Livable Streets Alliance - Vision Zero

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Overview

Abstract

This study investigates the efficacy of speed cameras in reducing traffic crashes as part of the Vision Zero initiative across ten major U.S. cities. Our client, Livable Streets Alliance, is concerned that reliance on speed cameras is a temporary fix rather than a sustainable long-term solution to traffic safety. The study seeks to answer three essential questions proposed by our client: (1) the disparity in crash reduction effectiveness for cities with and with camera, examining the severities and types of crashes; (2) the prevalence and strategic placement of speed cameras, particularly in school zones; and (3) the socioeconomic implications of fines associated with speed violations. By comparing five cities that employ speed cameras (Chicago, New York, Portland, Seattle, and Washington D.C.) with five that do not (Boston, Houston, Jersey City, Los Angeles, and San Francisco), we seek to understand the role of speed cameras within broader traffic safety strategies. Together with our client, we hypothesize that speed cameras have not effectively reduced traffic crashes on an aggregate city level. Our research includes a comprehensive review of traffic crash data, speed camera locations, and demographic variables, aiming to determine if speed cameras significantly impact crash rates. Preliminary findings and visualization of different types of graphs demonstrate that cities with speed cameras generally reported higher crash rates, suggesting that speed cameras alone may not substantially reduce crash occurrences.While speed cameras may contribute to a reduction in traffic crashes, other factors, including the COVID-19 pandemic and changes in transportation patterns, have also influenced recent trends in traffic safety.

Client

Livable Streets Alliance is a non-profit organization located in the Metro Boston Area that advocates for traffic solutions that are safe, affordable, and enjoyable. Our client, Livable Streets Alliance, aims to create a more connected community and break discrimination barriers in different communities. Livable Streets participates in many community engagement and outreach events to share their cause and gain insights from experiences. A sample project that Livable Streets Alliance is involved in is the Emerald Network project, which consists of building a 250-mile network of greenways in Boston, supporting policies seeking to resolve transportation issues. In addition, Livable Streets Alliance integrated into the Vision Zero initiative, aiming to reduce traffic fatalities and improve safety on city streets.

Vision Zero

Vision Zero is a campaign to eliminate traffic fatalities and injuries among all road users. It was first found and implemented successfully in many European cities and is now well spread to various cities across America. Vision Zero believes that traffic deaths are preventable and that there needs to be a systemic approach to their primary goal of saving more lives. Vision Zero initiative implements a multidisciplinary approach, utilizing various methods to reduce fatal crashes.

Problem

In this project, our client, Livable Streets Alliance, raises a major concern about methods implemented by Vision Zero as it believes that Vision Zero is using speed cameras as a stop-gap instead of a long-term solution to fixing streets and reducing traffic crashes. Our project centers on the hypothesis that speed cameras have not effectively reduced traffic crashes on an aggregate city level through cross-analysis in 10 different Vision Zero committed cities, with or without cameras. Cities are carefully selected to provide the best comparison and produce meaningful conclusions. The five cities without speed cameras would be Boston, Houston, LA, San Francisco, and Houston, and the five cities with speed cameras would be Seattle, Chicago, NYC, Washington, DC, and Portland.

Methodology

City Selection and Literature Review

Our analysis commenced with a review of cities initially identified by Livable Streets Alliance. To enhance the breadth of our study, additional cities were strategically chosen based on their alignment with the Vision Zero initiative. A comprehensive examination of existing literature on Vision Zero and each city's specific approach to mitigating hazardous car crashes informed our selection process. The aim was to ensure a diverse representation of major metropolitan areas actively participating in Vision Zero, thus providing a substantial dataset for our analysis.

Data Collection

The subsequent phase of our methodology involved meticulous data collection from the selected cities. We focused on acquiring information related to traffic crashes, speed camera locations, and demographic data. Given the inherent variability in data collection and distribution practices

across states and cities, a detailed investigation was conducted. Traffic crash data, for instance, was found to be dispersed among different administrative bodies, including state departments of transportation and departments of motor vehicles. Demographic information, primarily sourced from the census bureau, exhibited inconsistencies in neighborhood-level breakdowns, necessitating a thorough exploration of local-level data repositories.

Notably, the retrieval of information on citations issued by speed cameras proved challenging, as cities often exhibited reluctance due to potential legal implications. Despite this limitation, we strived to comprehend the available data comprehensively, recognizing the significance of the information obtained.

Data Analysis

The final stage of our methodology involved a systematic analysis of the compiled data. Initial assessments focused on examining the frequency and types of crashes recorded in each city over consecutive years. Comparative analyses between the two groups of cities were conducted, emphasizing the average number of crashes per capita. This approach aimed to elucidate the potential impact of speed cameras on overall crash rates.

Subsequently, a detailed investigation was undertaken to correlate crash locations with the placement of speed cameras across cities. Our analysis sought to identify trends within individual cities and explore overarching patterns across the entire set of cities. The objective was to provide a nuanced understanding of the influence of speed cameras on crash occurrences, both at the city level and in broader comparative contexts.

Analysis

Cities with Speed Cameras

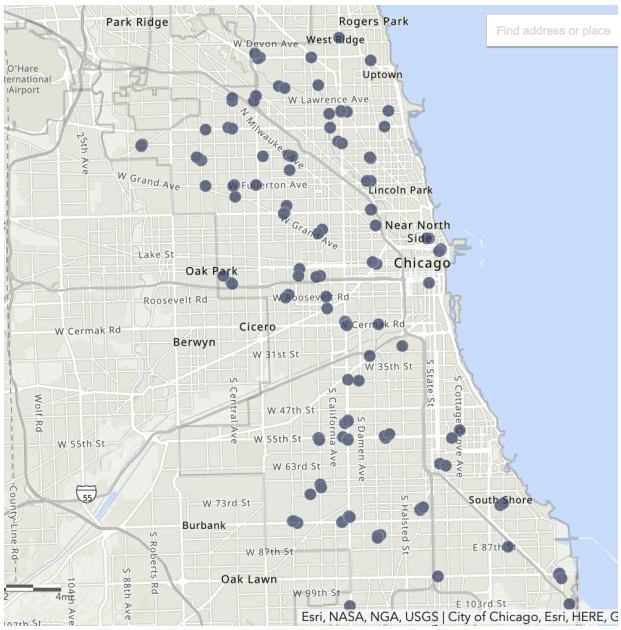
Chicago, IL

The city of Chicago, located in the state of Illinois, is the third largest city in the United States by population. As of 2023, it is home to an estimated 2.608 million residents1.

Chicago has a rich history and diverse culture. The area’s recorded history begins with the arrival of French explorers, missionaries, and fur traders in the late 17th century and their interaction with the local Pottawatomie Native Americans2. The modern city was incorporated in 1837 and

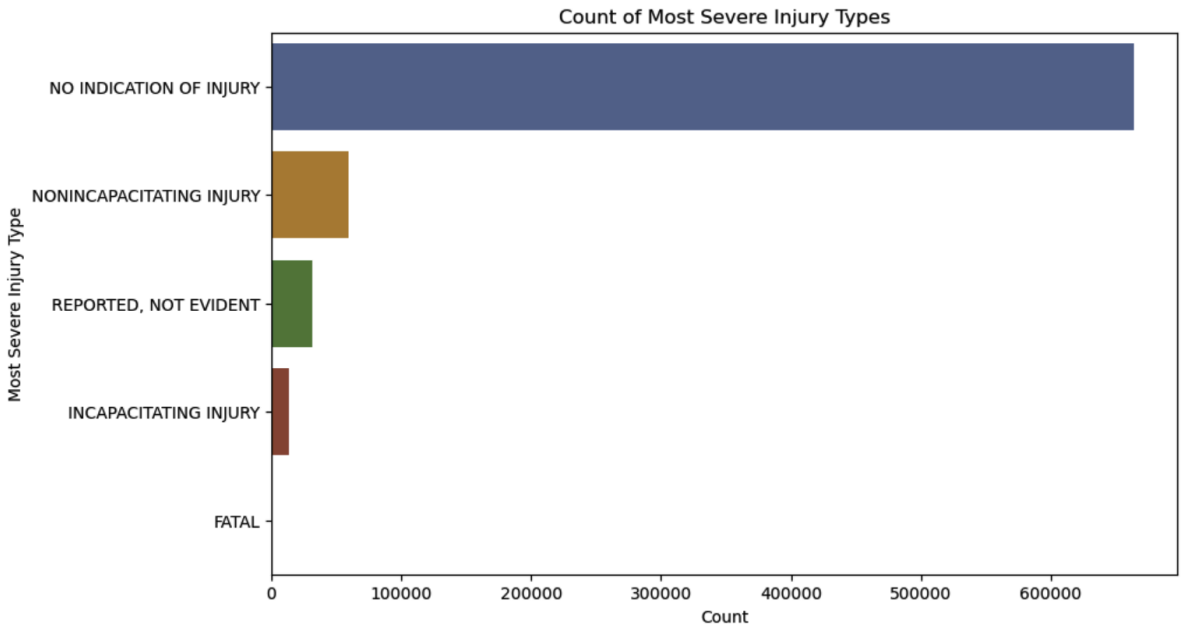
grew rapidly from real estate speculation and its commanding position in the emerging inland transportation network.

In Chicago, speed cameras play a vital role in enforcing speed limits, particularly in Child Safety Zones—areas within one-eighth of a mile of parks or schools. As of January 1, 2020, the city deployed 161 speed cameras across 68 Child Safety Zones, with 96 strategically enforcing speed in one direction and 65 in both. Among these, 84 are located in 39 park zones, and 77 in 29 school zones in this populous city with an estimated 2.608 million residents.



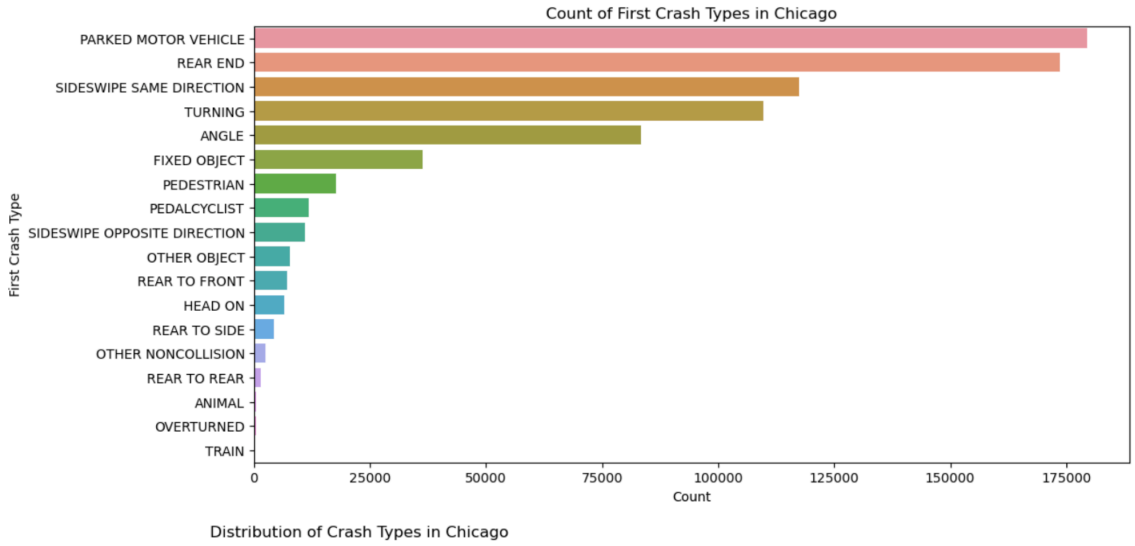
Reckless driving remains a significant factor, contributing to nearly 90% of traffic deaths in Chicago, underscoring the importance of enforcement measures. Persistent inequities are also evident, with those facing barriers to health and safety being more likely to be affected by traffic crashes.

For this report, we collected data from the City of Chicago data portal on Traffic Crashes. The dataset includes reports of crashes within the city of Chicago, spanning from March 2013 to October 2023.
Through data analysis, we generated a box plot illustrating the distribution of the most severe injury types. Examining the spread of injuries, it is evident that a significant majority of individuals (approximately over 600,000) emerged from the incidents without any indications of



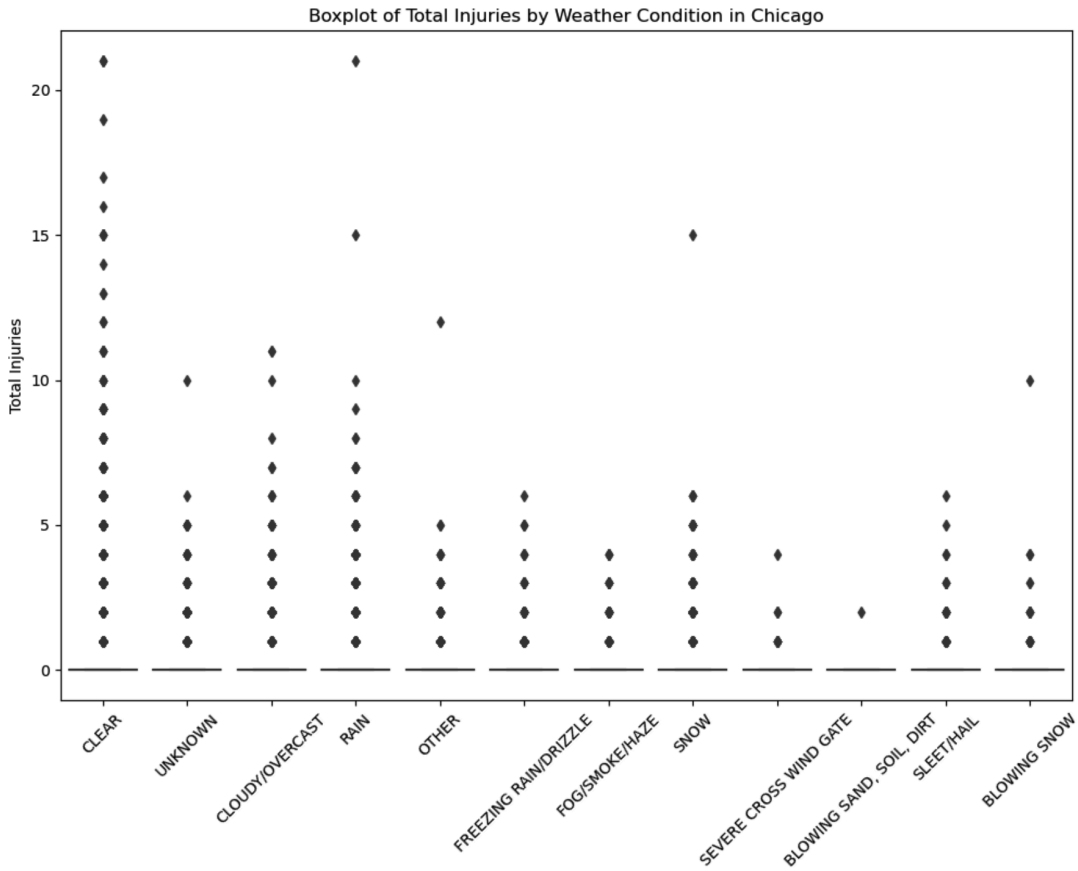
injuries. Following this, there were roughly 100,000 cases of “Non-Incapacitating” injuries, and fewer instances for “Reported, Not Evident”, and “Fatal injuries”.

Understanding the distribution of severe injury types in traffic crashes is crucial for enhancing public safety by allowing policymakers to implement targeted interventions based on prevalent risks. This understanding may help emergency services in efficiently allocating resources to areas with higher occurrences of specific injuries, ensuring a more effective response.



Distribution of Crash Types in Chicago

By examining the distribution of crash types in Chicago, we can observe that the majority involve 'Parked Motor Vehicles,' 'Rear End,' 'Sideswipe Same Direction,' and 'Turning' incidents. Following whether crashes are severe or not from the previous



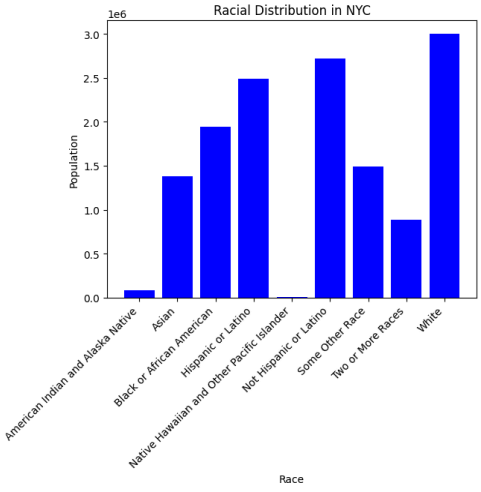
By examining the frequency of different types of crashes, it prompts curiosity about the factors contributing to these incidents. While analyzing the data, we discovered a correlation between injuries and weather conditions. Surprisingly, a significant number of crashes occur in clear weather, followed by rain. While this may suggest that weather conditions might not play a pivotal role in crashes, it is intriguing to observe the distribution of various weather conditions in these incidents. This understanding can play a crucial role in guiding decisions when determining the contributing factors to crashes. It implies the importance of comprehensively grasping all potential influences that may lead to accidents, providing valuable insights for informed decision-making.

According to INRIX, the intersections with the most crashes per 100,000 vehicles in Chicago include South Rockwell & West Cermak Road, North Fairbanks Court & East Erie, and West Diversey. Through interpreting this data and considering the prevalence of speed-related crashes, it becomes crucial to emphasize the role of speed cameras. By integrating insights from these cameras, we can gain a more comprehensive understanding of the factors contributing to crashes and implement effective measures to address speed-related incidents at these identified intersections.

For now, an early conclusion that we can make is that speed cameras can help identify what is effective and not effective for the safety of specific neighborhoods.

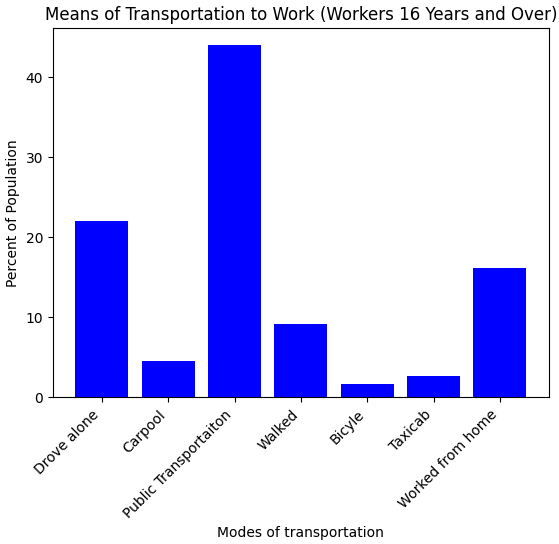
New York, NY

New York City is a major city located in New York and has a population of 8.7 million people, according to the latest US Census Bureau. New York City is also the largest city we analyzed. In the New York City Open Data, there were a total of 2.3 million crashes between 2021 and 2023. Across the 11 years of data, the average number of crashes was 209,000 accidents. The population is distributed as follows.

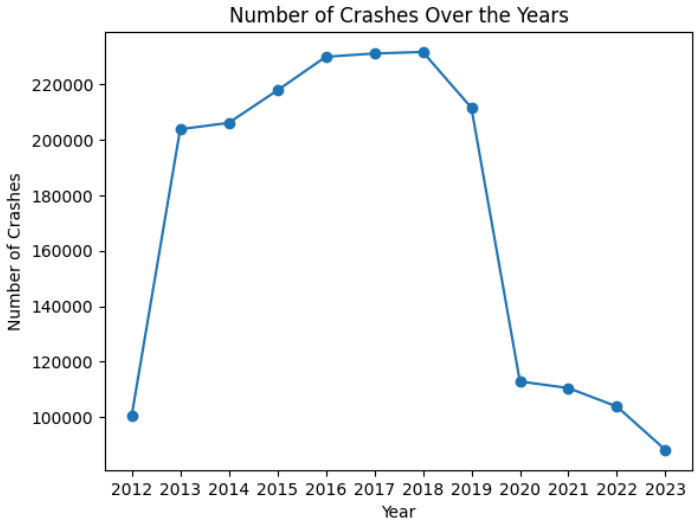


In New York City the population is very diverse with a lot of races having similar populations. However, the difference in socioeconomic status is obvious. The average salary in New York City is $74,694 according to the latest Census. In the Bronx, there is a much higher population of Hispanics and African Americans along with the lowest income on average across all the boroughs.

In New York City there is a huge population of people who take public transportation compared to driving.

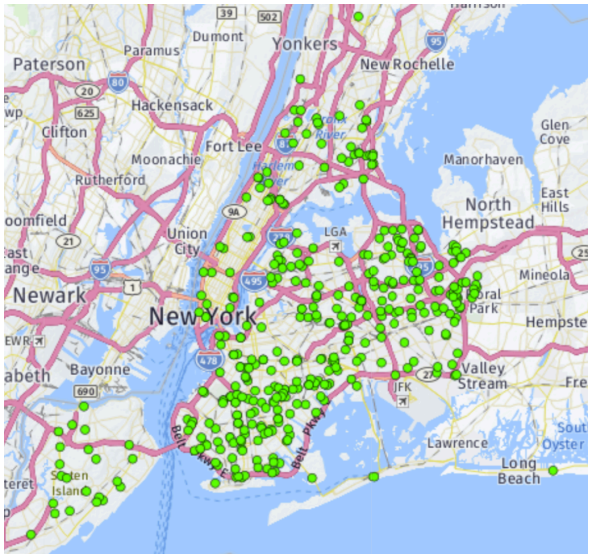


As we can see there is a large amount of people who take public transportation, however, that does not mean that there is a lower amount of crashes.

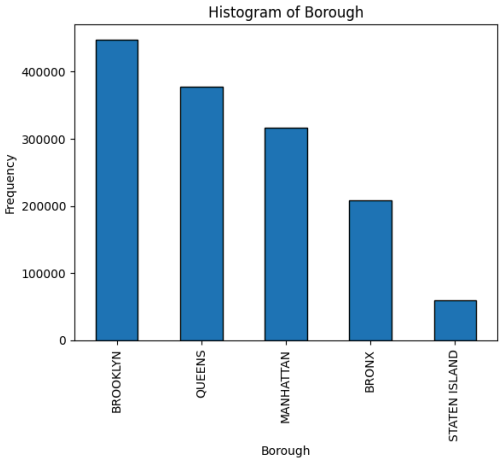


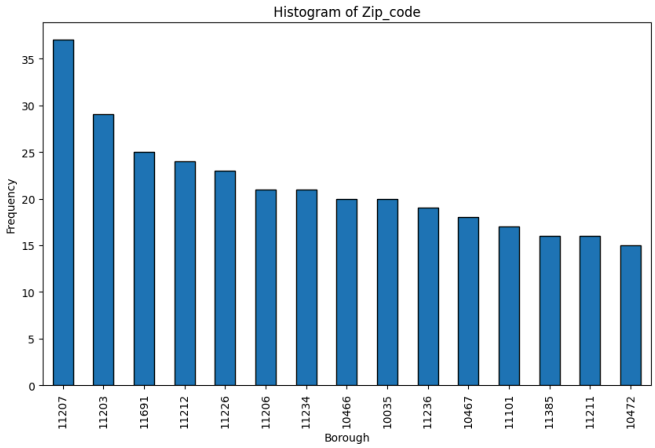
The way the city collected this data was through cameras and reports. When it comes to the cause of the crashes many of them were speed-related. These cameras are actively trying to slow people down and part of this is giving them speeding tickets. However, this method is not effective for a multitude of reasons. New York City Joined the Vision Zero program right before the COVID-19 pandemic. In the year 2020, we see a sharp decrease because of COVID-19 and its lingering effects impacted the following years.

Currently, in New York City, there are 399 speed cameras and the green dots represent each camera.



It is clear that the majority of the cameras are in Brooklyn and that the most amount of crashes are in Brooklyn. Compared to other boroughs it is evident that the higher number of cameras leads to a higher amount of crashes reported.



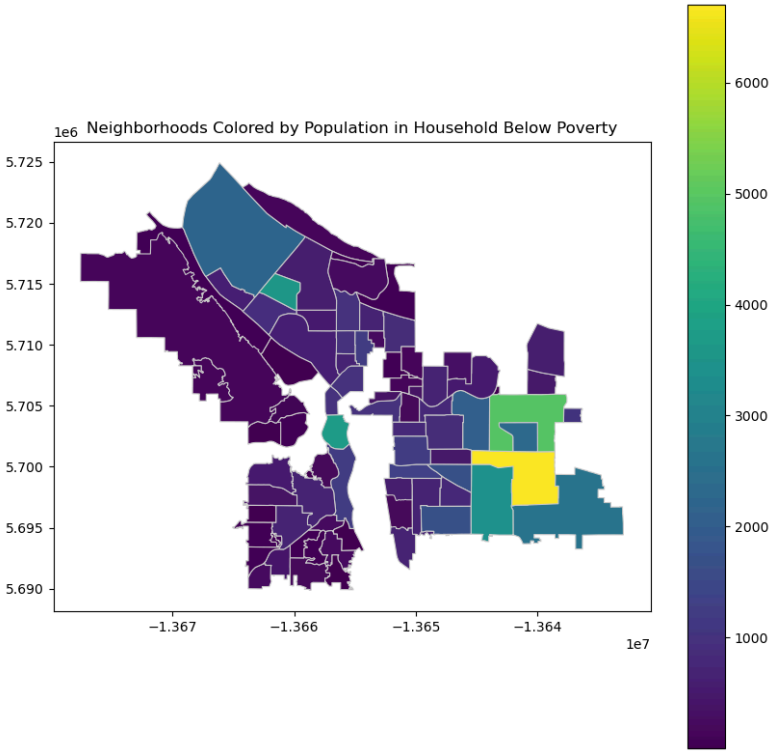


Additionally, the Zip Code that has the highest amount of crashes is located in Brooklyn. When it comes to why there are so many cases in Brooklyn compared to other Boroughs like the Bronx and Staten Island we could not determine. However, there should be more cameras in the other boroughs to make sure that the crash data is fair.

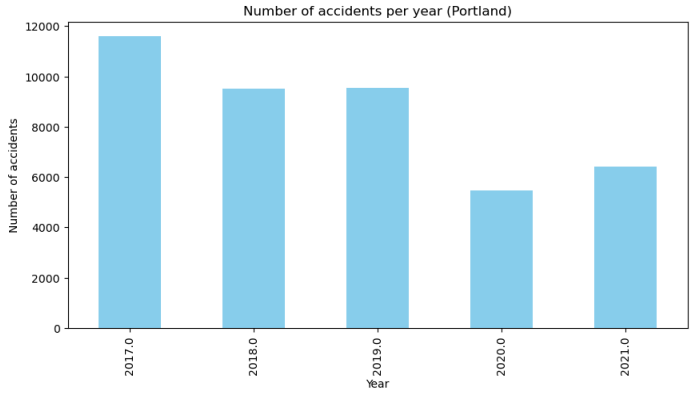
When it came to determining how effective these cameras are at reducing crashes in New York City is that it definitely can, however, it was not what caused the amount of crashes to decrease as much as COVID-19 and its lingering impacts across the city.

Portland, OR

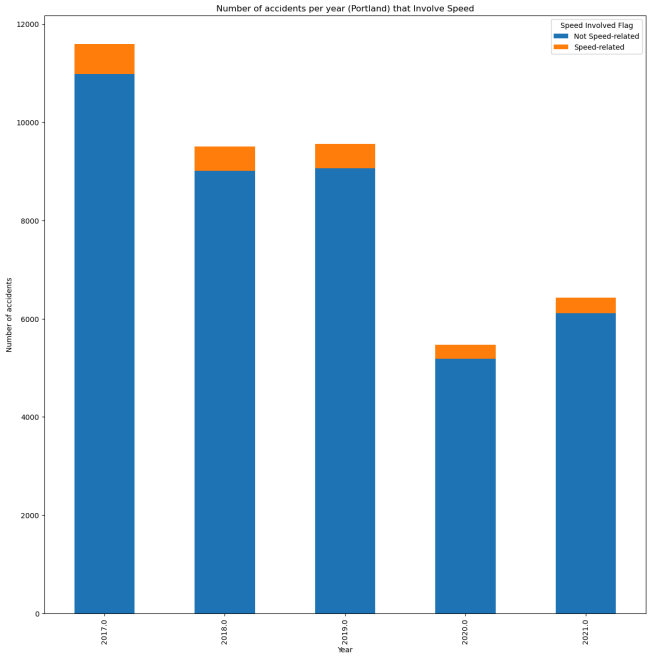
Portland is a mid-sized city on the west coast of the United States in Oregon with a population of 641,162 people according to the US Census Bureau. It is a mostly car-centric city, with a few public transit options. The average daily traffic volume was 19,154 for the last two years according to data from the Portland Bureau of Transportation at primary traffic counting locations. Its population is predominantly white (73%) with a median household income of $78,000. Certain neighborhoods have varying amounts of ethnic minorities and differing socioeconomic statuses. For example, the eastern neighborhoods of Portland have a higher population of Asian and African American people along with a lower median income than the city average. This map below shows the neighborhoods of Portland colored by the number of those in poverty. The yellow and green areas represent areas of higher populations below poverty.



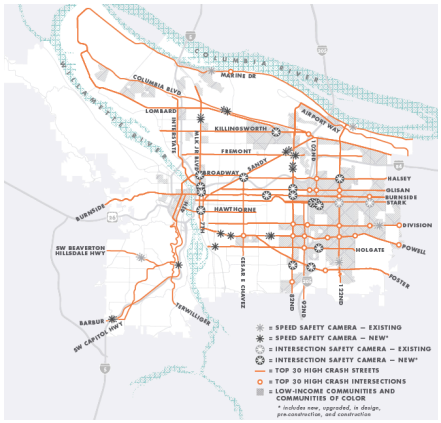
Next, we can look at the vehicle crash data for the 5 most recent years of published data in Portland. There has been a general decline in motor vehicle crashes, but notably 2020 and 2021 was when Covid-19 lockdowns were in place, which most likely meant there were fewer cars on the roads, and thus fewer crashes.

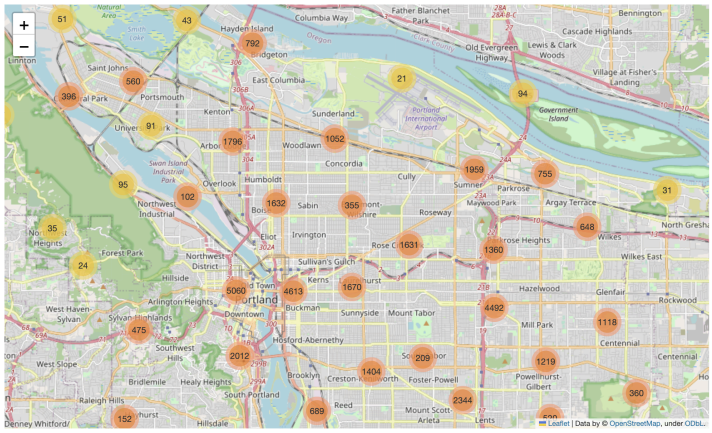


Of these crashes, few have been because of speeding, which the following chart shows. Those that involve speeding are indicated with orange on the graph. The majority of crashes have not involved speeding vehicles and were due to other reasons. This means there could be other measures that are more useful to reduce car crashes.



Yet, one of Portland's approaches to reducing car crashes in Vision Zero has been to implement speed cameras. These started to be implemented around 2015 and more have been added since then. There are currently 8 cameras issuing citations, and they are constructing and planning to add more cameras. Portland mapped out where they have their cameras installed, along with other key pieces of information. We compared this to where car crashes actually occur in clusters. The areas with some of the highest number of crashes according to data from 2016-2021 do not even have existing speed cameras. Along with this, many of the existing speed cameras are placed in or near low-income and/or communities of color as seen in their graph. This shows that the placement and use of these cameras should be questioned further, and could be overly surveilling certain areas.

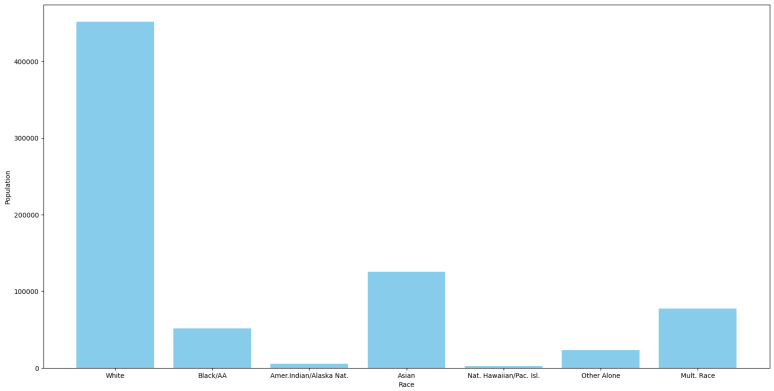


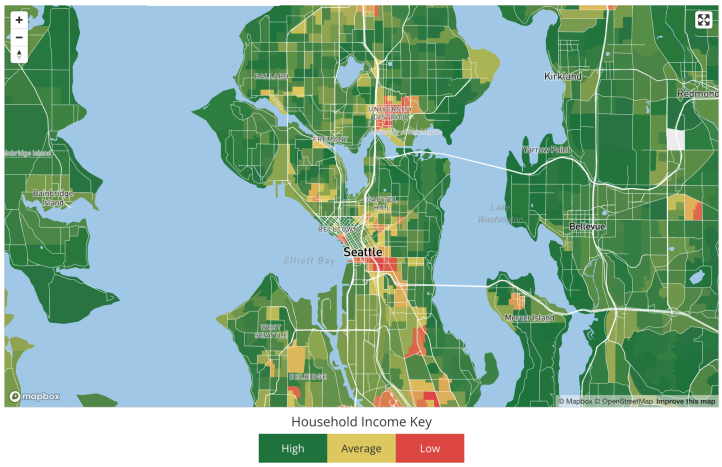


Although, it is possible the city of Portland is reevaluating their camera placement, since some of the new cameras that they are planning to use are outside of these communities and closer to more areas with higher crash rates. It will be important to continue monitoring crashes in the future once these are in use. It would be helpful to get data on citations issued at various camera locations, but unfortunately this data is not publicly available or well documented at the moment. For now, an early conclusion that we can make is that speed cameras do not seem to be the most effective way to reduce crashes and are potentially targeting low income neighborhoods.

Seattle, WA

Seattle is a major city located in the state of Washington on the west coast of the United States. According to the latest census, Seattle has a population of 737,015. The chart below shows the race breakdown of Seattle. Unsurprisingly, people of White and Asian backgrounds make up a majority of the population. In general, northern Seattle is known to have a richer population and is less prone to poverty, while southern Seattle is poorer and has much higher poverty rates than northern Seattle. Looking at the average household map for Seattle, we can see that this is generally true.



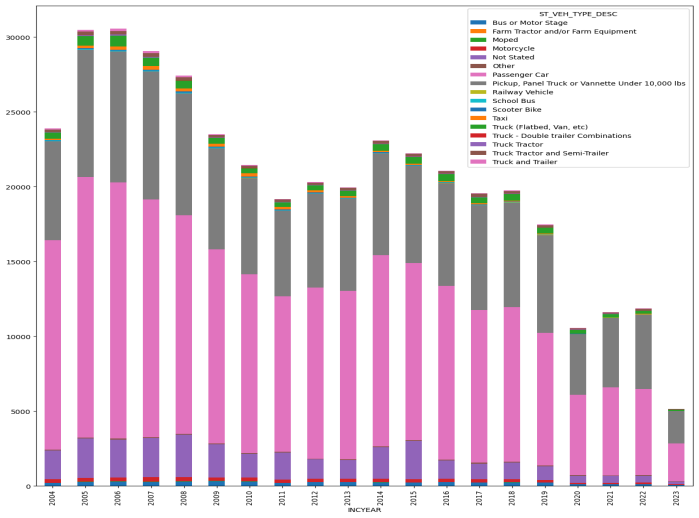


Some of Seattle's main roads and highways include the I-90, I-5, SR-520, and SR-99. These roads are usually filled with traffic as people commute to work, visit neighboring cities, or just

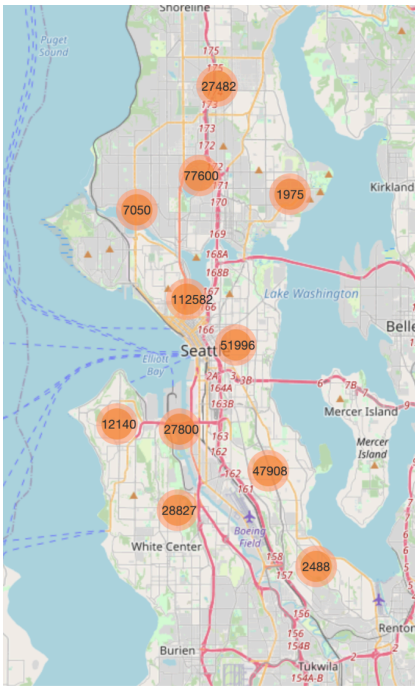
travel from one part of the city to another. These large and usually congested areas can also lead to many crashes. These factors make Seattle an interesting case study when studying the effectiveness and usage of speed cameras in attempting to improve the safety of roads.

The charts shown below depict the number of crashes that have been recorded in Seattle over the last 19 years, from 2004 to present day, as well as in what type of vehicles these crashes occurred. On the plot showing the type of vehicles, we can see that most crashes are happening in passenger cars and pickup trucks/vans. This is probably due to the fact that these type of vehicles are the most common on the road. As a general trend, we see that over the years, the amount of crashes per year have been steadily decreasing.

However, this isn't all due to the implementation of speed cameras. For reference, speed cameras in Seattle were implemented from the years 2012 to 2015, in which we actually see an increase



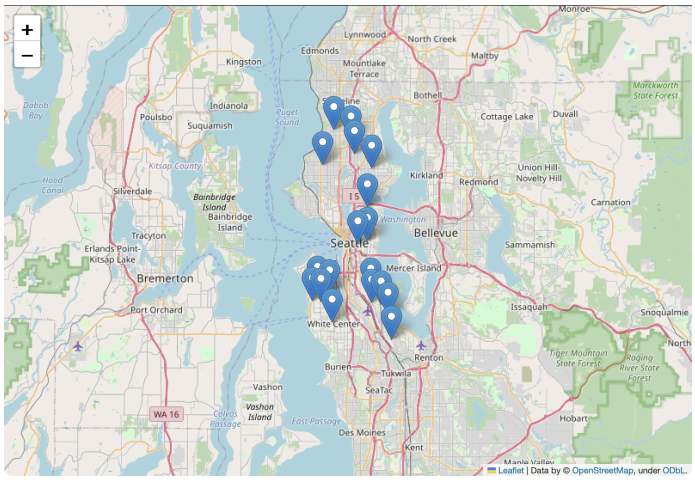
in crashes. Seattle committed to Vision Zero in 2015, and since then, has seen a decrease in crashes overall. The caveat here is that a majority of the decrease that has happened in recent years can be attributed to the COVID-19 pandemic and the lockdown that occurred along with it. This can be seen from the drastic drop in the number of crashes from 2019 to 2020. Prior to the pandemic, there was still a decrease in total crashes on a yearly basis (about 1000 to 3000 crash difference give or take), but the decrease was minimal compared to the decrease due to the pandemic.

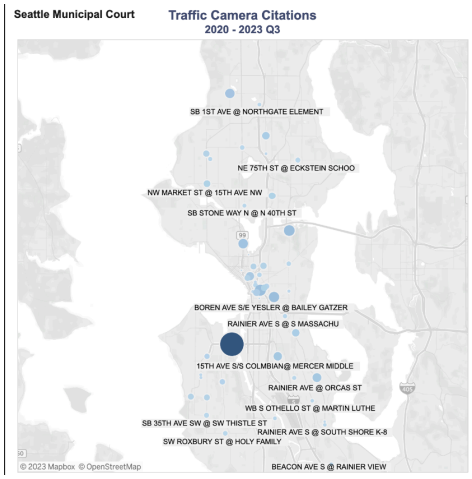


One preliminary conclusion that can be drawn from this, independent of the other cities, is that although there is a decrease in crashes after the implementation of speed cameras, there are many nuances that could have led to this other than speed control. The decrease is too minimal to concretely determine that speed cameras are as effective as they are meant to be.

In order to further understand the context of these crashes, we will take a look at where these crashes are occurring. The image to the right describes the general areas where crashes have occurred over the years. From a quick glance, one thing that is very noticeable is that many of the crashes are closer to the main roads that go north-south through Seattle, namely the I-5 and SR-99. This can be seen especially in central Seattle, where multiple main roads intersect. These types of large roads that usually get lots of traffic are very prone to lots of crashes.

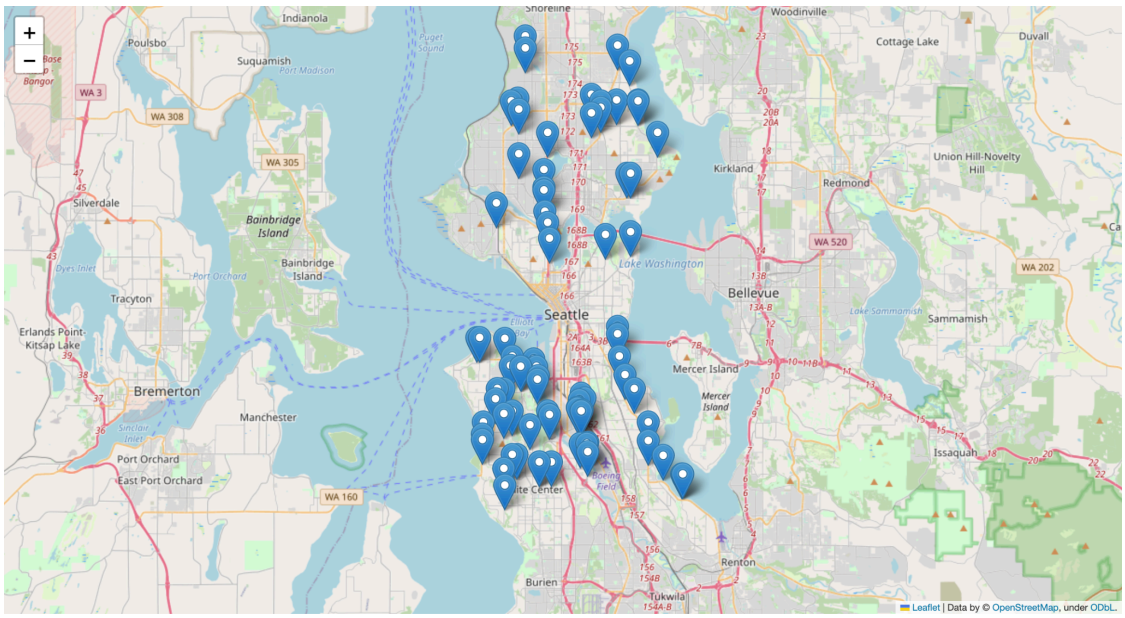
After visualizing Seattle's crash records, we decided to take a look at where speed cameras were located in Seattle. We realized that in Seattle, speed cameras were located in school zones. These were implemented to help keep areas where many students were safer. The following maps describe the locations of these speed cameras as well as how frequently each one picks up citations. The image on the left shows where the locations of the speed cameras are, and the right image, courtesy of the Seattle Municipal Court, shows the frequency of citations at each site. These citations further affirm the fact that many of the crashes happen along the main roads and also near central Seattle.





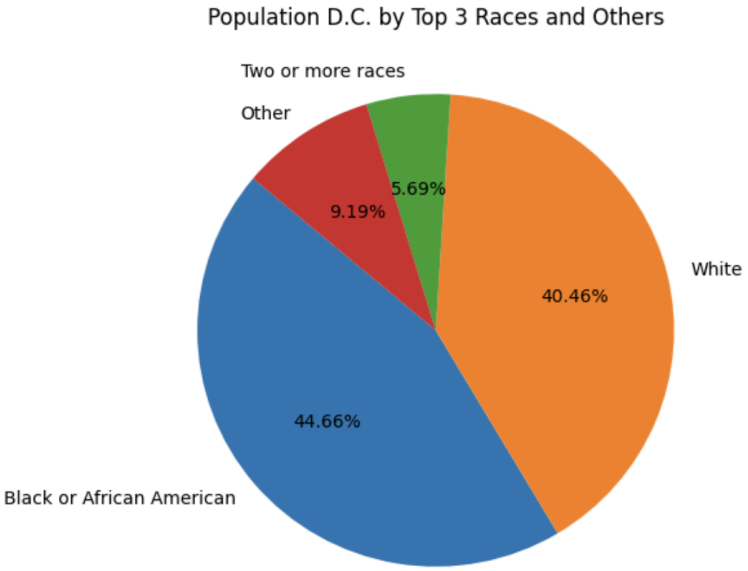
As mentioned earlier, northern Seattle is generally considered "safer" and "richer", while southern Seattle is known for its higher poverty rates and consisting of "poorer" neighborhoods. As we can see from the above images, there are more speed cameras located towards the southern side of Seattle than the northern side. The perceptions of these differing neighborhoods may have led to the placement of speed cameras.

On a side note, during research, it was found that Seattle makes use of speed radar signs on top of speed cameras to monitor speed on the roads. As seen below, there are a lot more speed radar signs than speed cameras. This may be due to the fact the speed radar signs notify drivers of their speed and could possibly lead them to be more conscious of the speed that they are driving at. Again, it can be seen that there are slightly more radar signs placed towards the southern side of the city.



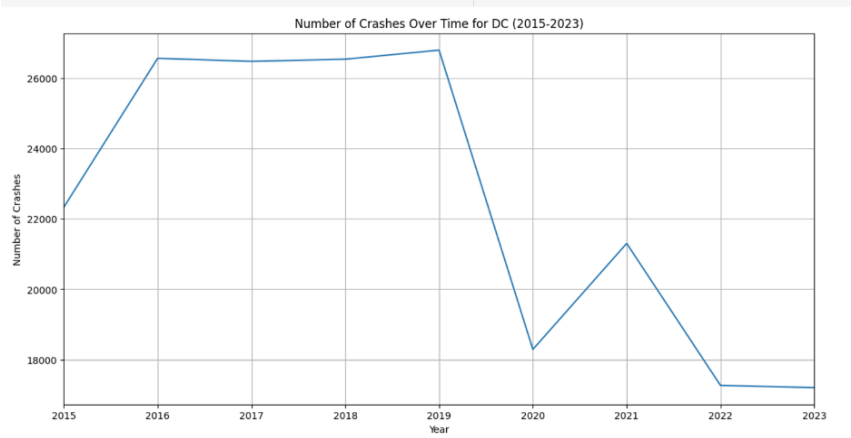
Washington D.C.

Washington, D.C., is the capital of the United States, with a population of 712,816 in 2020.

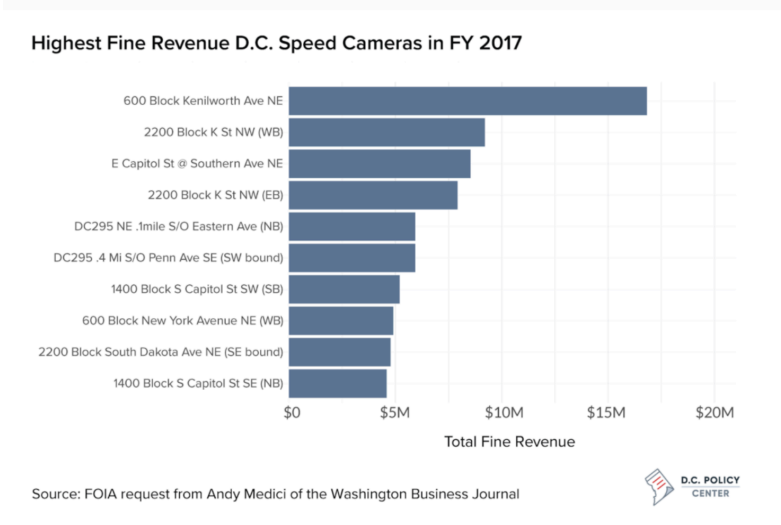


The pie chart illustrates racial distribution for the population in Washington, D.C. As clearly demonstrated, Black or African American community constitutes a large portion of the population in the city, and the White community is the second largest.

The chart below illustrates the number of traffic crashes in Washington, D.C., over the past eight years. We noticed a sharp decrease in crashes in Washington, D.C., around 2020. A similar trend exists in all the other cities we are analyzing for this project. We conclude that this trend is due to the outbreak of Covid-19. On the one hand, there were occasional isolation periods from time to time during the Covid outbreak in those years. In addition, more companies are switching to working remotely, even post-pandemic; fewer people would need to commute to work, resulting in a sharp decrease in traffic crashes. Speed cameras were introduced in the early 2000s in Washington, D.C. According to a report by the D.C. Policy Center; researchers conclude that speed cameras are an effective tool to reduce traffic crashes and fatalities in the city, eliminate racially biased policy enforcement, and generate revenue for the city government through fines. In D.C., speeding is the primary factor contributing to fatal crashes, accounting for approximately 59% of such incidents, as per National Highway Traffic Safety Administration statistics. By 2002, traffic crashes were reduced by 14% after introducing speed cameras.



Nevertheless, there has been criticism surrounding the use of speed cameras in Washington, D.C. Many residents express concerns about areas where the highest fine revenue was generated. Residents complain that speed cameras posted by the D.C. government do not necessarily function as safety measures but as speed traps, contrary to their intended purpose.

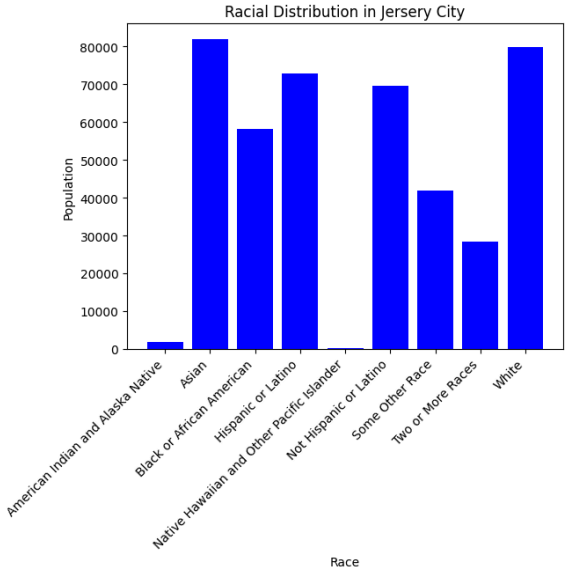


Maps and statistics have shown that places with the most fine revenues are located at city borders, indicating the speculation that the city wishes to generate fines from commuters outside of D.C. to “protect” residents.

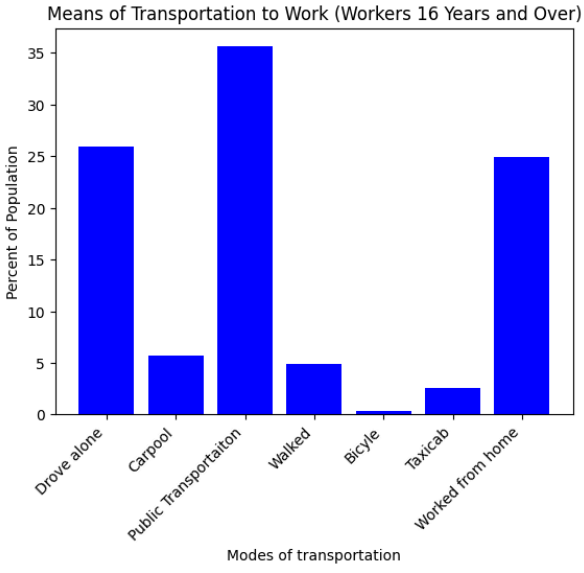
Cities without Speed Cameras

Jersey City, NJ

Jersey City is one of the largest cities in New Jersey with a population of 283,927 people according to the latest census data. Jersey City has an average income of $94,080 and has a 12.8% poverty rate. Though it is a smaller city compared to the rest of the city, it is still very diverse as shown in this graph.

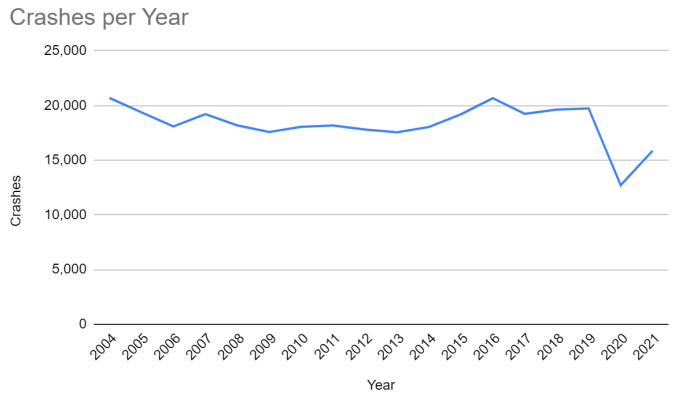


This diverse city is the same when it comes to its modes of transportation. They use many different modes of transportation.



We see that their highest form of transportation is driving and public transportation. In the city, there are no speed cameras because it is illegal. Throughout the 17 years of crash data, the

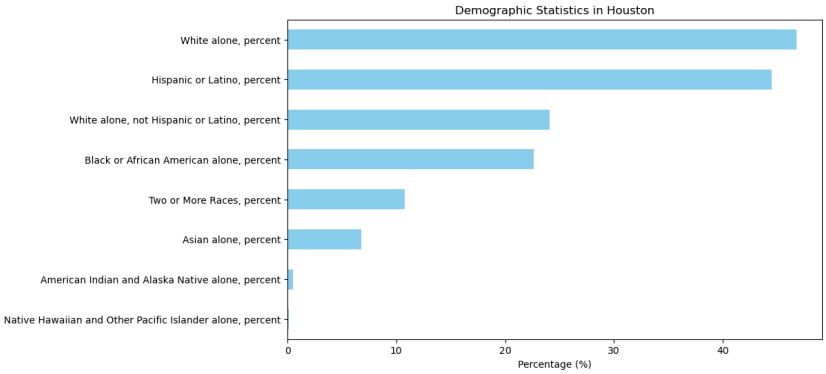
amount of crashes per year stayed the same. However, due to the COVID-19 pandemic, the number of crashes in 2020 and 2021 was lower than before. This can all be seen in the graph below.



Over the years the amount of crashes has stayed pretty consistent and is not an alarmingly high amount of crashes. This is because of their own laws that help make driving much safer. It is clear that the use of not using speed cameras is able to help keep a consistent amount of crashes. However, Vision Zero is working with the city to help reduce the number of fatalities and amount of crashes by their own team by 2026. We will see in time how effective their efforts are by 2026 in Jersey City.

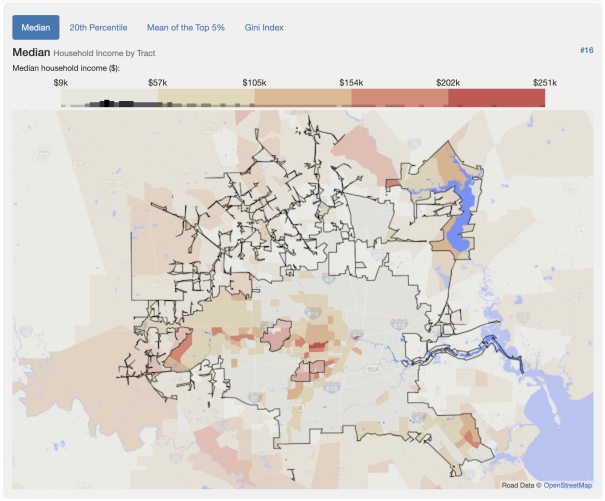
Houston, TX

Houston is a major metropolitan city in Texas with a population of 2.28 million according to the latest census data. It is a very diverse city, with the following graph showing the racial breakdown from the latest census data. Particularly notable is that there is a large Latino/Hispanic population in Houston.

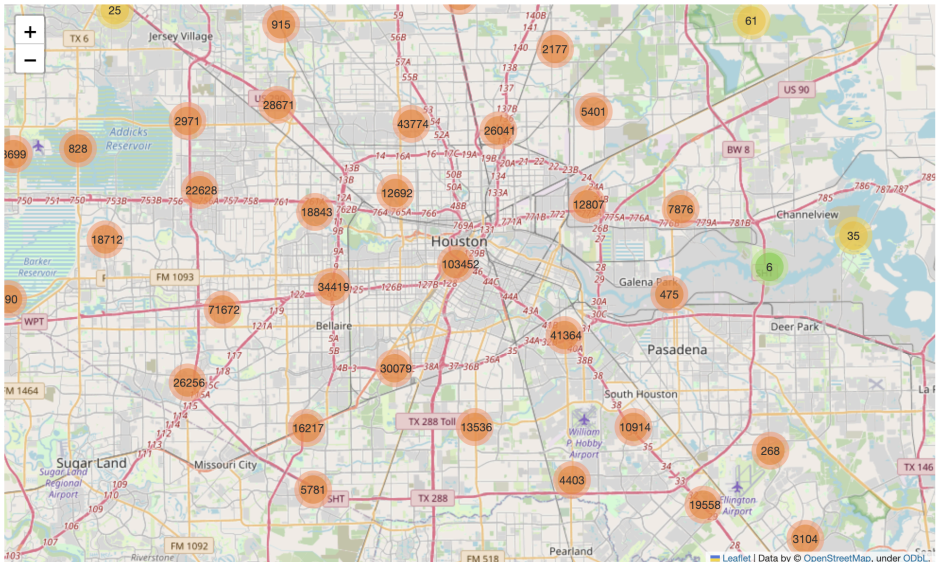


The median household income in 2021 was $56,000. Below, we can see what the median income was in the different regions of Houston. There are some clear distinctions between areas with

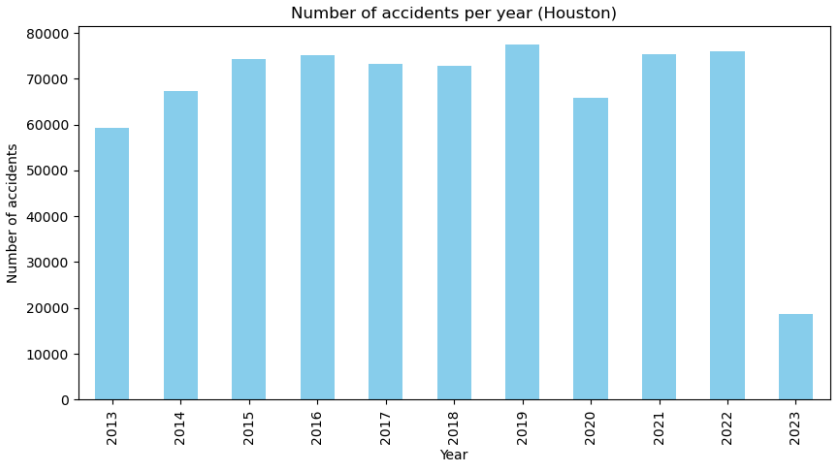
lower and higher incomes. Overall, the income distribution was skewed right, with more people closer to the median and a long tail with few neighborhoods having higher median incomes.



When we analyzed where crashes occurred, these areas of low and high income neighborhoods did not seem to have a very direct relation.



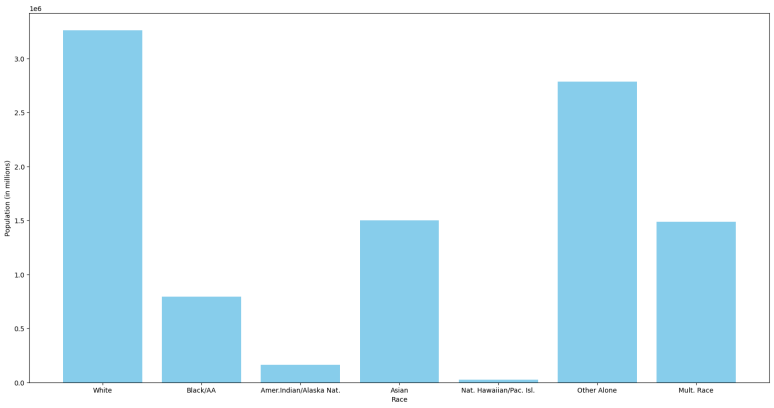
Although, they may have been more related to where certain busy highways and streets are located. Houston is a very car-dense city, with 6 of the 10 most congested roads in the state according to a report by Texas A&M. The Annual Average Daily Traffic amount in 2023 was 185,5490 in Houston which shows that many people are driving in the city each day. I-10 and I-69 are particularly congested roads, and they do show high crash numbers. The population has been growing, there's very few public transport options, and a lot of urban sprawl. Many people are coming into the city from surrounding suburbs, which means more people have to travel greater distances causing heavier traffic. This has led to a relatively high number of crashes each year. Here are the number of crashes per year from 2013-2023.

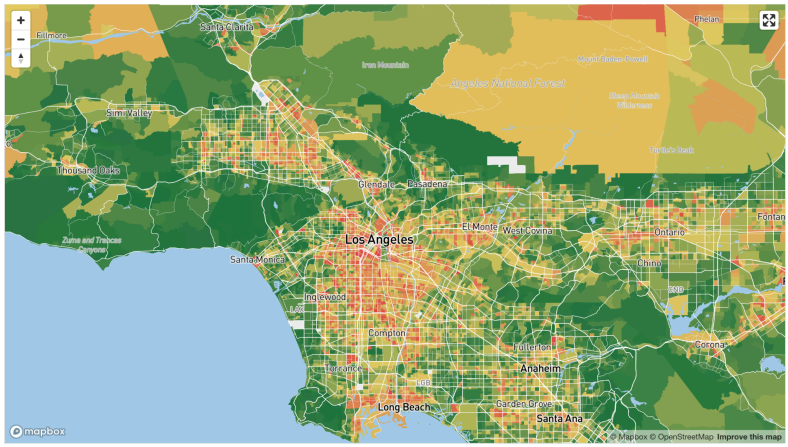


We can see there is not much of a decrease in the number of crashes, except for the year 2020. This means that Houston needs to implement more measures to reduce crashes, whether they are speed cameras or something else. Now, Vision Zero was implemented in Houston at the end of 2020, so it will be necessary to continue monitoring traffic crashes in the city over the next few years since it is a relatively new initiative. This will give better long term data on whether fatal car crashes have truly been reduced.

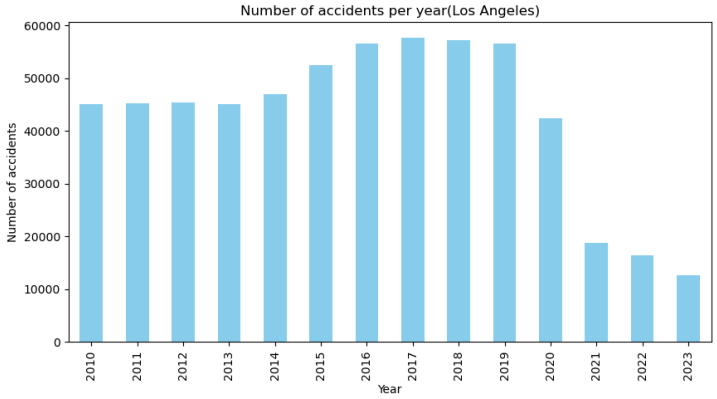
Los Angeles, CA

Los Angeles is one of the largest cities in California located on the west coast. Its population is 10,014,009 as of the latest census. Below is a graphic that shows the race breakdown of Los Angeles. People of White and Asian backgrounds make a majority of the population, and people of race Other (which includes Hispanics) also make up a good portion of the population in LA. In general, central and southern Los Angeles are considered to be poorer and more dangerous than the outskirts of LA, where many celebrities and influencers tend to stay (i.e. Beverly Hills). When looking at the average household income map of Los Angeles, we can see that a majority of LA is lower income and only the outskirts of LA on average have a high household income average.

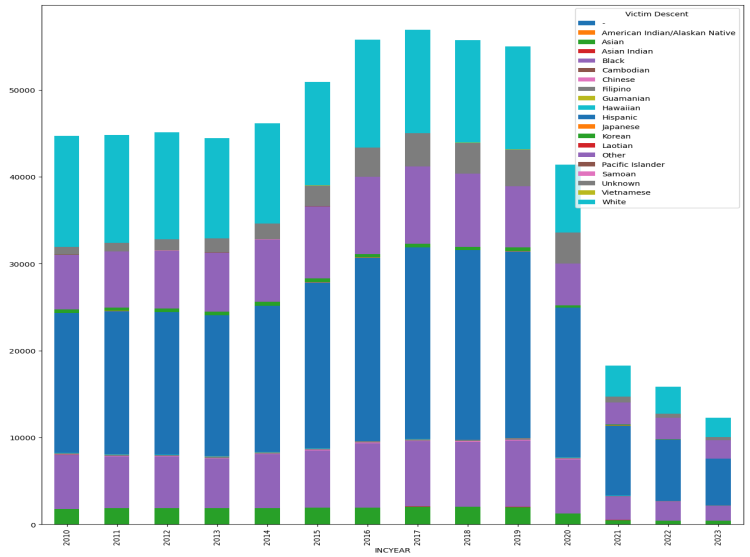




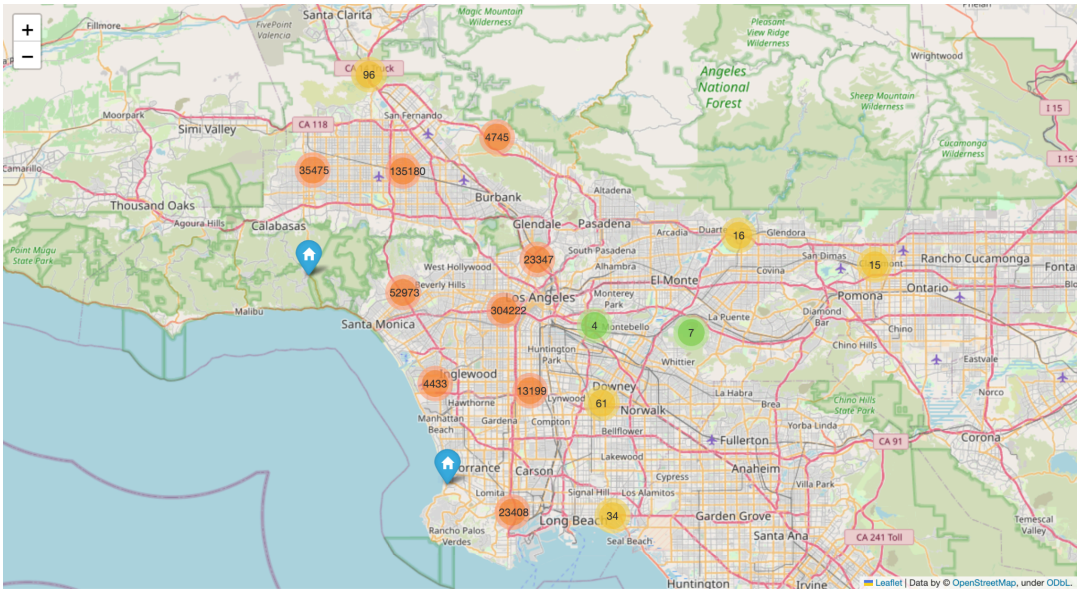
Being a larger city, Los Angeles has an extensive network of roads and highways. Some of the main ones include the I-5, I-10, I-405, US-101, SR-134, and many others.
Looking at the crash reports from Los Angeles, we can see that Los Angeles has a history of having a very high number of crashes per year, and according to this dataset, 2017 had the largest number of crashes since 2010. As with many of the other cities, we see a drastic decrease of car crashes per year during the COVID-19 pandemic, which essentially halved the amount of crashes occurring per year up to that point. Other than that observation, the amount of crashes per year happening until then had been pretty consistent.



We can break the crashes down by looking at who gets involved in these crashes. From the graphic, we can see that a majority of crash victims are of White/Hispanic background, while Black, Asian, and others make up a smaller percentage of the total number of crashes. This is most likely due to the makeup of the population in LA, so the numbers are fairly proportional.



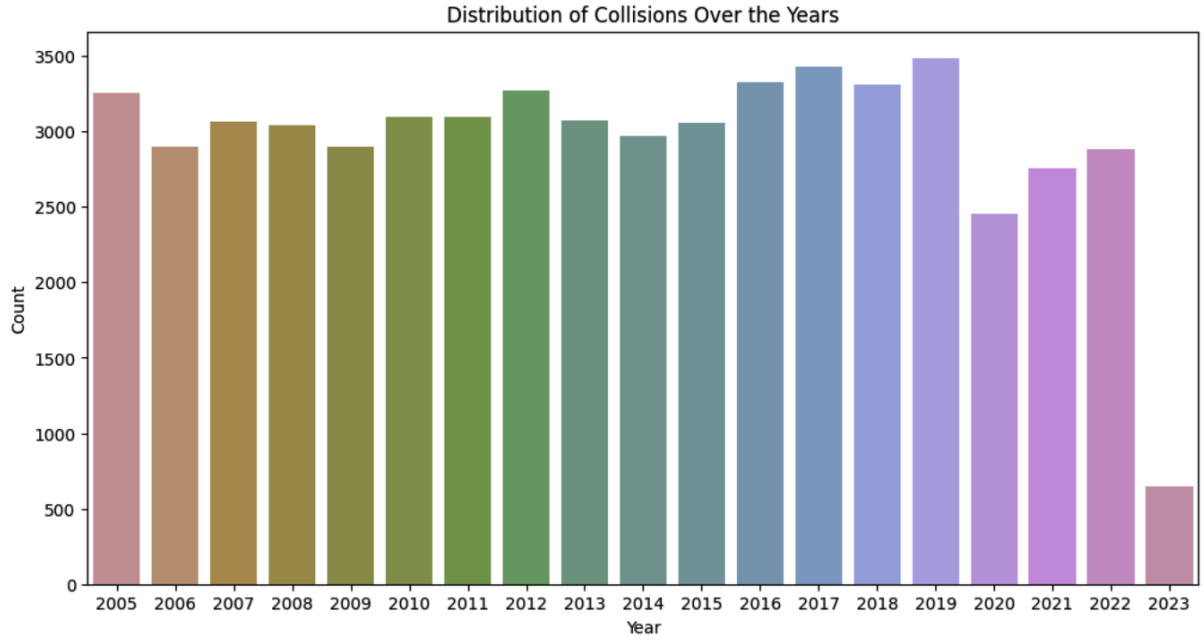
As a city that does not have any speed cameras installed, there are obviously no visualizations that describe where the speed cameras are located. However, the map of crash clusters can give a sense of where these cameras would be located if they were to be installed. From this graphic, we can see that the majority of the crashes are occurring in central and southern Los Angeles along the major road networks. It can also be seen that less dense areas overall have accumulated less crashes over the years.

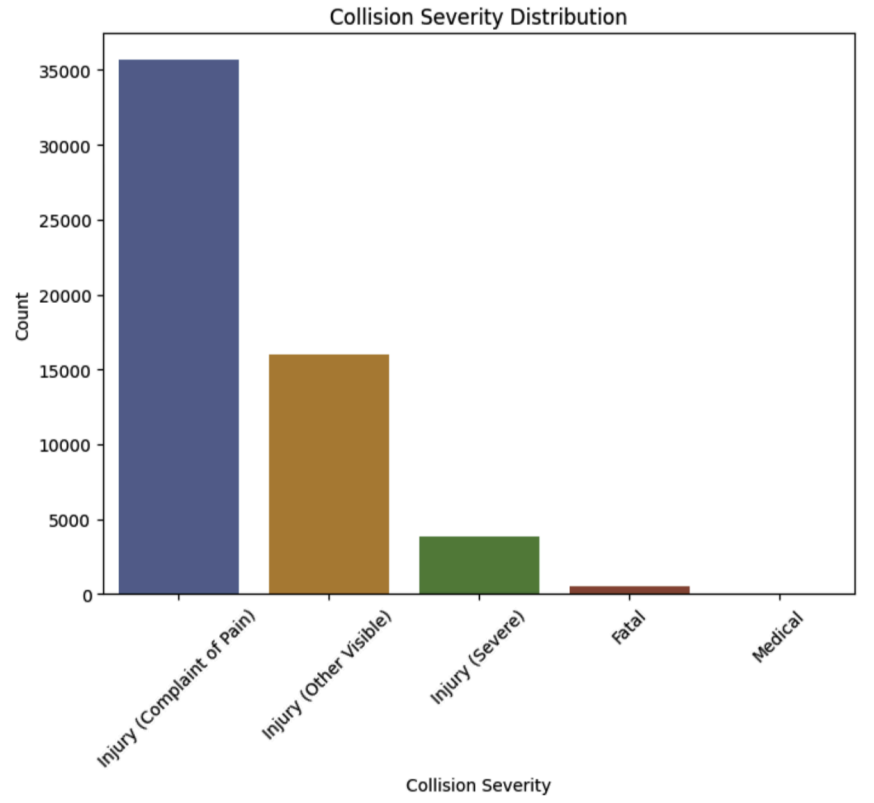


San Francisco, CA

San Francisco, located in the state of California, stands as a vibrant and iconic city on the west coast of the United States. As of July 1, 2022, the population of San Francisco was estimated to be 834,000 by the California Department of Finance.

San Francisco is the 17th most populated city in the United States and the fourth most populated city in California. It has a population density of 6,266 people per square mile, making it the second most densely populated city in the country after New York City.





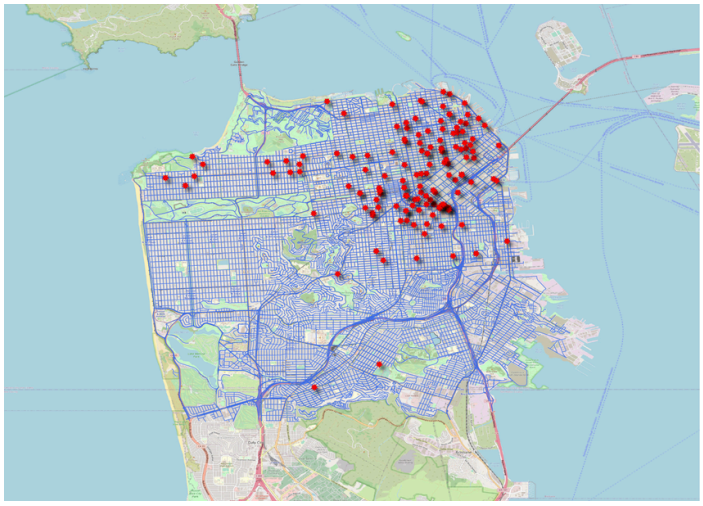
For this report, we collected data from the San Francisco's Open Data Portal on Traffic Crashes Resulting in Injury. The dataset includes reports of crashes within the city of San Francisco, spanning from 2005 to 2023.

The distribution of crashes has remained stable over the years, with a noticeable dip in 2020. It's important to acknowledge that the decrease during that year could be attributed to the impact of the

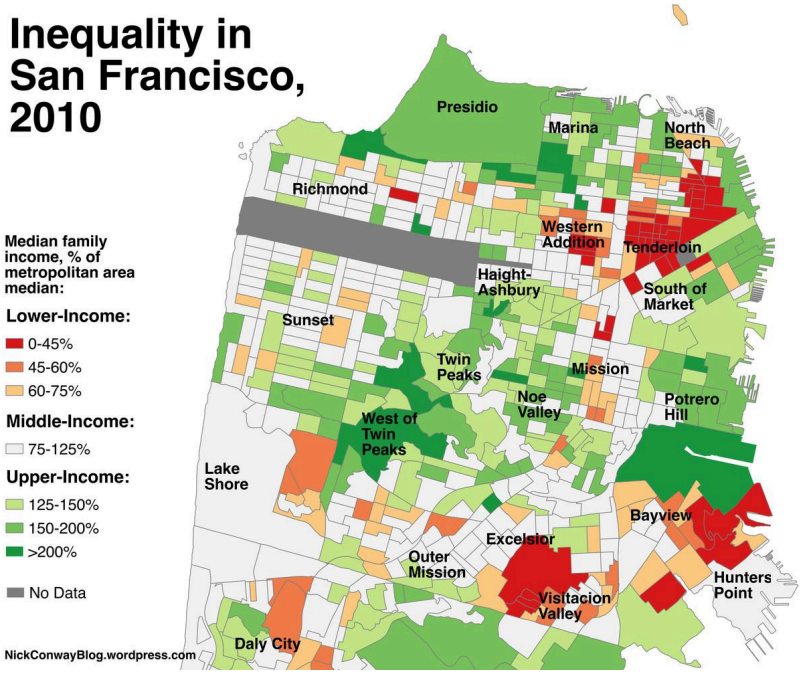
COVID-19 pandemic, leading to fewer cars on the road and subsequently fewer reported incidents. This insight shows the need for adaptable safety measures that can respond to external events affecting traffic patterns, ensuring a proactive approach to road safety management.

In terms of collision severity, we observe a higher count for injuries (complaint of pain). The second highest category is injuries (other visible). While the injury rate is low compared to fatal injuries, the count of injuries tends to be higher in cities without speed cameras.

As of October 2023, AB 645, introduced by State Assemblymember Laura Friedman, authorizes San Francisco, San Jose, Oakland, Los Angeles, Glendale, and Long Beach to implement a five-year speed safety camera pilot. The legislation goes into effect on January 1, 2024, allowing the SFMTA to install 33 speed safety cameras throughout the city.



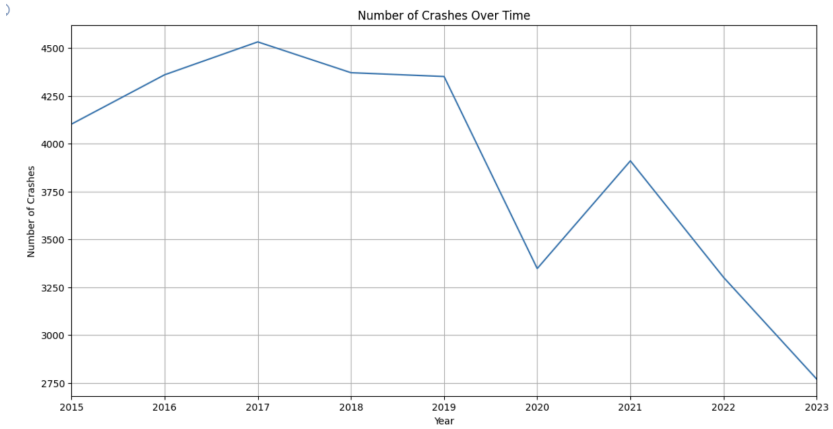
While we currently do not have data on how crashes may be related to the effectiveness of speed cameras, we have observed a higher number of crashes in lower-income and middle-class areas compared to wealthier neighborhoods. The first image illustrates the locations in San Francisco where crashes tend to occur frequently, primarily in the top right of the image. An insight that was brought up is whether there is a correlation between high crash rates and household income levels. The second image showcases the household income in San Francisco from 2010, and how there are predominantly lower income and middle class households to the upper right. This is aligned well with where most crashes occur.



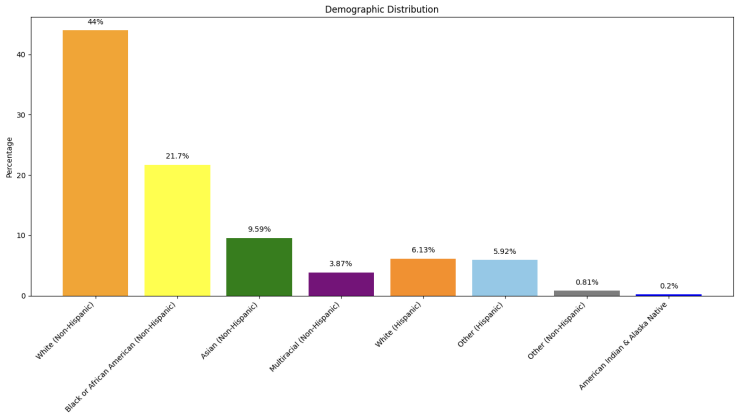
While we currently cannot provide further insight on the effectiveness of speed cameras, we can observe differences in the locations where crashes tend to occur. Following January 2024, when San Francisco implements speed cameras across the city, we will be able to analyze whether there is a noticeable impact from these cameras

Boston, MA

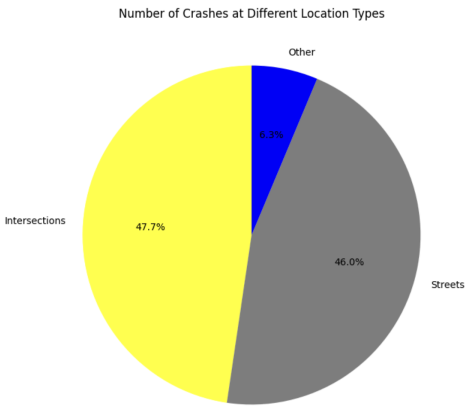
Boston is the city we live in and where our client, Livable Streets Alliance, is located. With a population of 654,776 in 2021, Boston is one of the major cities in New England. Below is a line graph depicting traffic crashes in Boston over the years. As the city without speed cameras for our analysis, the main cause of reduction in traffic accidents in Boston is Covid-19.

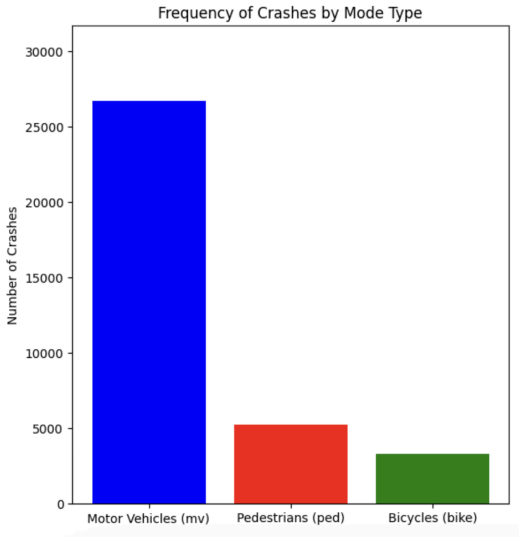


As the bar chart on racial distribution in Boston shows, the White(Non-Hispanic) community is the majority racial group in Boston.



According to a dataset released by Vision Zero Boston from 2015 to 2023, our visualization shows that most crashes in Boston happen on the interactions and with motor vehicles.

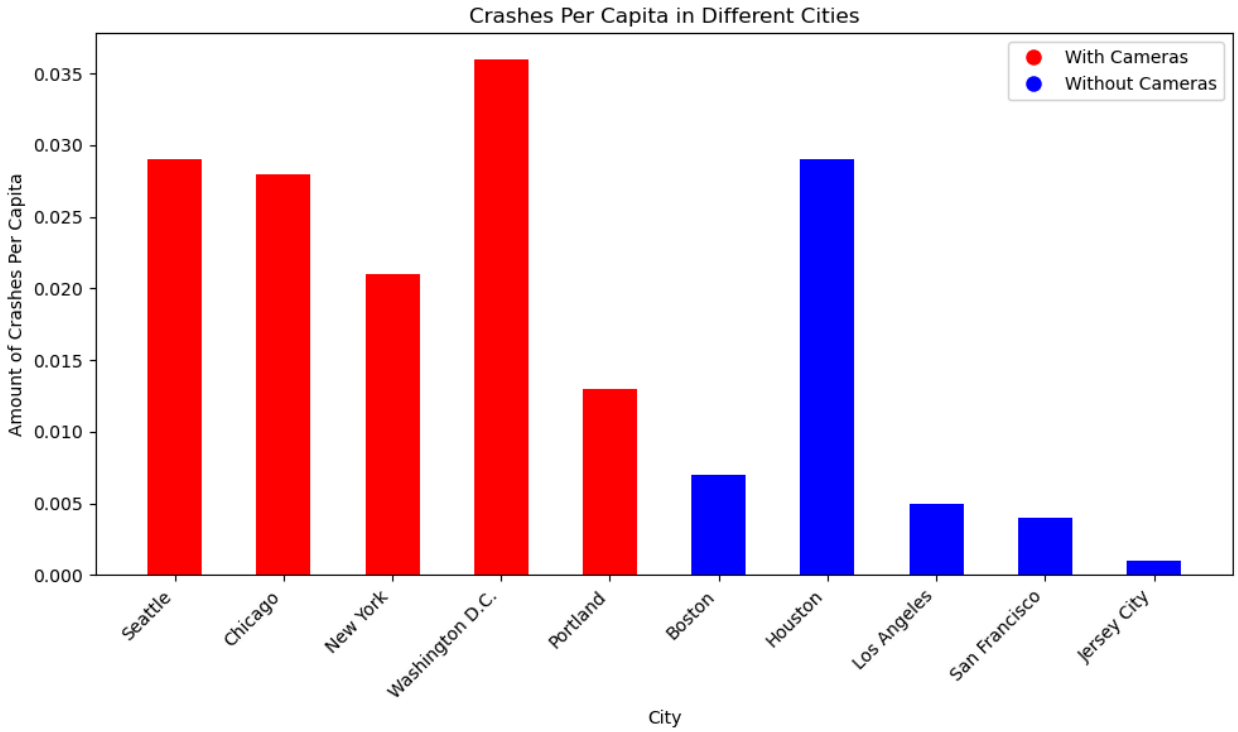




Intersections are where different traffic streams intersect, often presenting complex scenarios requiring careful navigation. With a high population density and a network of intricate roadways, Boston's intersections emerge as critical junctures for assessing crash data. In the absence of speed cameras, policy planners can make effective use of this conclusion and come up with more safety measures and policies at intersections, with a specific focus on mitigating risks associated with motor vehicles.

Comparisons Between Cities

One of the main factors that we wanted to compare between cities with and without speed cameras was the amount of crashes per capita in a given city. We hypothesized that this would give us a good idea of the effectiveness of speed cameras in cities with versus cities without cameras. Looking at the graphic below, we can see that on average, cities that have implemented speed cameras tend to have a higher crash rate than the cities that don't have speed cameras. This can be due to many several factors, including the size of the cities and their population density. This high crash rate is also most likely part of the reason why the speed cameras were implemented, but as shown from our analysis, the speed cameras did not do much to actually decrease the amount of crashes happening in these cities.



Another observation seen across all cities was that there was a great decrease in the number of crashes per year when the COVID-19 pandemic caused the country to go into lockdown. During this time period, there was a drastic decrease in the amount of people who left their homes, and consequently, did not drive on the roads. However, even after lockdowns were lifted, we still see

that the amount of crashes did not quite accelerate back to prior numbers. We hypothesized a number of reasons for this. For one, even after lockdowns were lifted, many people were unwilling to leave their homes often. On top of that, many workplaces either stayed closed, became remote, or had hybrid options. Even school districts implemented a hybrid schedule for students coming back to school. A culmination of these factors most likely led to an decrease of vehicles on the road at any particular time, which in turn statistically makes it less likely for crashes to occur. On top of these external factors, we must keep in mind that these cities are still part of Vision Zero and have ongoing efforts to try and improve road safety, which not only includes the implementation of speed cameras but also lowering speed limits, increasing fines, and ensuring that public transportation is also following these rules. These factors could also be part of the reason for reduced crashes post-pandemic.

There are also some observations that can be made about the placement of speed cameras in the cities which have them installed. Across all of the cities that we observed, we saw that a larger proportion of speed cameras were placed in areas with a denser population. Some of these densely populated areas also saw lower average income and higher crime rates compared to other parts of the city.

These observations lead us to our final conclusion on the issue of speed cameras and how cities tackle the issue of safe roads across the country.

Conclusions

Throughout our research, we looked at a variety of datasets, which included information on crash records, speed camera locations, and demographic information. Using these datasets, we created various visualizations for each individual city and explored the reasoning behind our observations and how they impacted our overarching question of whether or not speed cameras were useful or if they were only a stop-gap measure. We wanted to find trends that existed across all of the cities, as this would strengthen our conclusions and help us cross-reference different observations, making sure that we would not take into account any outliers in the data. We first focused on the crash records data to understand where crashes were occurring and how frequently they were occurring. For some cities, we were able to get comprehensive data on the types of crashes, their severity, and even the demographics of crash victims. We then focused on the locations of speed cameras in the cities that had them and created visualizations that showed where they were. In order to form some conclusions about these cameras, we looked more closely at census data as well as average household income, attempting to discover connections between this and speed camera placements.

Concluding our analysis, our main conclusion is that speed cameras are not a very effective way to reduce crashes in major cities across the United States. Although we see a decline in crash rate

in recent years throughout all of the examined cities, most of this can be attributed to the COVID-19 pandemic and the recovery process that followed. However, although this is the major factor as to why it declined, more variables need to be investigated. For example, in New York City, after 2020 the number of crashes increased a little but not to where it was in previous years. In some cities, there were new policies implemented that could impact the number of crashes.

We can also conclude that cities have a tendency to have biased placements of speed cameras, often placing them in lower-income neighborhoods more frequently than in rich neighborhoods. For example, Seattle's speed cameras are placed in both northern and southern Seattle, however, more frequently in southern Seattle, which is generally lower income as compared to northern Seattle. This hints that there may be external factors when it comes to the placement of said cameras and that there is a bias when talking about where incidents are occurring more frequently.

Both of these conclusions have been the result of the research and analysis that we have completed. Yet, there is still a lot more work to be done on this issue. Many of these questions have many layers, and there are lots of specifics that can be further examined for more interesting insights regarding this issue. The use of speed cameras, however, is definitely not the perfect solution to creating safer roads for all drivers.

What We Learned

Over the course of this semester, our team learned a lot in both the data science and social science aspects of the project. At first, our biggest challenge was to acquire all the data that we needed to get started with any analysis that we would eventually do. This required a lot of searching online, contacting different city departments, and working with each other to aggregate the data. What we found was that each city collects data in a slightly different manner, leading to some inconsistent data features. This taught us a very valuable lesson as many datasets are not perfect and require a lot of manipulation to create what is desired. When working with the data and coming up with our analysis, we shifted our focus over to technical skills. Utilizing Python and its relevant libraries, we were able to create various visualizations that helped us depict our findings. Through this process we were able to hone in on our technical skills and learn more about useful features Python has to offer. On the social science side, we as a team learned more about safety on roads and how much of a critical issue it is, as people's lives are involved when fatal accidents occur. We were able to learn about many different cities and how each state handles data collection differently. We value the opportunity to learn about how states are working towards safer roads, and how our research can aid this cause. In conclusion, this project was a great learning experience in a multitude of ways.

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