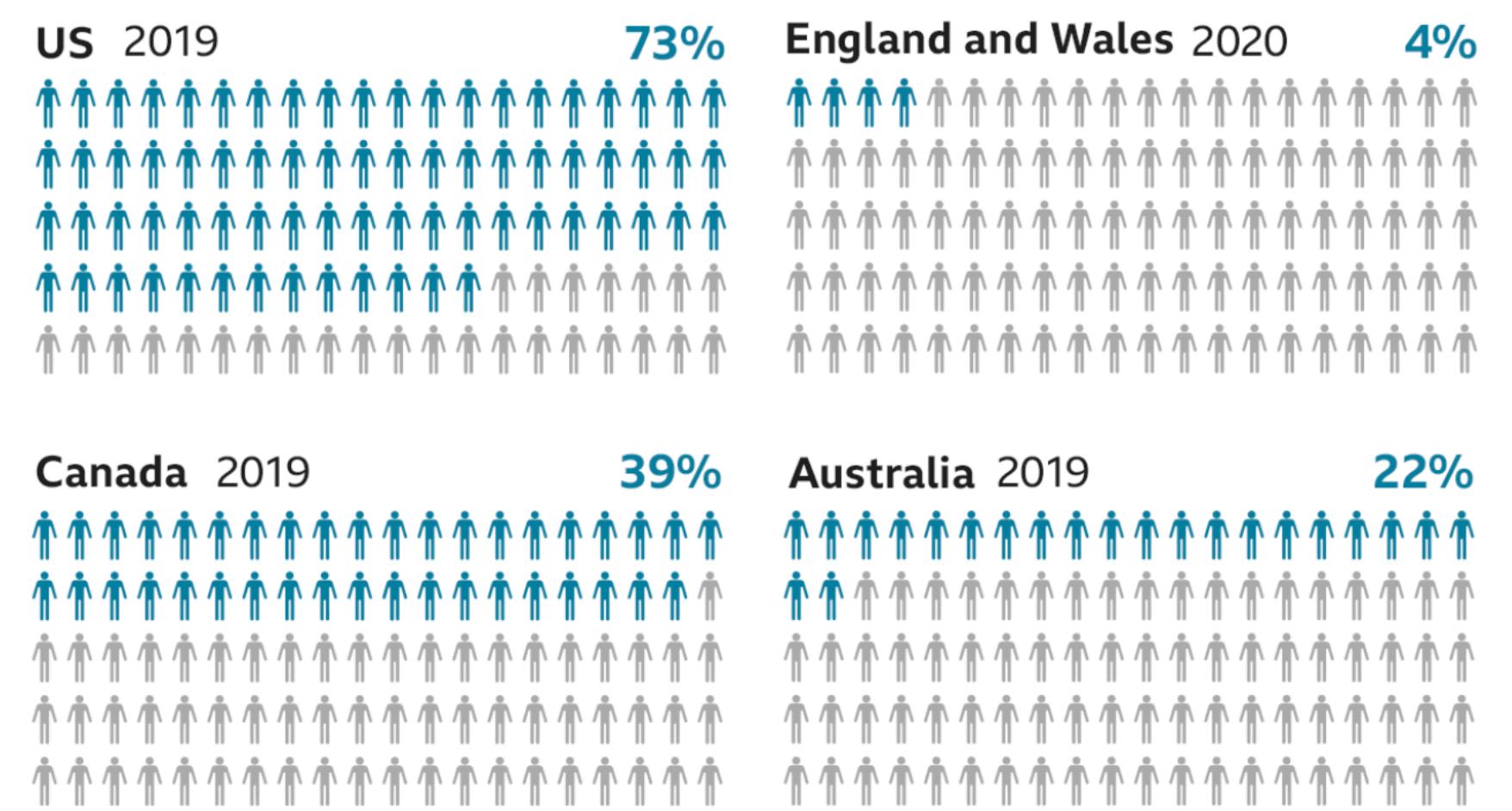
# Background

- The United States (US) has the 28th highest rate of deaths from gun violence in the world.<sup>4</sup>
- Active shooter incidents have become more common in the US.

Number of active shooter incidents, by year



## An international comparison of gun-related killings as a % of all homicides



Sources: FBI/Home Office/Australian Bureau of Statistics/Statistics Canada

BBC

*Gun Violence in America*

# Data Collection - ATF

## Fire Arm Commerce:

- Report on Firearm Commerce (2014-2019)



**ATF** Bureau of Alcohol, Tobacco,  
Firearms and Explosives

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## Data & Statistics



### Firearms Commerce Report in the United States

This report presents data drawn from a number of ATF reports and records in one comprehensive document. It also provides comparative data from as far back as 1975 for context, analyses of trends over the years, and a fuller picture of the state of firearms commerce in the United States today.

Please note, the reports in PDF format below are not fully Section 508 compliant. We are working quickly to ensure they are accessible for all users of our site.

[2021 Report on Firearms Commerce in the U.S.](#)

[2020 Report on Firearms Commerce in the U.S.](#)

[2019 Report on Firearms Commerce in the U.S.](#)

[2018 Report on Firearms Commerce in the U.S.](#)

[2017 Report on Firearms Commerce in the U.S.](#)

[2016 Report on Firearms Commerce in the U.S.](#)

[2015 Report on Firearms Commerce in the U.S.](#) (This publication has been updated to correct 2013 firearms manufactured total in Exhibit 1.)

[2014 Report on Firearms Commerce in the U.S.](#)

[2013 Report on Firearms Commerce in the U.S.](#)

[2012 Report on Firearms Commerce in the U.S.](#)

[2011 Report on Firearms Commerce in the U.S.](#)

*Gun Violence in America*

## Data Collection - ATF (continued)

By State (2014-2019):

- Any Other Weapon
- Destructive Devices
- Machine-gun
- Silencer
- Short Barreled Rifle
- Short Barreled Shotgun

**Exhibit 8. National Firearms Act Registered Weapons by State (May 2019)**

State	Any Other Weapon <sup>1</sup>	Destructive Device <sup>2</sup>	Machinegun <sup>3</sup>	Silencer <sup>4</sup>	Short Barreled Rifle <sup>5</sup>	Short Barreled Shotgun <sup>6</sup>	Total
Alabama	1,228	80,726	29,757	46,902	7,214	2,438	168,265
Alaska	332	5,346	1,674	9,250	2,503	1,415	20,520
Arkansas	651	70,179	5,657	26,804	4,279	1,231	108,801
Arizona	1,365	108,692	17,841	55,099	19,124	2,696	204,817
California	4,113	299,766	30,173	15,131	13,354	14,129	376,666
Colorado	1,045	50,349	7,377	41,983	10,008	1,929	112,691
Connecticut	973	13,647	41,920	13,731	3,567	1,039	74,877
District of Columbia	69	51,297	5,689	551	1,119	1,107	59,832
Delaware	35	3,324	542	388	357	635	5,281
Florida	3,881	216,851	45,893	118,097	38,216	9,643	432,581
Georgia	2,113	80,158	33,743	82,003	16,238	11,738	225,993
Hawaii	34	7,794	435	259	70	73	8,665
Iowa	898	17,203	3,697	12,074	1,576	1,092	36,540

**Exhibit 8. National Firearms Act Registered Weapons by State (Feb 2018)**

State	Any Other Weapon <sup>1</sup>	Destructive Device <sup>2</sup>	Machinegun <sup>3</sup>	Silencer <sup>4</sup>	Short Barreled Rifle <sup>5</sup>	Short Barreled Shotgun <sup>6</sup>	Total
Alabama	1,218	79,282	26,687	47,574	6,289	2,348	163,398
Alaska	328	5,032	1,650	7,107	2,131	1,324	17,572
Arkansas	637	50,465	5,469	22,554	3,742	1,178	84,045
Arizona	1,312	103,787	17,192	45,023	15,969	2,493	185,776
California	3,980	282,787	29,800	16,128	11,723	13,805	358,223
Colorado	1,023	48,481	7,385	33,538	7,904	1,831	100,162
Connecticut	948	13,508	37,311	11,919	3,588	1,023	68,297
District of Columbia	69	44,813	5,188	505	931	1,104	52,610
Delaware	33	3,088	588	333	297	645	4,984
Florida	3,645	190,060	44,484	98,972	31,162	8,884	377,207
Georgia	2,022	73,632	29,318	72,734	14,194	11,496	203,396
Hawaii	34	7,231	431	199	61	62	8,018
Iowa	886	16,532	3,588	8,720	830	1,031	31,587

## *Gun Violence in America*

# Data Collection - CDC

## Firearm Mortality Data by State (2014-2019):

- Death Rate
- Deaths

## National Center for Health Statistics

CDC > NCHS Home > NCHS Pressroom > Stats of the States

↑ NCHS Pressroom

Weekly COVID-19 Mortality  
Overview

2021 Release Schedule

Upcoming

Publications Archives

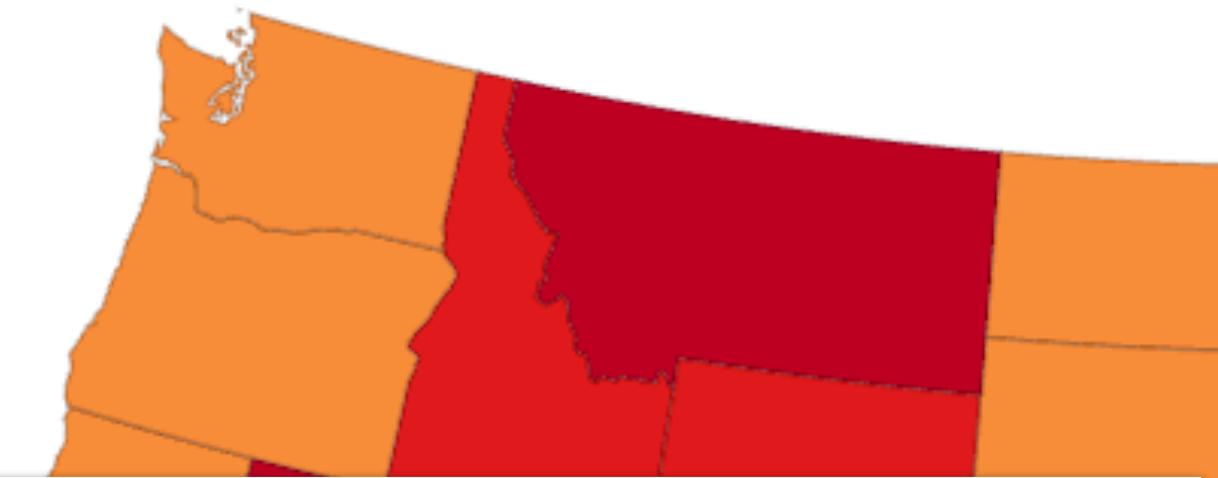
QuickStats Archives

Stats of the States

Firearm Mortality by State

Most Recent Data on Health Topics

## Firearm Mortality by State



Data Table		
Location	Death Rate (Click for...)	Deaths (Click for Ra...
Alabama	22.2	1,076
Alaska	24.4	179
Arizona	15.1	1,136
Arkansas	19.3	580
California	7.2	2,945
Colorado	14.2	846
Connecticut	5.3	190
Delaware	9.9	93
Florida	12.7	2,872
Georgia	15.8	1,695
Hawaii	4.4	62
Idaho	14.2	255
Illinois	10.8	1,367
Indiana	14.1	958
Iowa	9.1	294

# Data Collection - USCB

## Population Estimates by State (2014-2019):

- The U.S. Census is taken every 10 years, but they release estimates.

United States®  
**Census**  
Bureau

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// Census.gov > Our Surveys & Programs > Population and Housing Unit Estimates

POPULATION AND HOUSING UNIT ESTIMATES

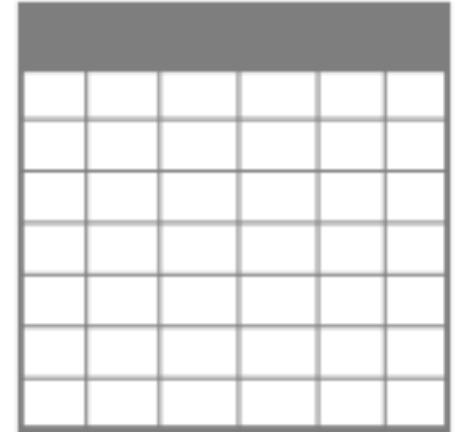
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**Population and Housing Unit Estimates**

The Census Bureau's Population Estimates Program (PEP) produces estimates of the population for the United States, states, metropolitan and micropolitan statistical areas, counties, cities, towns, as well as for Puerto Rico and its municipios.

[Read More](#)



Vintage 2019 Tables

Demographic Analysis

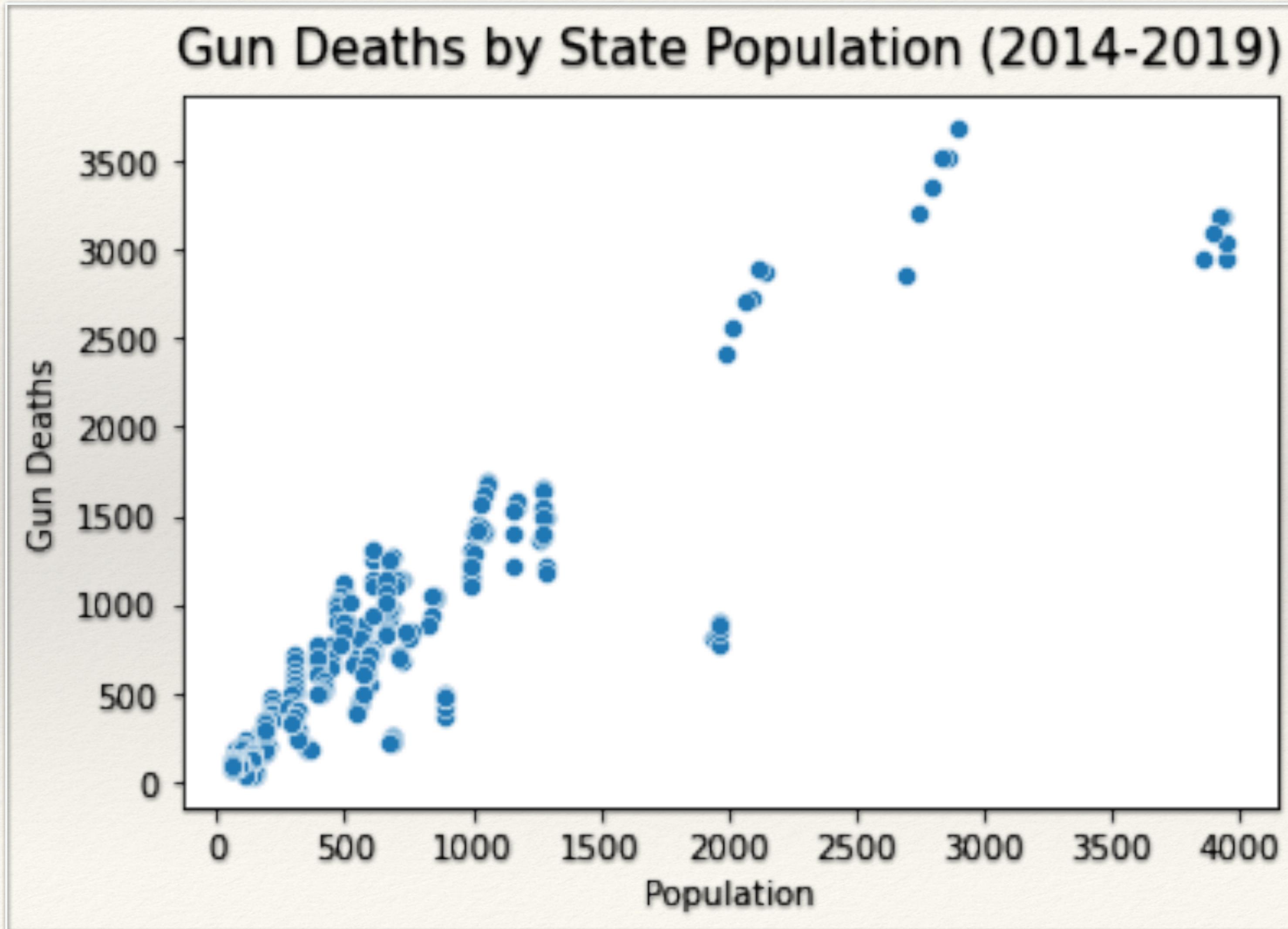


# Data

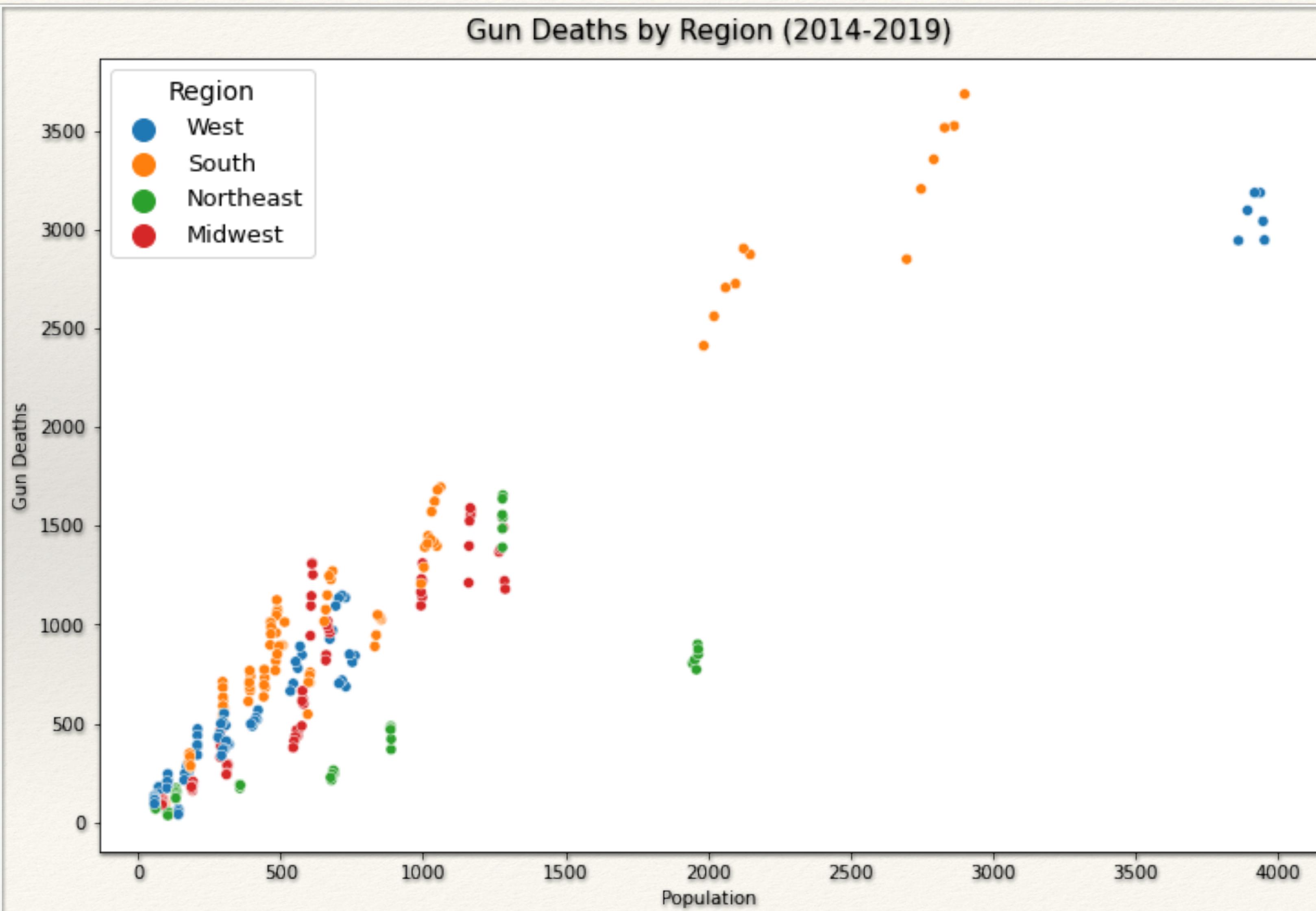
- We gathered our data from the following websites: CDC and Bureau of Alcohol, Firearms, and Explosives
- Split the training and testing sets by year instead of using split train test

#	Column	Non-Null Count	Dtype
0	year	300 non-null	int64
1	state	300 non-null	object
2	gun_death_rate	300 non-null	float64
3	gun_deaths	300 non-null	int64
4	any_other_weapon	300 non-null	int64
5	destructive_device	300 non-null	int64
6	machinegun	300 non-null	int64
7	silencer	300 non-null	int64
8	short_barreled_rifle	300 non-null	int64
9	short_barreled_shotgun	300 non-null	int64
10	total_weapons	300 non-null	int64
11	population	300 non-null	int64
12	state_id	300 non-null	int64

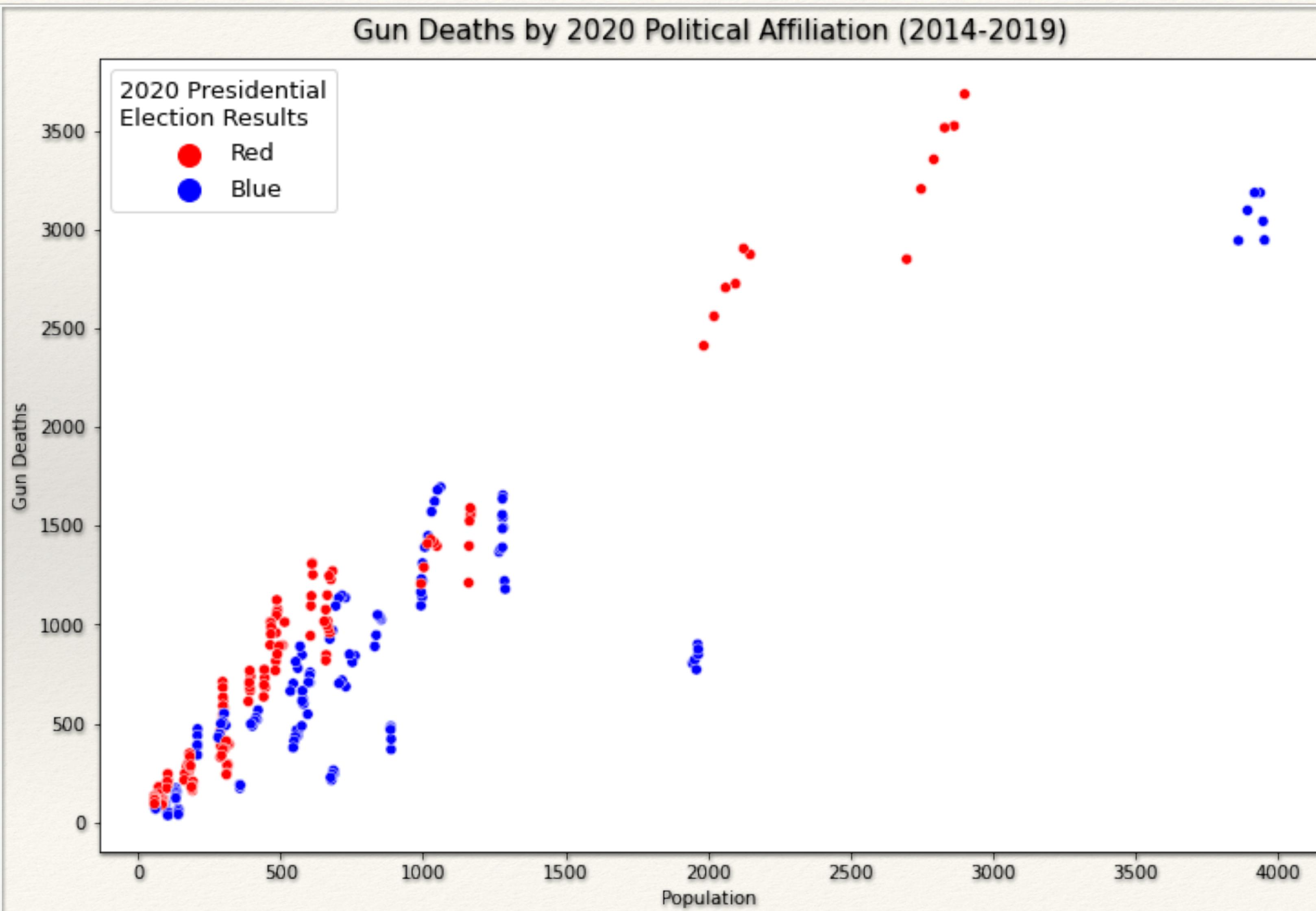
# Exploratory Analysis



# Exploratory Analysis

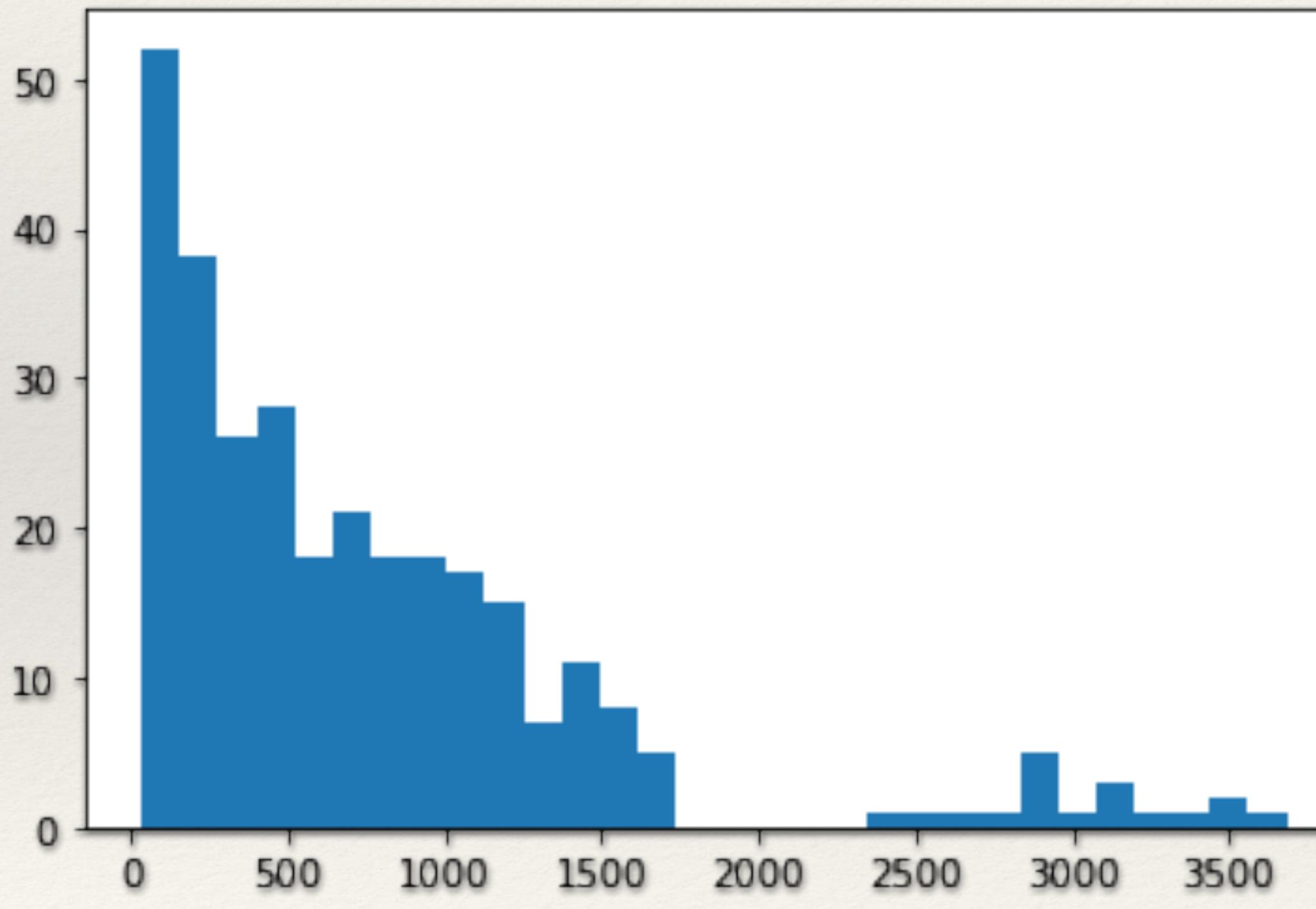


# Exploratory Analysis

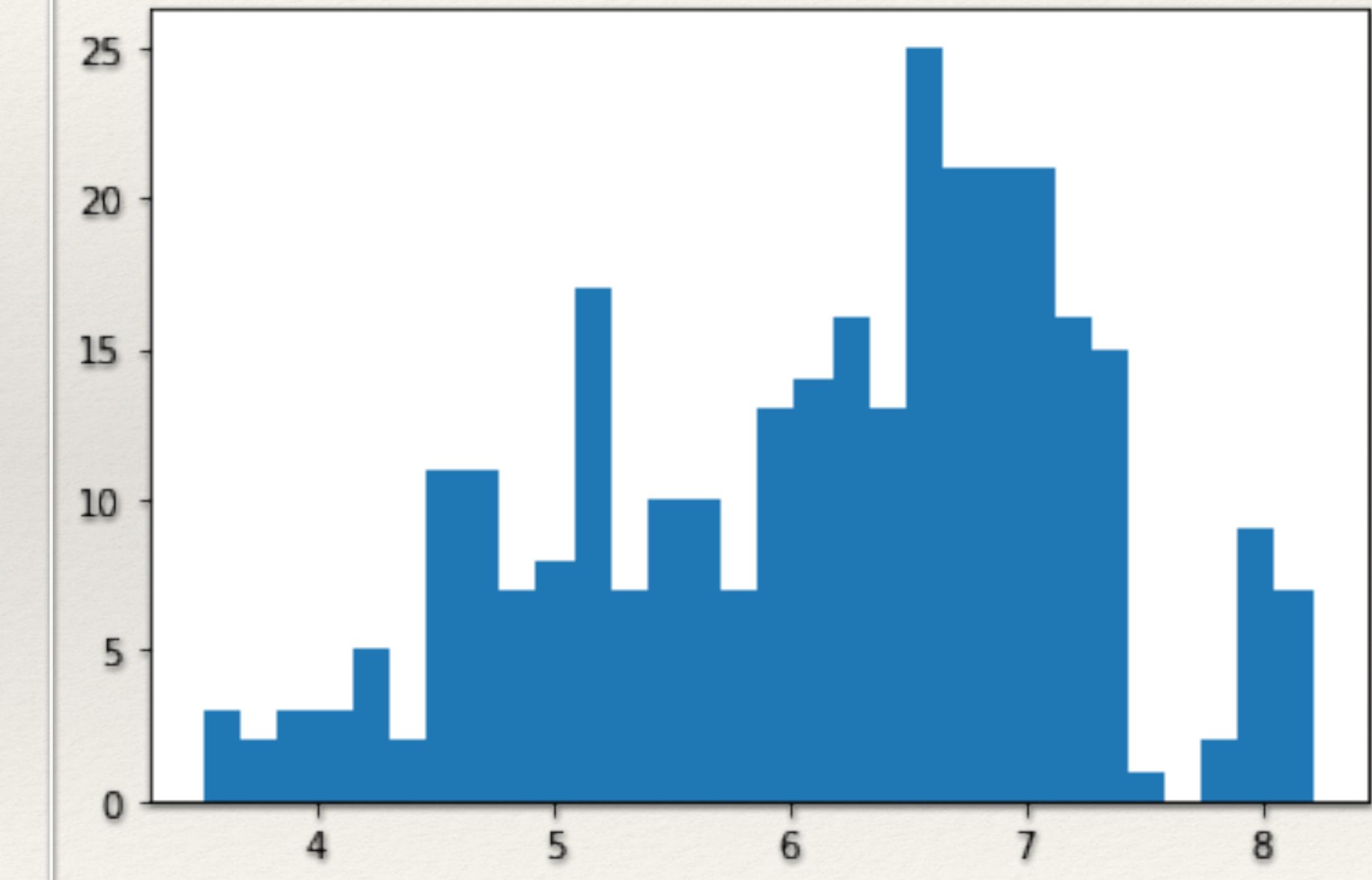


# Exploratory Analysis

Histogram - Gun Death



Histogram - Log of Gun Death



# Linear Regression Model

Training Score

0.995

Testing Score

0.990

Test RMSE

108

	column	coef
0	year	1.037502
1	any_other_weapon	1.048452
2	destructive_device	1.048421
3	machinegun	1.048421
4	silencer	1.048424
...	...	...
57	state_Wyoming	0.348514
58	region_Northeast	0.485503
59	region_South	2.166765
60	region_West	0.825537
61	elect_res_2020_Red	0.906543

# Decision Tree Regressor

Training Score	0.99
Testing Score	0.97
Test RMSE	135

*Best Parameters:*

ccp\_alpha = 0  
max\_depth = 9  
min\_samples\_leaf = 4  
min\_samples\_split = 8

# Random Forest Regressor Model

Training Score                    0.98

Testing Score                    0.99

Test RMSE                        107

*Best Parameters:*

ccp\_alpha = 0

max\_depth = 9

min\_samples\_leaf = 4

min\_samples\_split = 9

n\_estimators = 75

# Voting Regressor

Training Score      0.99

Testing Score      0.98

Test RMSE      93

*Estimators:*

Linear Regression  
Decision Tree Regressor  
Random Forest Regressor

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# Conclusion

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Our best model is the voting classifier model, with an RMSE of 93.  
We predicted about 38,000 gun deaths in the United States for the year of 2019

*Some ways to reduce gun violence:*

1. Reduce easy access to guns.
2. Eliminate funding restrictions on this type of research.<sup>5</sup>
3. End Legal Immunity for gun manufacturers.<sup>6</sup>
4. Invest in communities to promote wellbeing and mental health support

# Resources

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1. <https://everytownresearch.org/report/gun-violence-in-america/>
2. <https://www.cdc.gov/injury/wisqars/facts.html>
3. <https://everytownresearch.org/report/the-economic-cost-of-gun-violence/>
4. <https://www.npr.org/sections/goatsandsoda/2019/08/05/743579605/how-the-u-s-compares-to-other-countries-in-deaths-from-gun-violence>
5. <https://time.com/5209901/gun-violence-america-reduction/>
6. <https://www.americanprogress.org/issues/guns-crime/reports/2021/05/04/499071/frequently-asked-questions-gun-industry-immunity/>
7. [https://www.cdc.gov/nchs/pressroom/sosmap/firearm\\_mortality/firearm.htm](https://www.cdc.gov/nchs/pressroom/sosmap/firearm_mortality/firearm.htm)
8. <https://www.atf.gov/resource-center/data-statistics>
9. <https://www.census.gov/topics/population.html>