

1. Introduction

Home to nearly six million people, Maryland's dense population, several major cities and metropolitan areas means a massive number of vehicles travel Maryland roads every day. This unfortunately also comes with an increased risk of auto accidents. Using the Maryland crashes, vehicles and people data we have decided to focus on the areas with the highest number of accidents. Baltimore County, Baltimore city and Prince George's county have the most number of automotive accidents in the state of Maryland. We wanted to explore this aspect of data, examine the subgroups in these counties and explore policy implications for this subset.

2. Dataset

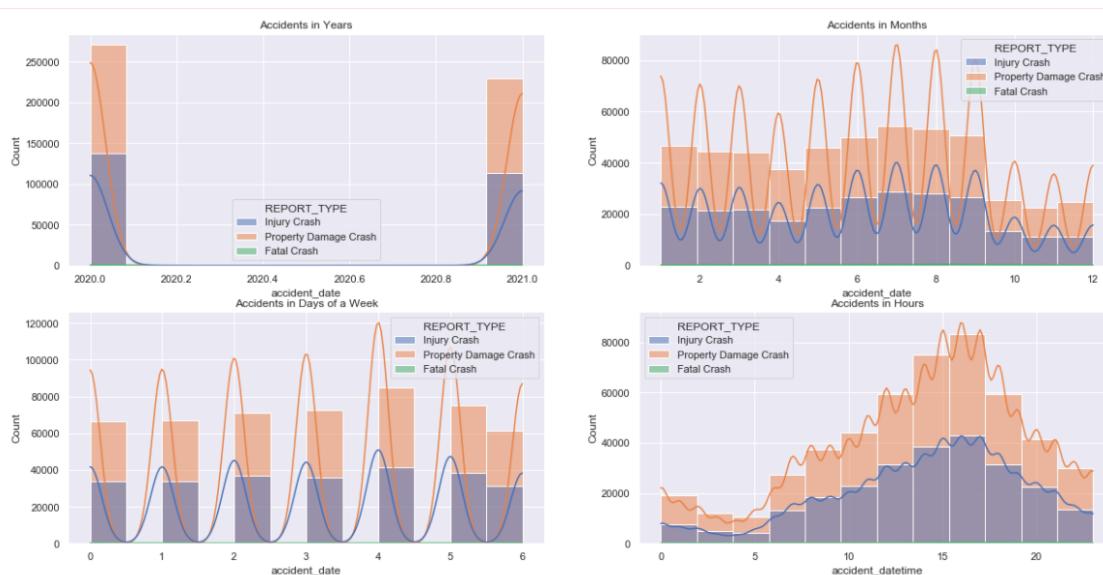
Maryland Statewide Vehicle Crashes: Crash data for Maryland from January 2015 through September 2021.

Maryland Statewide Vehicle Crashes—Person Details (Anonymized): Person data for Maryland vehicle crashes from January 2015 through September 2021.

Maryland Statewide Vehicle Crashes—Vehicle Details: Vehicle data for Maryland vehicle crashes from January 2015 through September 2021.

3. Methods

We started data cleaning and transformation using Python and R by dropping off less informative columns and creating a cohesive data frame. Through the initial visualizations on Tableau and Javascript, specifically, we utilized the 'Showing Clusters as a Heat Map' API to plot the geolocation (latitude, longitude) of the accident data into a heat map, which enlightened us to focus on Baltimore, Baltimore City, and Prince George's counties. We conducted informative EDA (univariate analysis, bi-variate analysis, time series analysis). We developed this project beyond the data with a clear vision of exploring policy implications as well as recent initiatives like the Zero death initiative to generate creative and fact-based analytical results.

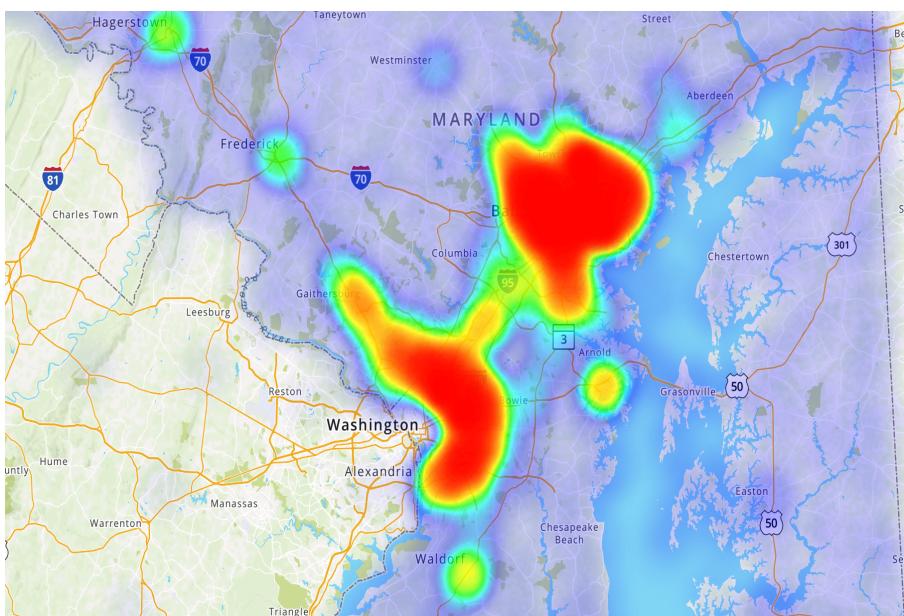


4. Results

- We discovered that thankfully, most car accidents in Maryland, in the years 2021-2022 are property damage. We know that is causally related to improvements in the car bumper technology. This trend also shed light on the importance of educating in-state residents about the

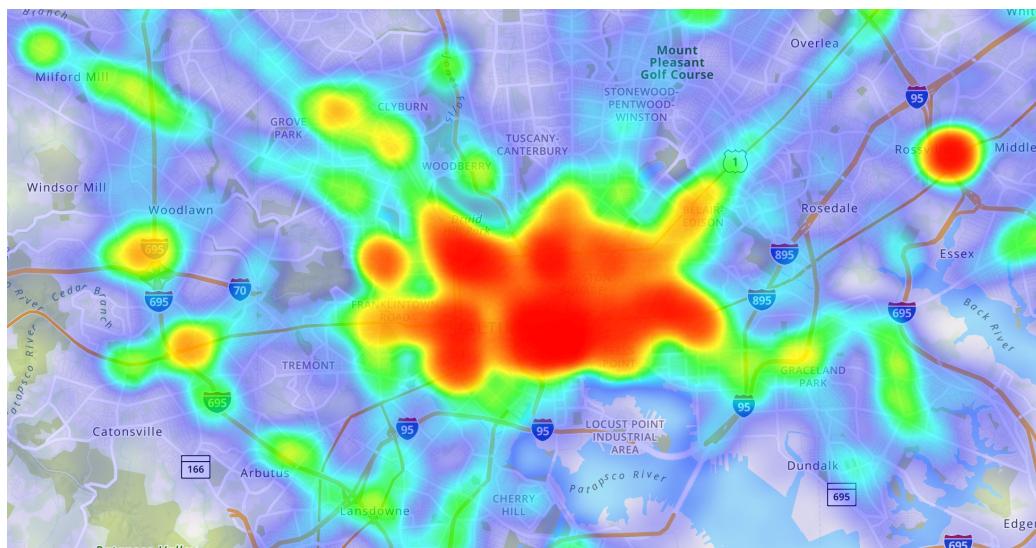
Maryland laws on reporting car accidents, especially the property damage ones.

- We also saw most accidents happen in summer. This makes sense as high school and college students are off during the summers with endless time for fun, which brings more young, inexperienced drivers out on the roads.
- Thursday turns out to have the greatest number of accidents. This may correspond to the “Fatal Thursday” phenomenon in trucking accidents. Since truck drivers are less likely to be on the road on the weekends, they move the most freight during the beginning of the week and wind down their hauling around Thursday, at this point, drivers may be fatigued, pushing themselves to get home, and might be less alert to traffic conditions around them.
- Most accidents happened between 4pm-5pm, which matches the common off-work time. This is not surprising as many people feel fatigued after a long day of work and speed up on the way home.



From the HTML file produced by our Python script and MapQuest ‘Showing Clusters as a Heat Map’ API, we noticed two big accident clusters in Baltimore and Prince George’s county.

After zooming into the map, the main cluster is in downtown Baltimore and the areas around it that is where the majority of the vehicle accidents happened. A much smaller but high density cluster is also spotted around the intersection of route 40 and interstate 695.



Compared to the Baltimore cluster, the Prince George’s cluster has a lower density of accidents data points with a little red area in College Park, MD.

Among all the counties in Maryland, Baltimore,

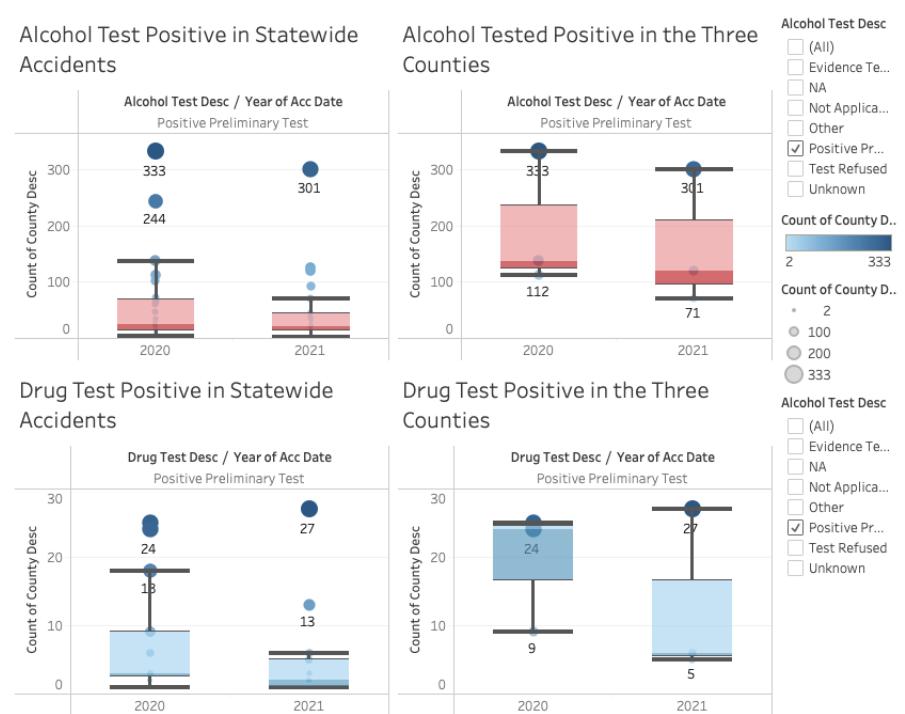
Baltimore city and Prince George's county account for a substantial number of accidents every year. In the years 2020 and 2021, they had more accidents than any other county. This is not surprising after doing some research on accidents in Maryland. Based on our literature review, we discovered:

- "Maryland has ranked sixth in intersection fatalities per every 1,000 miles of road, according to data from the National Highway Traffic Safety Administration (NHTSA). With 5.29 intersection deaths per 1,000 miles, Maryland's fatality rate was more than double the nation's average.⁶"
- A 2016 NerdWallet examination found that Baltimore residents are more likely to be involved in an auto accident multiple times within 4.7 years.
- The AAA Mid-Atlantic report shows Prince George's County is continuing an unsought distinction — the state's most dangerous place to drive or walk. In 2020, 111 people died in traffic crashes in Prince George's County, which accounted for almost a third of all traffic deaths in the greater Washington area, 34.2%^{4 & 5}.

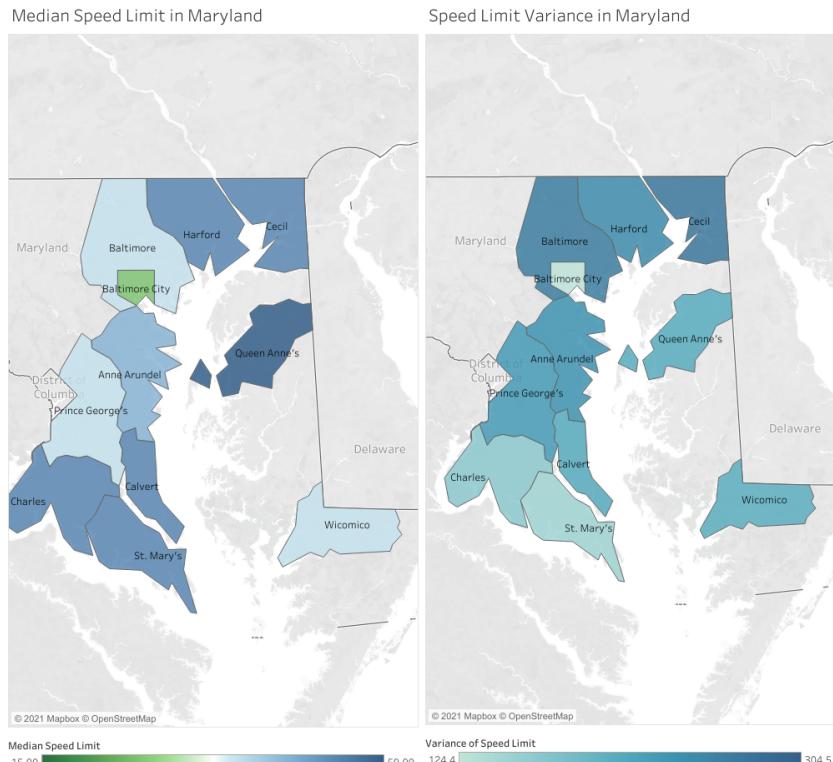
We knew that our research was consistent with past research and studies on these trends and turned our attention to the reasons for these adverse driving conditions.

Driving under the influence (DUI) is the offense of driving, operating, or being in control of a vehicle while impaired by alcohol or drugs (including recreational drugs and those prescribed by physicians), to a level that renders the driver incapable of operating a motor vehicle safely.

As the plots on the right reveal, despite the fact that the total number of cases for testing positive in alcohol and drug tests is going down from 2020 to 2021, Baltimore, Baltimore City, and Prince's George still have a higher state range that are beyond the median number statewide. Specifically, the alcohol issue in these three counties is significant.



Another aspect we chose to explore was speed limits. Since the speed limit in different counties of Maryland is skewed and has some outliers, median is better for intuitive observation as a statistics not influenced by outliers.



In the left graph, Baltimore, Baltimore City, and Prince's George don't have a very high median in general of all accidents. As a matter of fact, the median speed limit of Baltimore City is even the lowest.

However, in the right graph, these three counties have high variance in speed limit of recorded accidents, which is an important traffic characteristic that influences safety on the road.

Many extraneous factors such as weather conditions, driving education, road conditions, congestion, transit time and lack of safety and awareness programs contribute to these high numbers. We know from our data that more men are involved in crashes as opposed to women, that rain is the worst weather factor for accidents and that the transit time for commuters in Maryland is well above the national average.

Conclusions

Upon exploring the data on crashes, vehicles and people provided by the Maryland government open data portal, the team found many reasons that were leading to, or worsening the high number of accidents in Baltimore, Baltimore county and Prince George's county. However, the current numbers don't necessarily mean that things may not be turning around. In fact, the state of Maryland is working hard to achieve its zero vision initiative that aims towards zero deaths and serious injuries by 2030. In addition to this the state of Maryland has also started a traffic relief initiative

Maryland also has some of the most strict laws when it comes to driving under the influence and hit and run incidents. Stricter enforcement of our existing laws and more funding to improve road conditions will dramatically reduce the number of these instances.

This huge influx of funding for road improvement, traffic congestion, driver education and stricter enforcement of existing laws are all promising. Looking at the sheer volume of these programs, we are confident that the state government understands that there cannot be any improvement in the statistics for Maryland, without a marked improvement in the statistics for these three counties.