
Analyzing Gun Violence Trends from 2014-2021

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Questions of Interest

1. A state's gun violence statistics vs. National gun violence statistics
2. What are the states with the most incidents (injured and killed) due to gun violence?
 - a. Are there states that have more injuries but not deaths? Vice versa?
3. What are the cities with the most incidents (injured and killed) due to gun violence?
 - a. Are there cities that have more injuries but not deaths? Vice versa?
 - b. How does a city and its state compare in gun violence incidents?
4. What dates/time period do most gun violence (deaths or injuries) occur generally?
 - a. How does the date affect a city's or state's gun violence? Does it have any effect in general?
 - b. Does the date affect the mortality rate of victims in a gun violence incident (i.e. are victims more likely to be injured than killed if it's around the summer, etc.)?
 - c. Are there cities/states that differ from the general time period of frequent gun violence incidents? How so?

Data and Sanity Checking

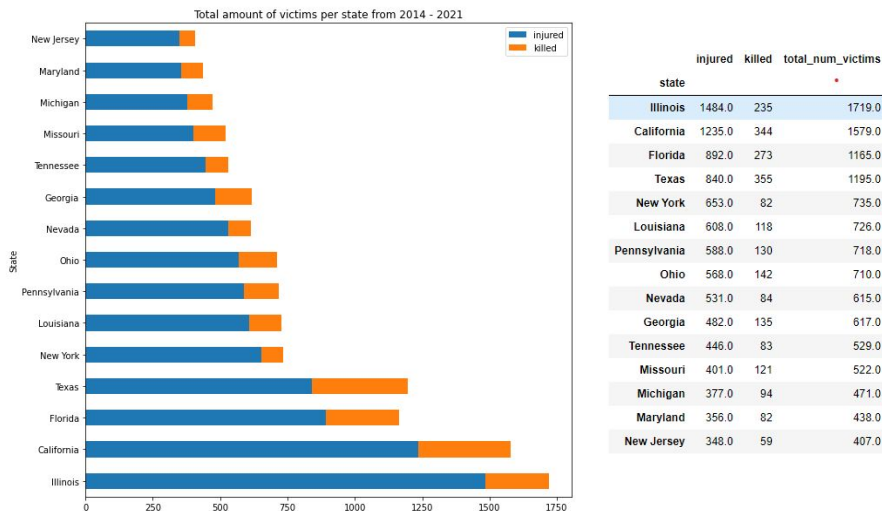
	incident_id	incident_date	state	city_or_county	address	killed	injured
0	2128682	2021-09-29	Illinois	Chicago	800 block of N Milwaukee Ave	0	5.0
1	2127374	2021-09-28	Illinois	Chicago	65th St and Calumet Ave	1	3.0
2	2128023	2021-09-28	Minnesota	Minneapolis	2700 block of Bloomington Ave	1	3.0
3	2126747	2021-09-27	New York	New York (Manhattan)	3964 10th Ave	0	5.0
4	2126450	2021-09-27	Illinois	Chicago	826 N Ridgeway Ave	1	3.0
5	2125790	2021-09-26	Illinois	Chicago	800 block of S Albany Ave	0	6.0
6	2125953	2021-09-26	California	Oakland	1400 block of 8th Ave	0	4.0
7	2126261	2021-09-26	Washington	Seattle (Des Moines)	22855 Pacific Hwy S	3	3.0
8	2125613	2021-09-25	New York	Utica	800 block of Mohawk St	0	4.0
9	2125444	2021-09-25	Tennessee	Athens	Co Rd 60	4	1.0

- Out of the 7 possible variables, we were interested in looking at 5 of them ('incident_date', 'state', 'city_or_county', 'killed', and 'injured').
- For sanity checking, we wanted to make sure of:
 - Incident_date - all dates are valid and appear between 2014 and 2021 inclusively
 - State - make sure all states are actual states in the USA
 - Killed - should be an integer and either a zero or a non-negative number
 - Injured - should be an integer and either a zero or a non-negative number
- We wanted to make sure that there weren't any empty columns in the dataset.
 - Only ended with two observations that empty values in the injured column.
 - Fixed this issue by changing the NaN to a 0

Initial Exploration

- Checked for total amount of victims per state, total amount of victims per year, and the average amount of victims each month where the data spanned from 2014 to 2021

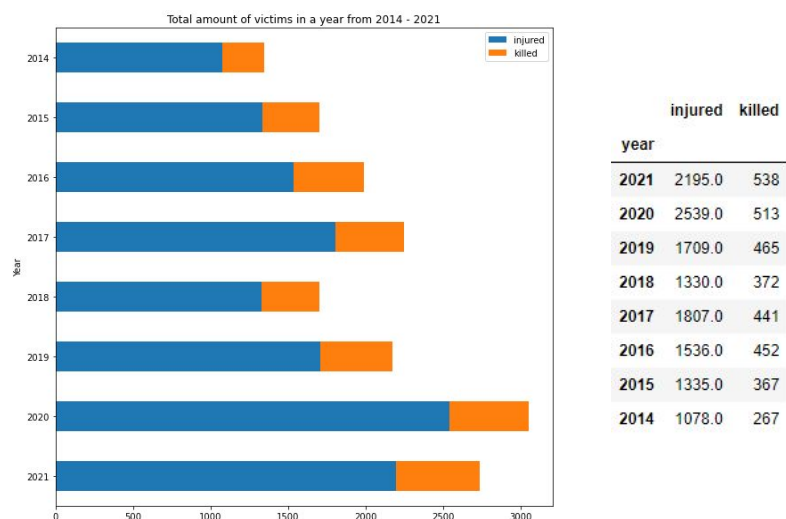
Initial Exploration - Total victims in each state



For total amount of victims per state, it makes sense that Illinois, California, Florida, Texas, and New York were in the top 5 as they are in the top 10 of the highest populations in the US.

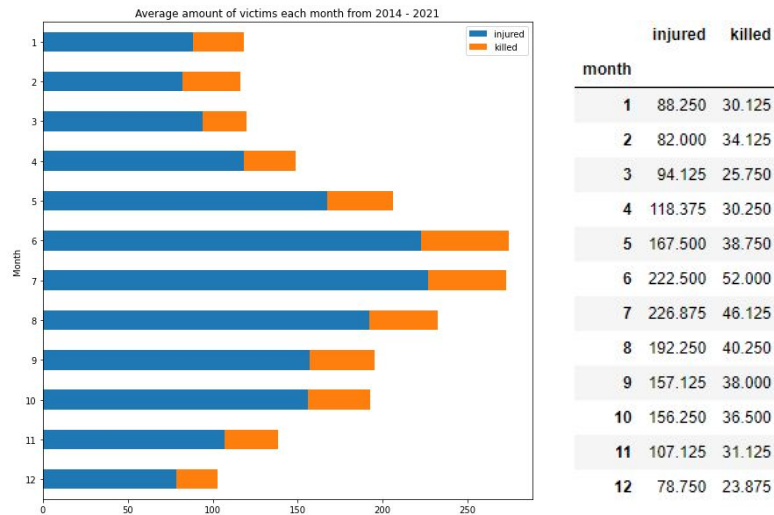
Louisiana interestingly is in the top 6 despite being the 25th largest state in the US.

Initial Exploration - Total victims in each year



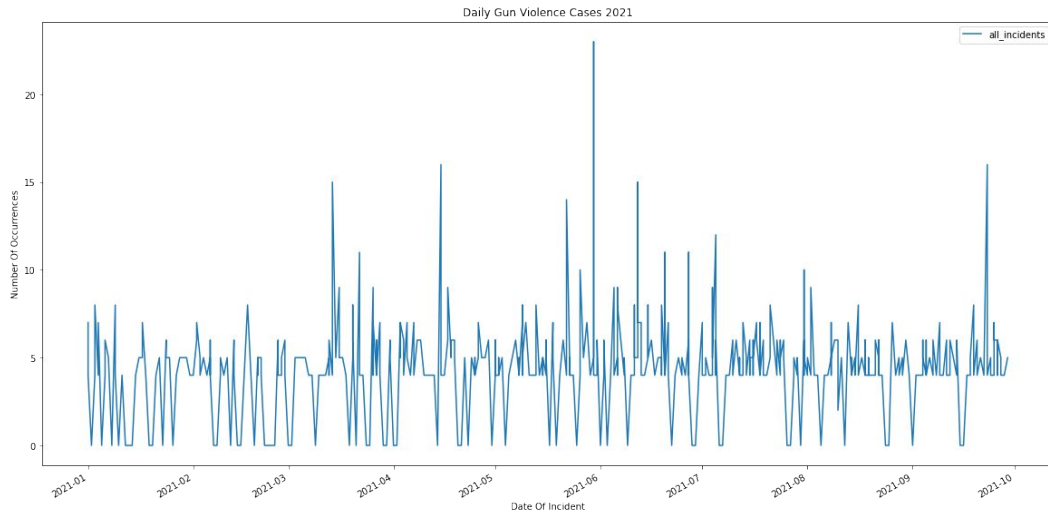
For total amount of victims in a year, there is a general upward trend of victims for both injured and killed.

Initial Exploration - Average amount of victims per month



For average amount of victims each month, there are more victims in the month of June, July, and August than there are in other months. Interestingly, these are all months that fall in the Summer.

General Gun Violence Trend 2021



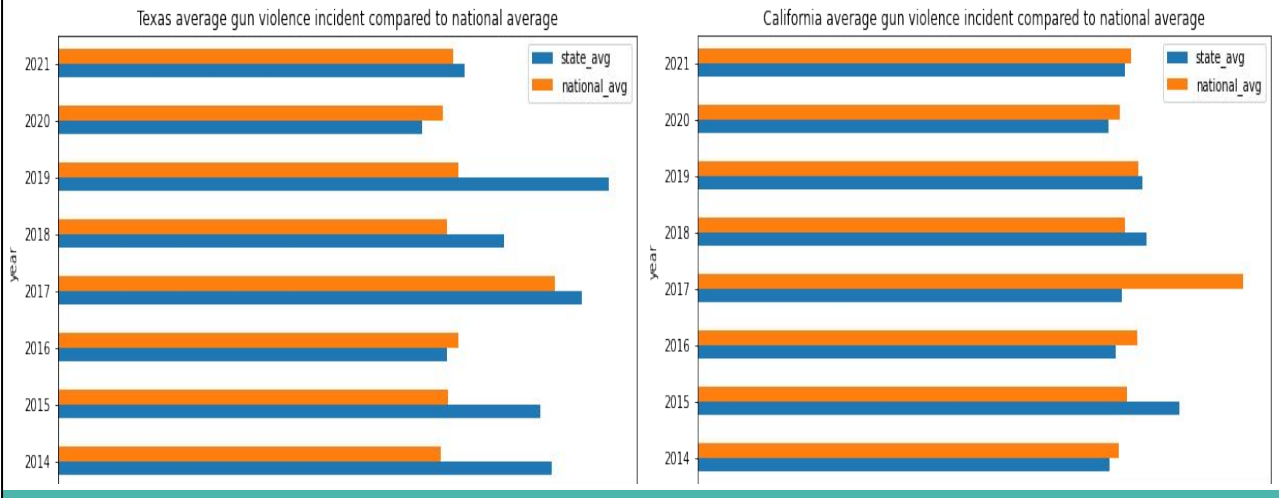
We found that the number of daily incidents of gun violence remains pretty low and constant throughout time.

There are exceptional cases where there happen to be a large number of incidents but for the most part the range of occurrences stay constant.

We also found that the number of deaths due to gun violence are usually much lower than injuries and happen to be 0 much more often.

AKA -- The average number of deaths is lower than the average number of injuries.

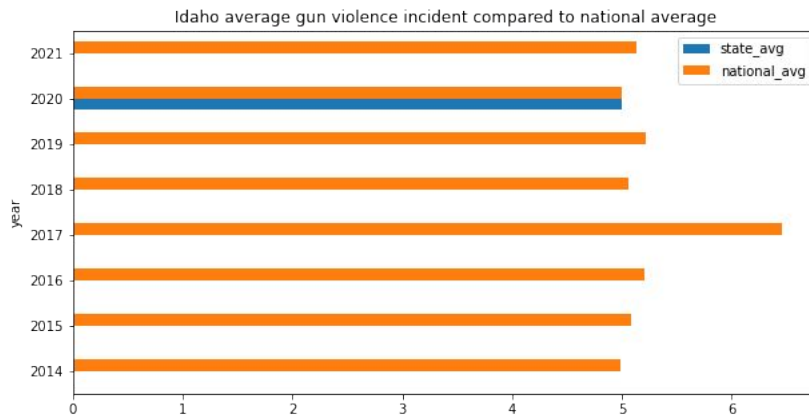
State Gun Violence Average Occurrence vs National Average, Per Year



When comparing different state gun violence averages vs the national average we found it was interesting that for Texas, the gun violence incidents exceeded the national average more often (and more dramatically) than most other states.

For example, California's gun violence incidents tend to stick very close to the national average as does Illinois.

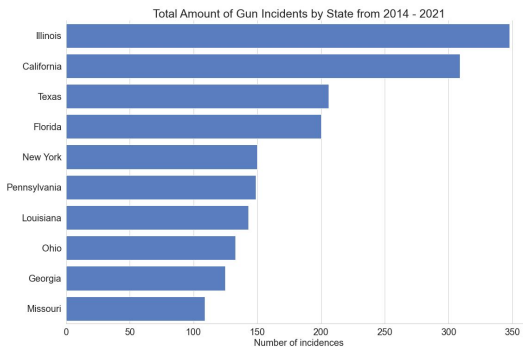
Idaho Average Gun Violence Incidents Compared To National Average



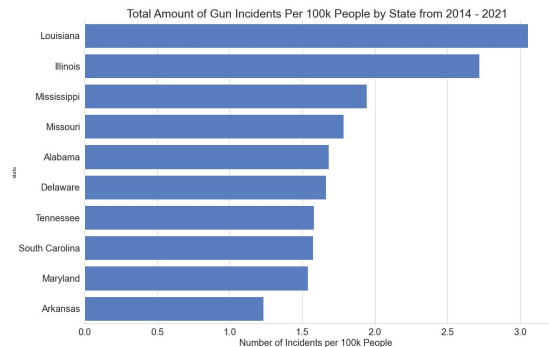
On the other hand, certain states such as New Hampshire and Idaho had gun violence averages much lower than the national averages.

Top 10 States With The Greatest Number Of Gun Violence Incidents

Top States Overall:



Top States Adjusting for Population



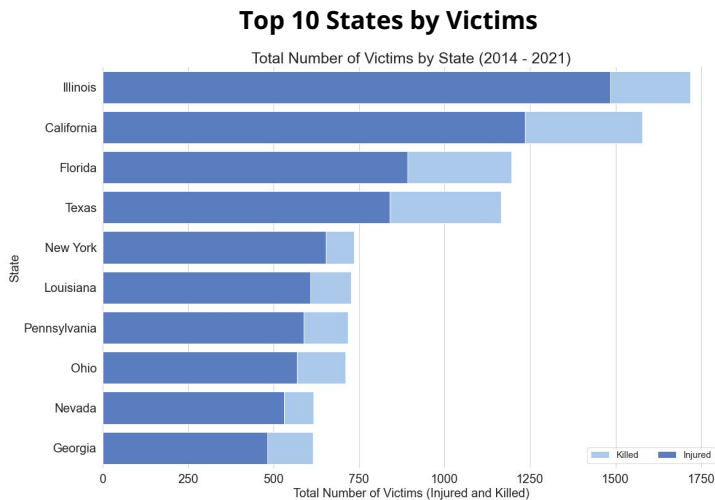
Top States Overall:

- In order to determine the states with the most incidents (injured and killed) due to gun violence, we looked at absolute numbers of Incidents by top states.
 - The top States were: Illinois, California, and Texas

Top States adjusting for Population:

- However, we noticed that only larger states were showing up because that approach does not take into account size or population of states. To adjust for those factors, we found the number of incidents per 100k people (using Census data on state populations).
- Looking at the relative number of incidents by state population, the top states were: Louisiana, Illinois, and Mississippi

States Gun Violence: Deaths vs. Injuries



Only states with more deaths than injuries:

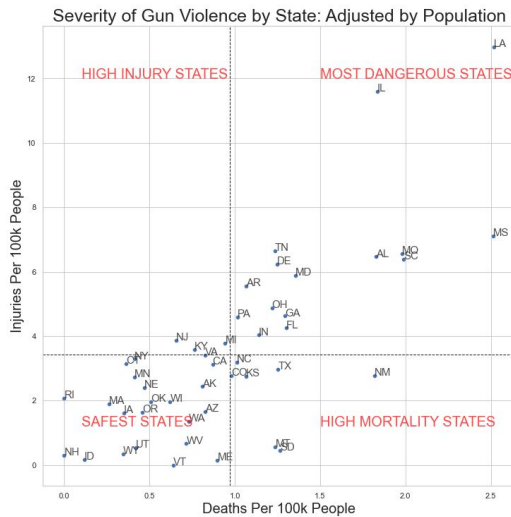
1. West Virginia
2. Montana
3. Maine
4. South Dakota
5. Vermont

We were also interested in looking deeper into gun violence incidents. Specifically, comparing states by number of gun victims, and then determining the ratio of victims who were killed vs. injured.

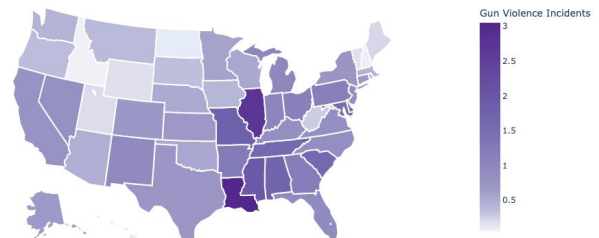
Overall, Illinois had the largest number of Victims over the 8 year time span.

Additionally, a vast majority of states had more gun injuries than deaths. The only states, this wasn't true were WV, MT, ME, SD, VT - And we hypothesize this was because these states has such small sample sizes of gun incidents.

Most Dangerous States In America: LA + IL



Total Number of Gun Incidents Per 100k People by State (2014 - 2021)



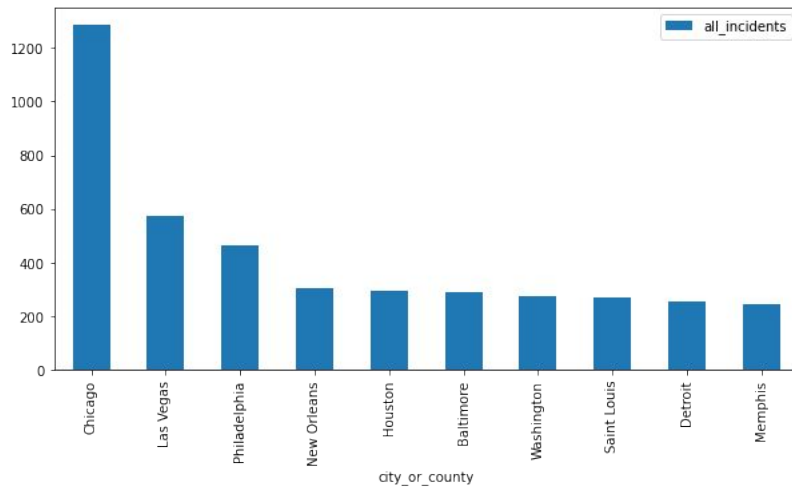
We then decided to further compare gun Deaths vs Injuries to determine the most dangerous states in America - which we defined as states with above average gun injuries, and above average gun deaths per 100k people.

We discovered that Louisiana & Illinois were by far the most dangerous per capita.

We used to the same system to determine:

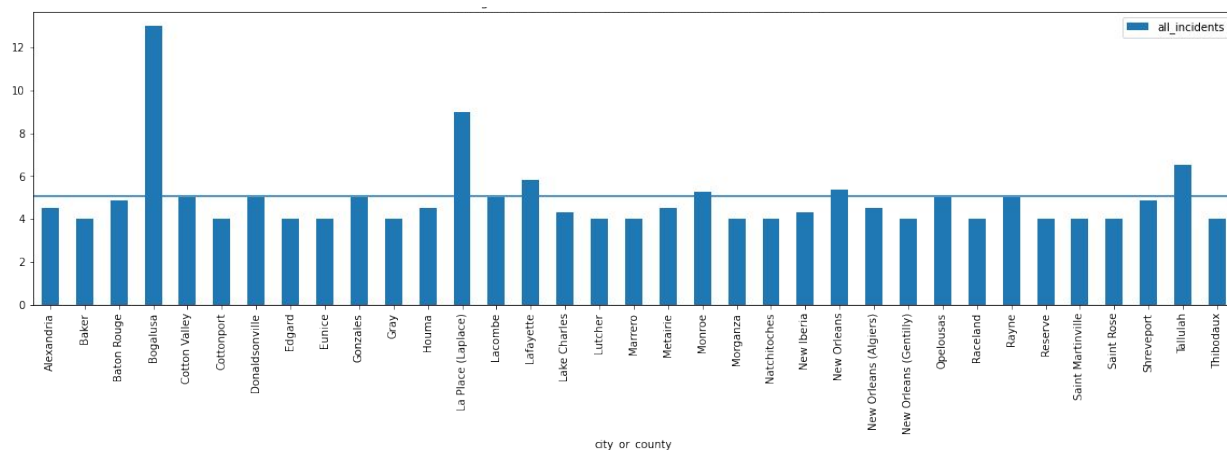
- **High Mortality States:** where per capita Gun deaths were relatively higher than Gun injuries compared to the national average (e.g. New Mexico)
- **High Injury States:** where per capita Gun injuries were relatively higher than Gun deaths compared to the national average (e.g. New Jersey)
- **Safe States:** where per capita Gun injuries and Gun Deaths were below the National average (e.g. New Hampshire)

Top 10 Cities/Counties With The Greatest Number Of Gun Violence Incidents



1. Chicago
2. Las Vegas
3. Philadelphia
4. New Orleans
5. Houston
6. Baltimore
7. Washington
8. Saint Louis
9. Detroit
10. Memphis

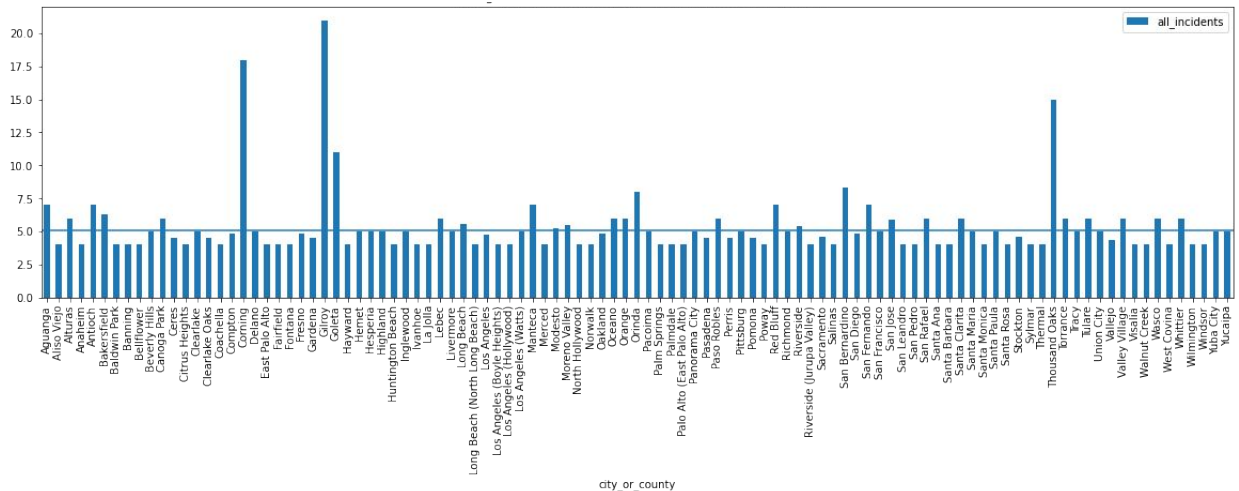
Average Gun Violence Incidents For The Cities of Louisiana Compared To The State Average



After comparing the average number of incidents for a city to its state's average gun violence incidents, we found that most cities stick close to the average and only a few cities in the state are outliers with a high number of incidents.

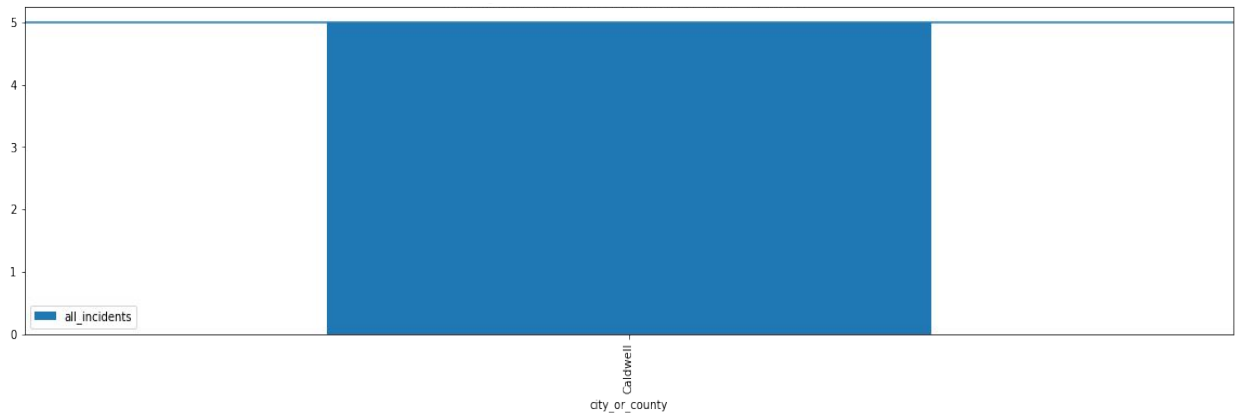
For example, most cities within Louisiana are close to the average but the city/county of Bogalusa is an outlier since it has a large number of incidents compared to other cities.

Average Gun Violence Incidents For The Cities of California Compared To The State Average



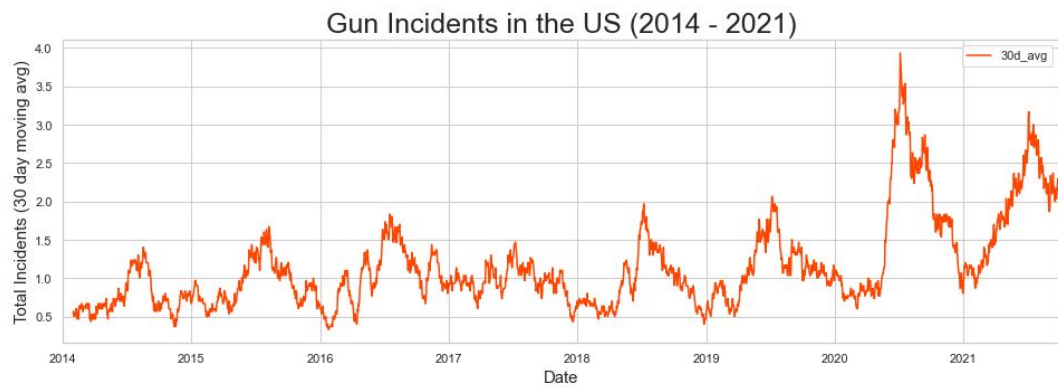
Similarly, we see this pattern continue in several cities of Illinois and California.

Average Gun Violence Incidents For The Cities of Idaho Compared To The State Average

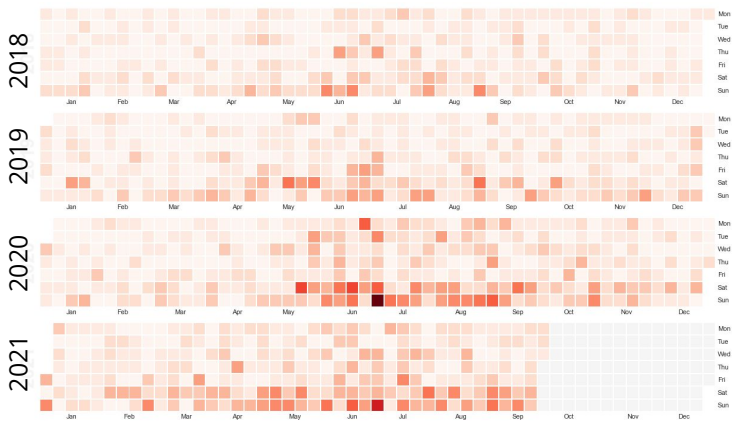


Meanwhile, states with low averages of gun violence incidents tend to have fewer cities with reported incidents. For example, Idaho only has one reported city/county

Time Period Violence Trends



Time Period Violence Trends



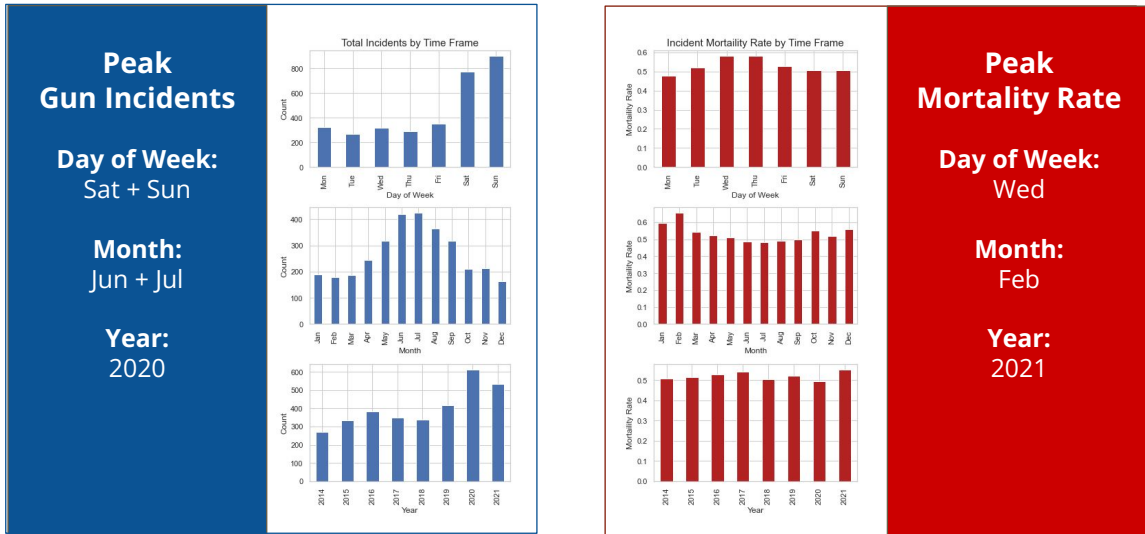
Finally, we wanted to determine when the most gun violence (deaths or injuries) occur.

After noticing that gun violence continues to escalate year-over-year, we decided to focus our analysis on the last 4 years.

And by charting the number of incidents on a calendar heatmap, we found that the on average the most dangerous day of year falls between July 4th and July 5th (presumably because many incidents occur after midnight on July 4th)

This year there will 11 gun incidents on July 4th (That is 5.7 times more than the daily average)

Gun Incident vs. Mortality Time Period Trends



Further looking into effect that timing has on gun violence, we decided to chart the number of total gun incidents:

1. By Day of Week
2. By Month
3. BY Year

Looking at total gun incidents between 2014 - 2021, we found incidents tend to peak during:

- Weekends: Specifically Sundays (which we attribute to incidents happening after midnight on Saturday)
- Summer: Specially June and July (when more people are outside)
- 2020: which we attribute to the socio-economic and emotional effects of the Pandemic

Using the same framework, we also looked at gun mortality rates (% of gun incidents involving a death).

Surprisingly we found a very different pattern, with mortality rates peaking during:

- Wednesdays + Thursdays
- February
- 2021

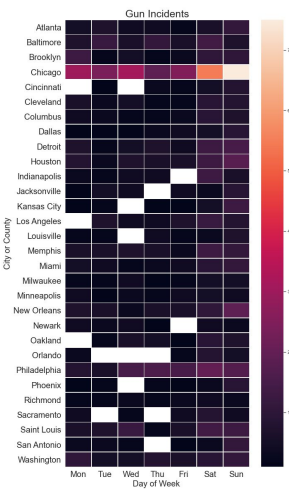
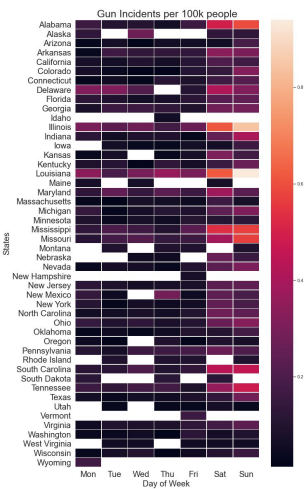
We presume, that this trend reversal is due to a decrease in random gun violence (that would normally lead to more victims vs murders).

City & State Time Trend Outliers

Top State
Outlier:



LOUISIANA



Top City
Outlier:



CHICAGO

Conclusion

- There is a general rise in gun violence incidents in the US.
- Incidents usually garner more injured victims than killed victims.
- States with a higher population tend to have more victims from gun violence incidents. When adjusted with population however, gun violence incidents seem more prominent in the east side of the country, specifically in the Midwest + South.
- In most cases, cities have the lower rate of incidents occurring compared to the state they're in.
- Summer is the time where gun violence incidents occur the most, most specifically July 4th. However, mortality rates peak in February.
- Top cities & states tend to be outliers because gun incidents consistently occur across the month and day of week

Final recommendation

- Stay away from Louisiana + Chicago on July 4th

Thank you!

Any questions?
