Gun Violence

Team members:

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Introduction:

Project Overview

Gun violence is a significant issue affecting many communities in the United States, including District 4 in Boston. It is a complex problem that demands a multi-faceted approach to understand the underlying causes and develop effective solutions. Councilor Worrell, a Boston City Councilman for District 4, is dedicated to addressing this challenge and improving the safety and well-being of his constituents. This project aims to analyze gun violence in District 4 and the broader city, identify key variables associated with its occurrence, and evaluate existing programs designed to mitigate the issue. The ultimate goal is to provide valuable insights that can inform data-driven policies and strategies for reducing gun violence in the district and throughout Boston. By understanding the drivers of violence, policymakers and community leaders can work together to create a safer environment for all residents.

The project is conducted in several phases, beginning with a comprehensive analysis of gun violence in District 4 and the city of Boston. This includes an examination of the volume, geographic distribution, and trends of gun-related incidents. We assess factors such as police presence, poverty levels, population movements, and other socio-economic variables to determine their correlation with gun violence rates.

We then conducted a comparative analysis to identify differences and similarities between District 4 and other districts in terms of gun violence rates and the underlying factors contributing to those rates. This comparison helps determine the unique challenges faced by District 4 and provide a better understanding of the context in which potential solutions can be implemented.

Finally, we creatively explore additional data about the school part to uncover compelling insights related to gun violence.

Impact

The potential impact of this project is substantial, as it seeks to improve the safety and well-being of residents in District 4 and throughout the city of Boston. By identifying the root causes of gun violence and evaluating the effectiveness of existing programs, the project can inform the development of targeted policies and strategies that address the issue more effectively. In the long term, this could lead to a significant reduction in gun violence, fostering safer communities and enhancing the overall quality of life for Boston residents.

Base Analysis

**What are the drivers of violence in District 4? How does this compare to the rest of the city?**

Figure 1.1 is a histogram of the number of residents with different races reveals that D4 and D5 have a high proportion of African American residence compared to other districts and compared to other races in the same district. What's more, the district with relatively less shootings has a higher proportion of Asian and White residents. This indicates a lack of resident diversity, which could be a contributing factor to gun violence in District 4.
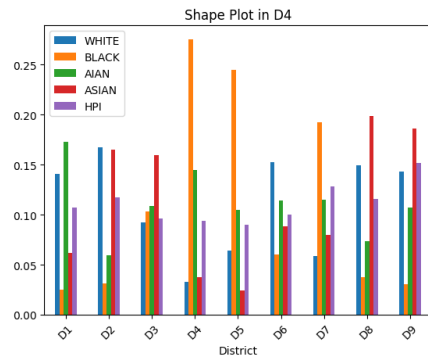
[Figure 1.1]

Figure 1.2 is a histogram of buyers number of firearms in different districts. Our analysis of firearm transactions indicates that District 4 experiences a higher volume of deals compared to other districts. The prevalence of firearm transactions in the area could be a significant factor contributing to the increased gun violence observed in District 4.

The buyer plot shows that District 4 has the highest number of gun buyers among all districts, suggesting a strong demand for firearms in the area. This heightened demand for guns could be one of the underlying causes of violence in District 4, as it may result in more firearms circulating within the community and, consequently, an increased likelihood of gun-related incidents.
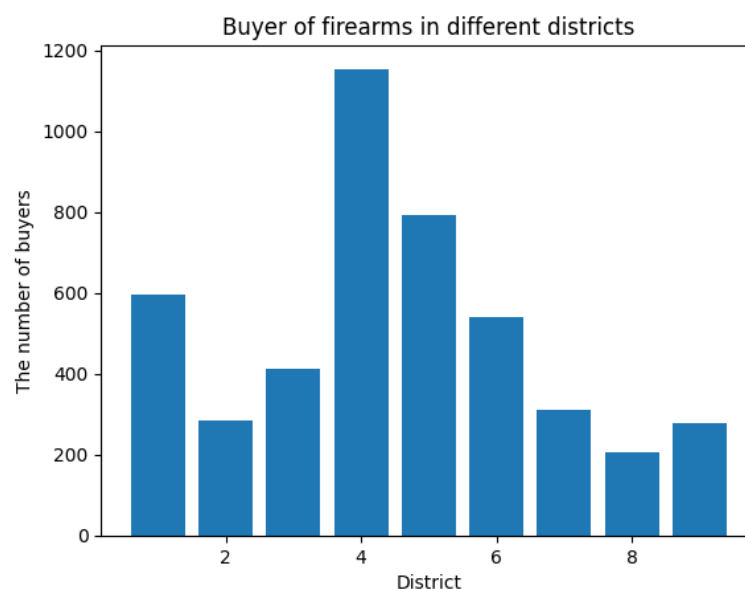
[Figure 1.2]

What is the rate of gun violence in District 4? How does this compare to the rest of the city?

According to figure 1.3, around 35% of the gun violences are taken placed in district 4 and around 23% are taken place in D7, which is the district that right near district 4. To sum up, 58% gun violences took place these two districts for the past 5 years, which is significantly higher than other districts.
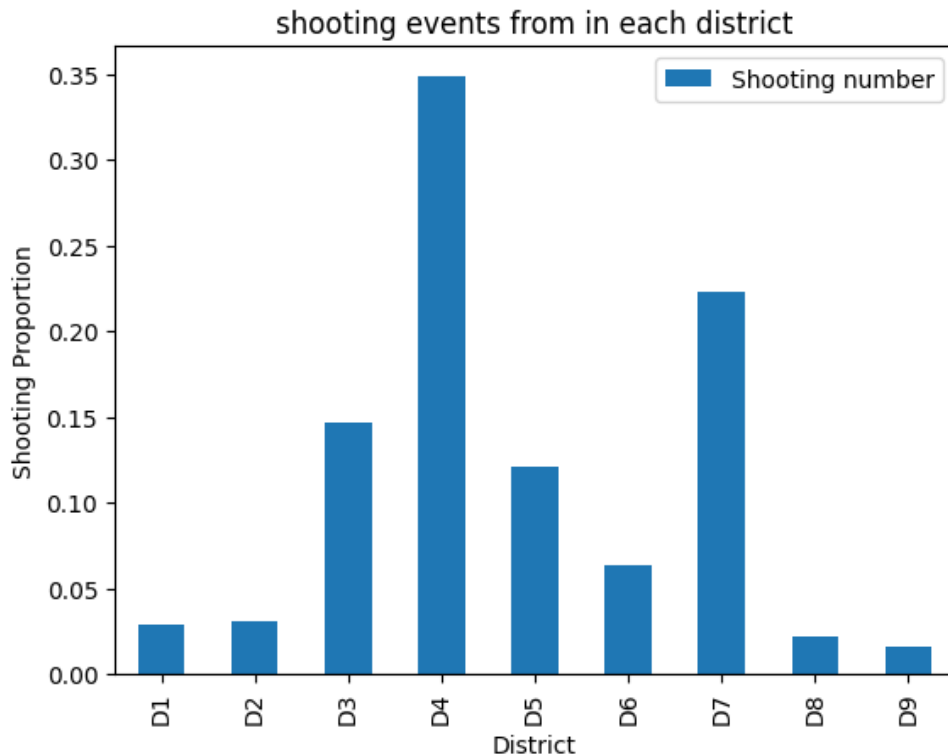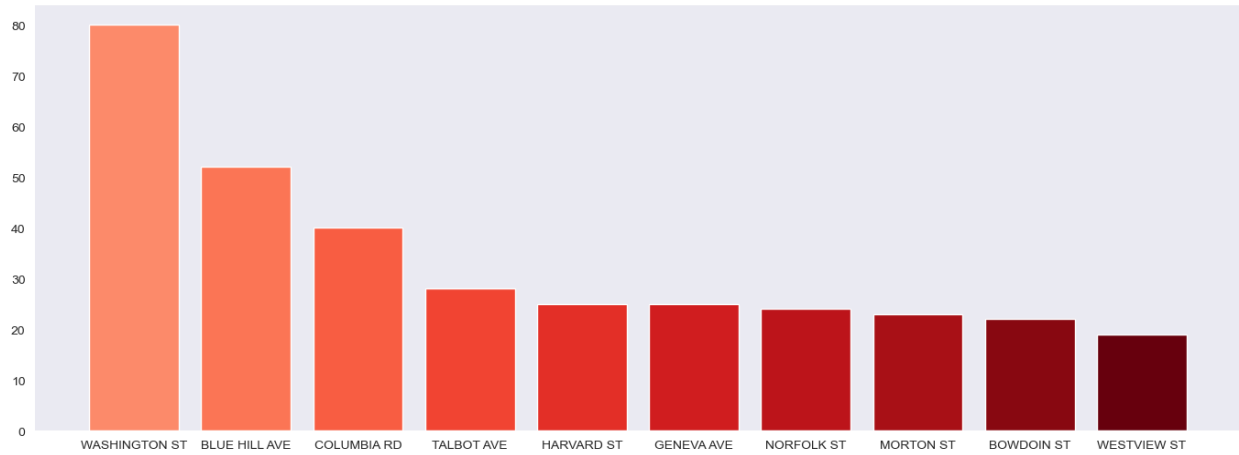

[Figure 1.3]

Are there patterns of violence in terms of location in District 4? How does this compare to the rest of the city?

Gun violence is dispersed throughout District 4, affecting numerous neighborhoods within its boundaries. In comparison to the rest of the city, District 4 exhibits a higher density of incidents, highlighting the urgency of addressing this issue in the area. This stark contrast emphasizes the need for a comprehensive analysis of the factors contributing to gun violence in District 4 and the implementation of targeted solutions to create a safer community for its residents.

In district 4, washington street has most number of shooting occur. And we list top 10 shooting street and the location for top 5.

[Figure 2]
(This histogram is top 10 street where most shooting event happened in district 4.)
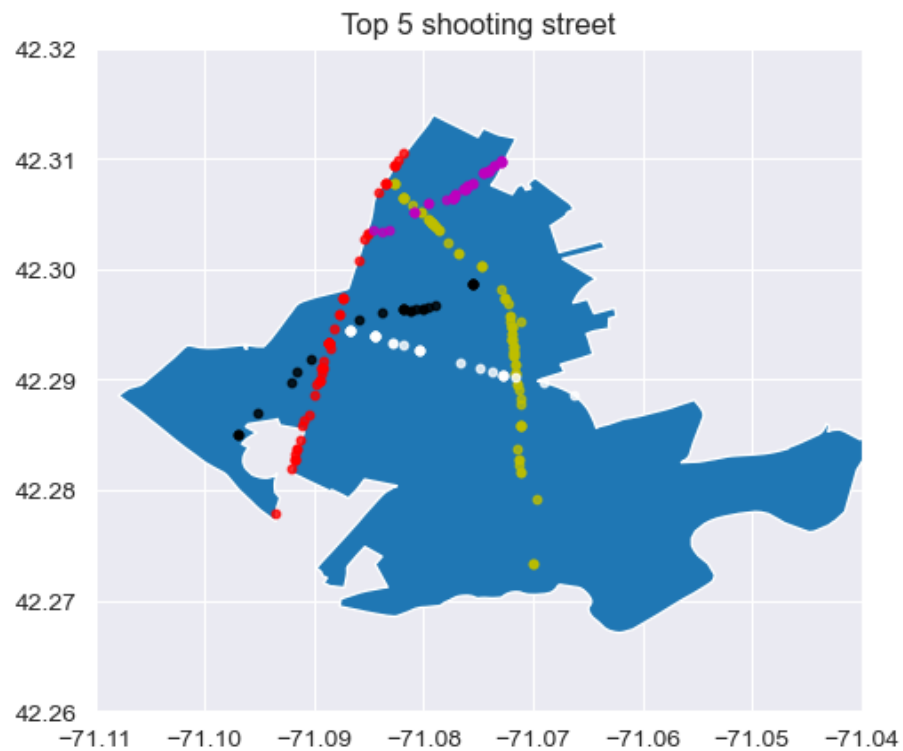
[Figure 3]
(This graph is the shape of district 4, and the scatter point on the graph is the location of the shooting events in the top 5 shooting street
The yellow scatter points are shooting on washington street
The red scatter points are shooting on blue hill ave
The magenta scatter points are shooting on columbia rd.
The white scatter points are shooting on talbot ave.
The black scatter points are shooting on harvard st)

Are there patterns in terms of type of violence in District 4? How does this compare to the rest of the city?

The top 6 proportion for type of violence in D4 are Aggravated Assault, Homicide ,Warrant Arrests, Robbery, Ballistics, Firearm Violations. And the top 6 proportion for type of violence in Rest cities are Aggravated Assault, Homicide, Warrant Arrests, Ballistics, Firearm Violations, Search Warrants. As we can see the proportion of robbery in D4 is higher than the proportion in the rest of the cities. There is no police station inside the D4 might be a potential cause.
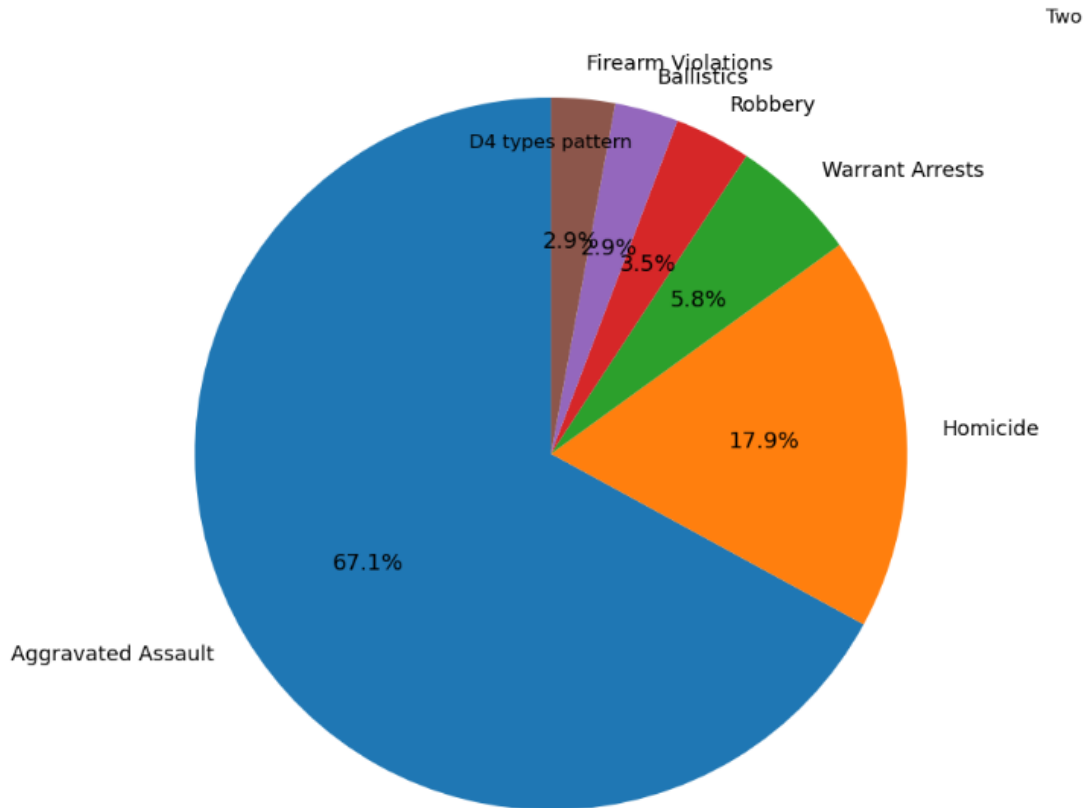
[Figure 4.1]
(This pie chart is showing the proportion of shooting crime in disctirct 4)
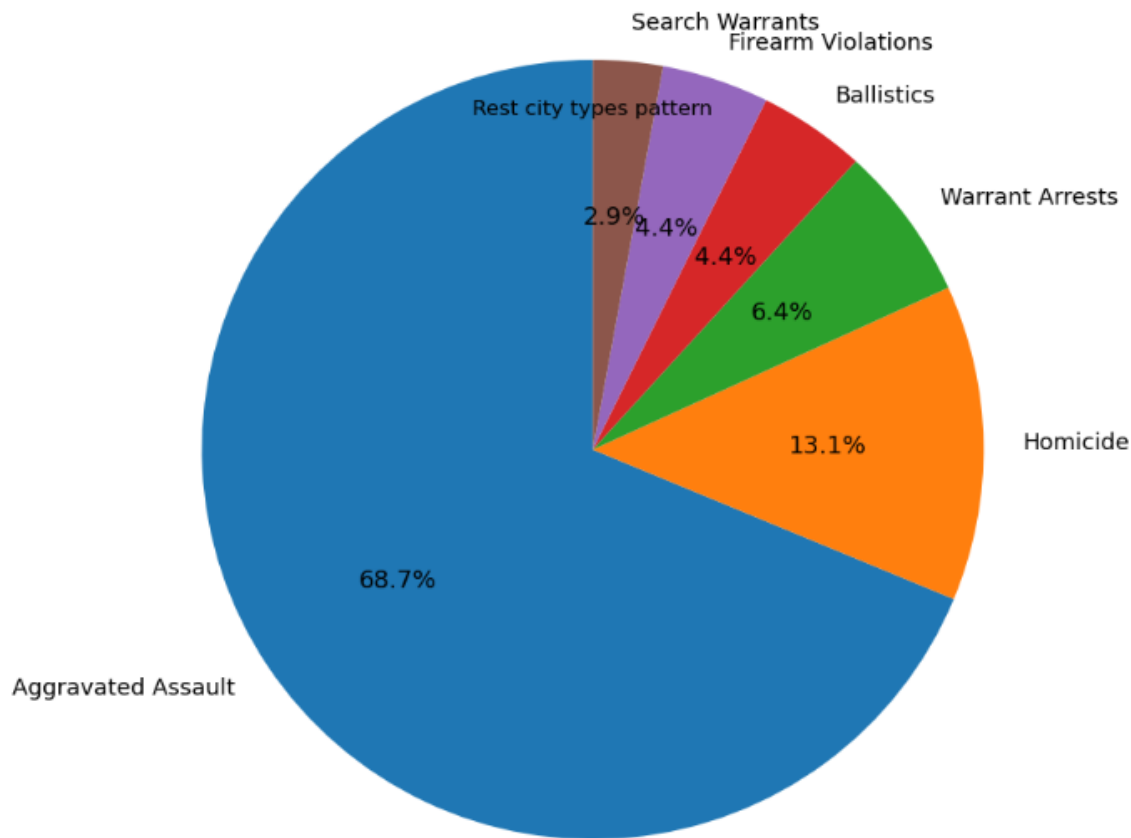
[Figure 4.2]
(This pie chart is the type of shooting crime in the rest of cities)
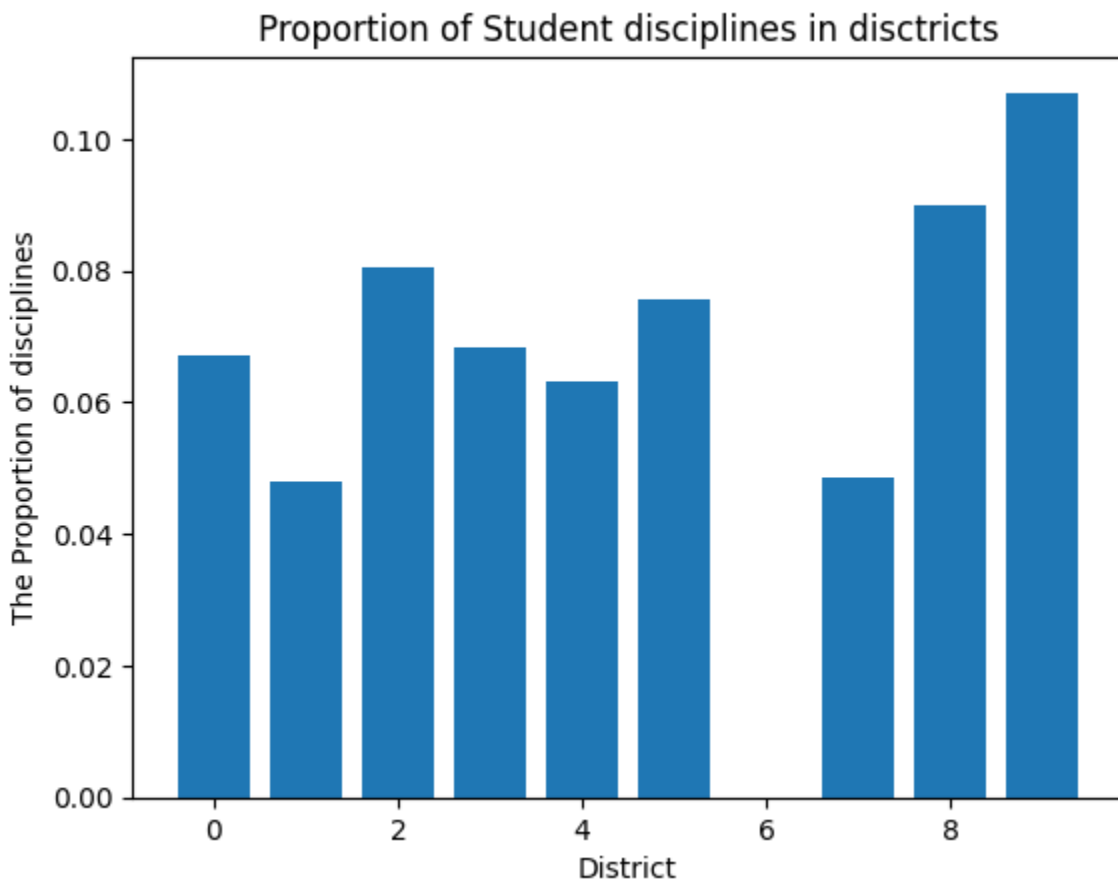
Extension Analysis

School part:

In the school part, we use the datasets from Department of Elementary and Secondary Education(DESE) in Massachusetts. Generally, I have about 300 to 400 data in each dataset, and we filter out the schools in Boston. We first locate all schools in Boston by checking the zipcode. We found that there're around 30 schools in Boston. Then, we search each school one by one and identify the district area they belong to. Finally, we successfully find four schools in district 4: Brooke Charter School, Codman Academy Charter Public, KIPP Academy Boston Charter School, and UP Academy Charter School of Dorchester. For other districts, we find 1 to 5 schools expect Distrct 6

After cleaning the dataset, we start to find the features that possibly relates to the gun violence. Based on the data we have, we mainly analyze the following aspects: school discipline, attendance, enrollment, and performance.
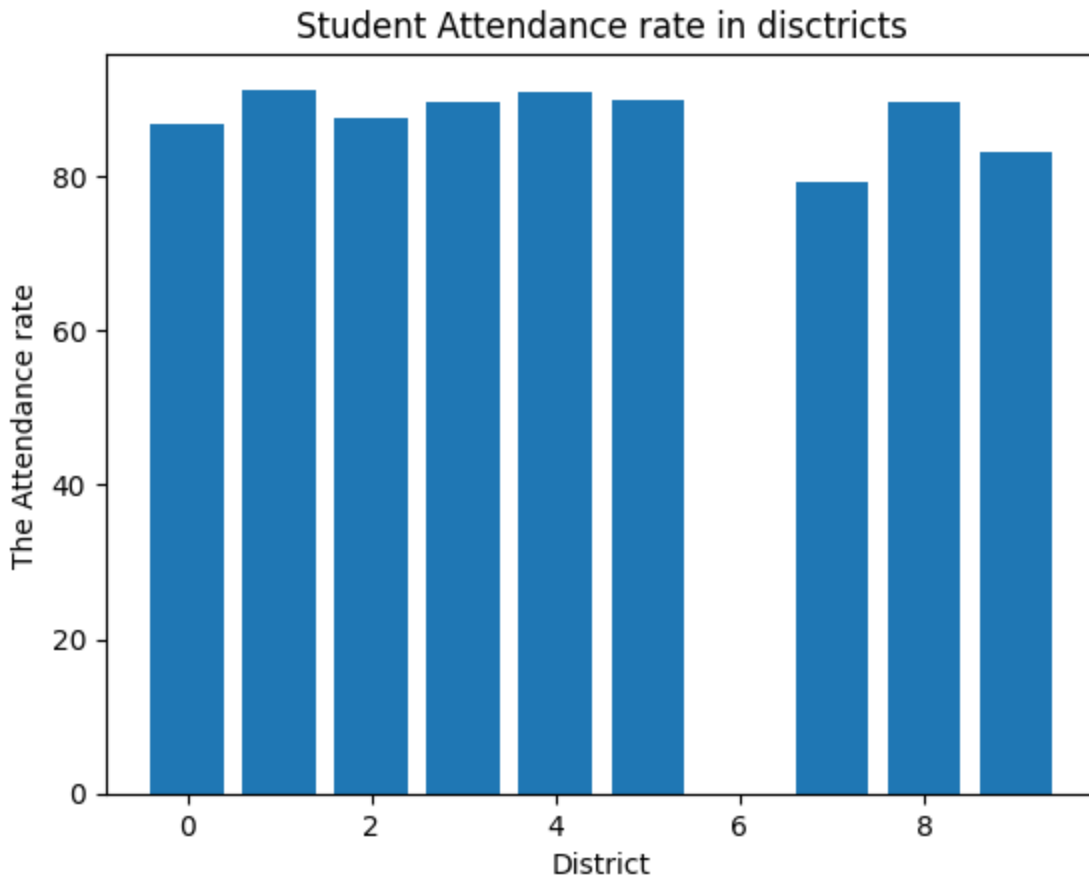
In the following plots, the index 0 represents the expectation value in Boston, and the index 1 - 9 represents the Distrct 1 to 9.
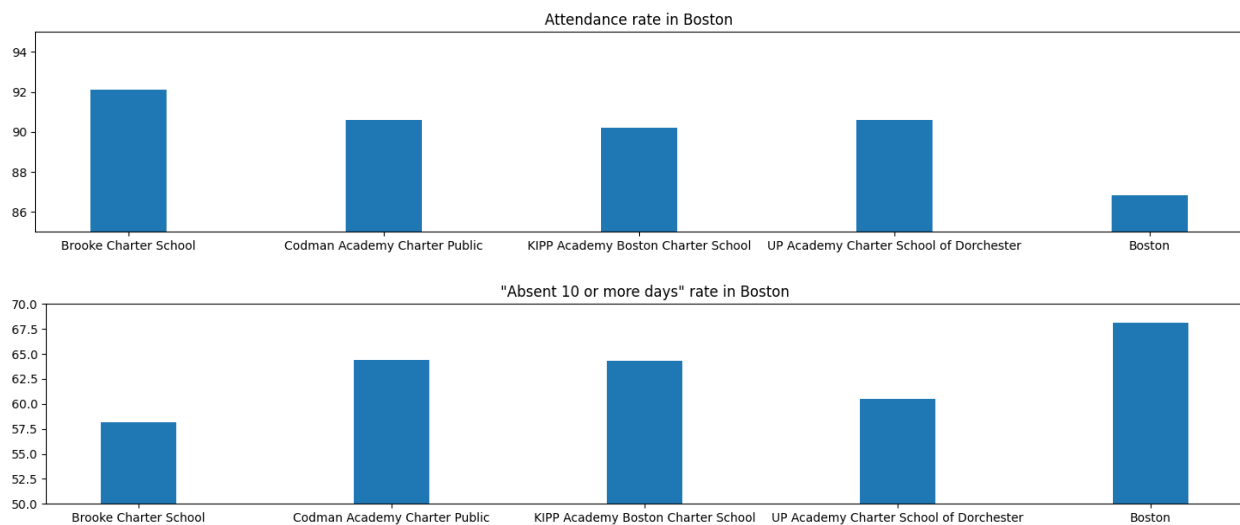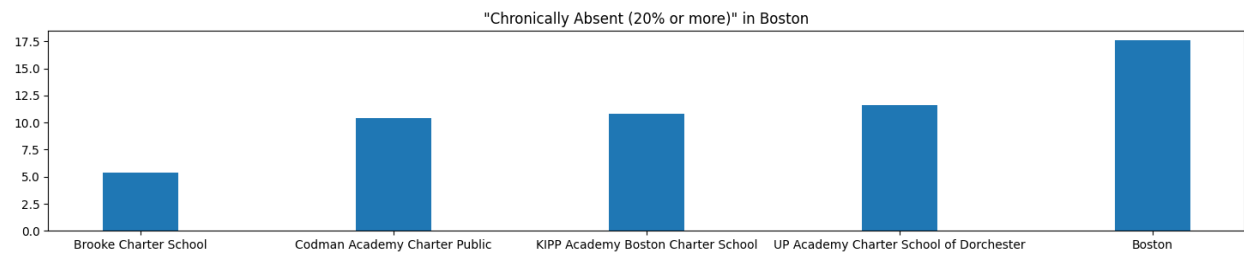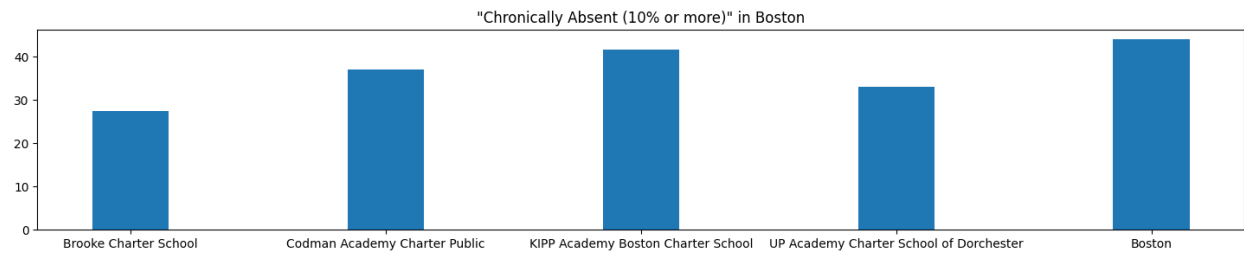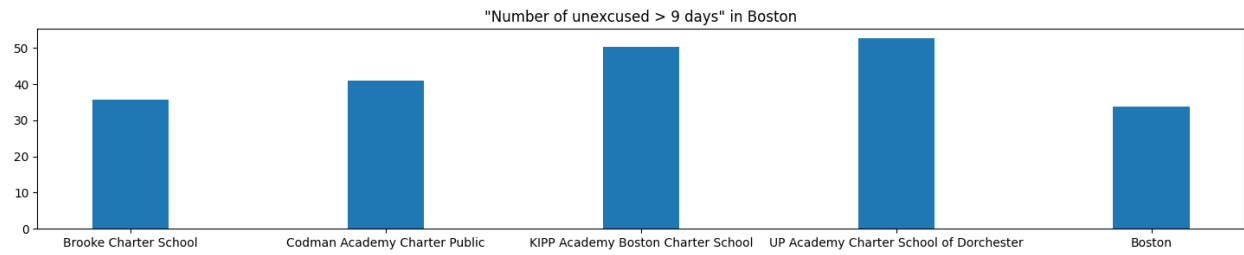
School Discipline:

School Attendance:

Student Attendance rate in disctricts
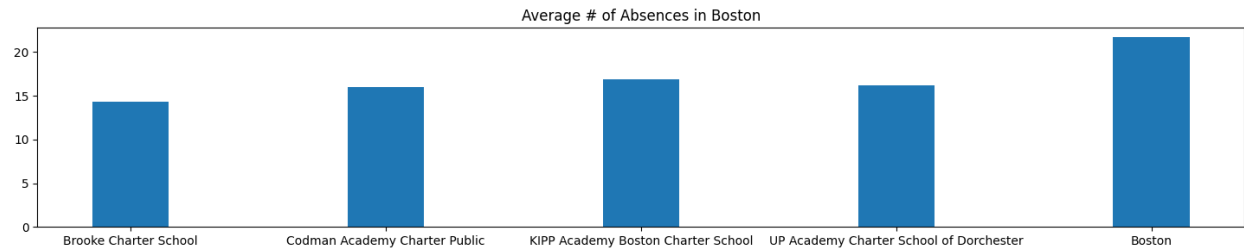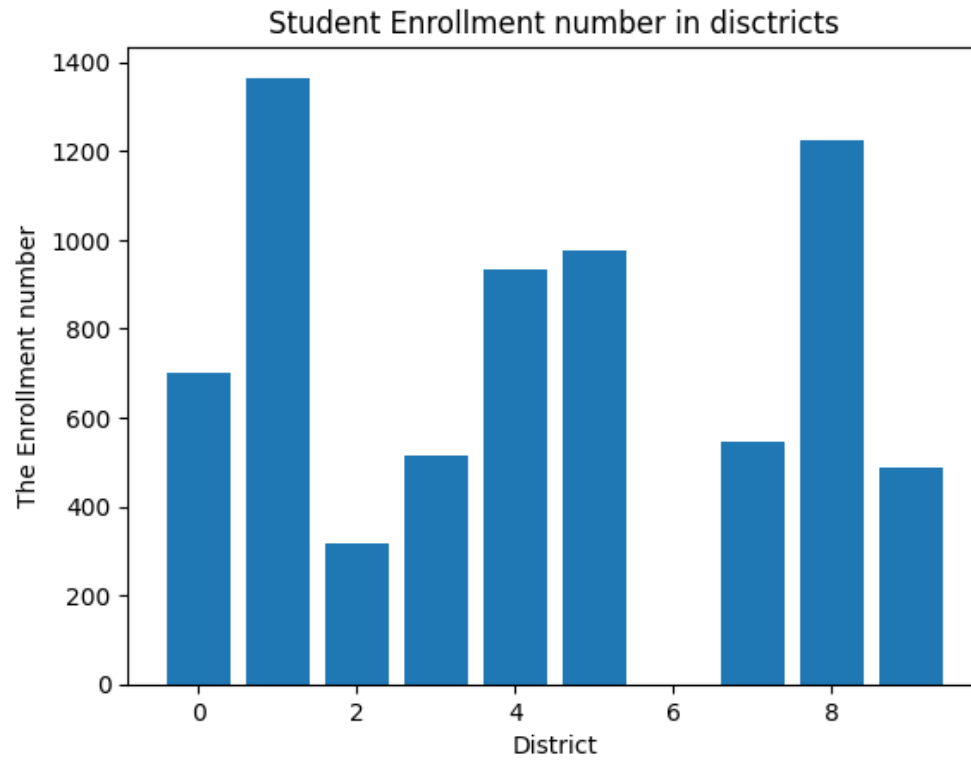
Attendance rate of schools in District 4 compared to Boston

Attendance rate in Boston

"Absent 10 or more days" rate in Boston

Average # of Absences in Boston

"Number of unexcused > 9 days" in Boston

"Chronically Absent (10% or more)" in Boston

"Chronically Absent (20% or more)" in Boston

School Enrollment:

Student Enrollment number in disctricts

School Performance:

Graduation rate in Boston

Dropped Out rate in Boston

SAT Performance in Boston

	Brooke Charter School	Codman Academy Charter Public	Boston
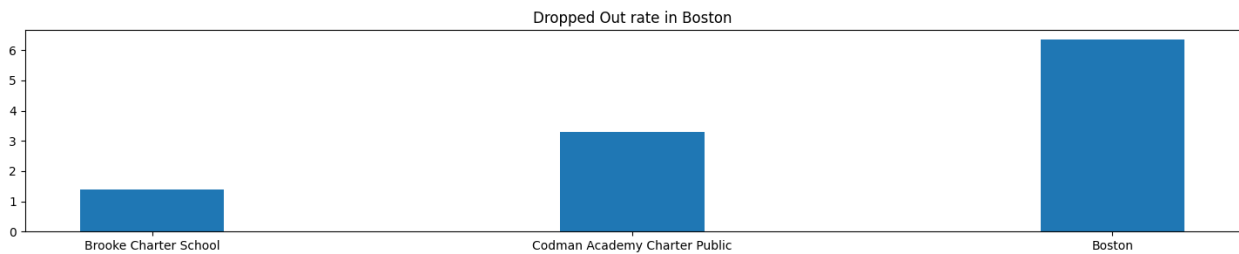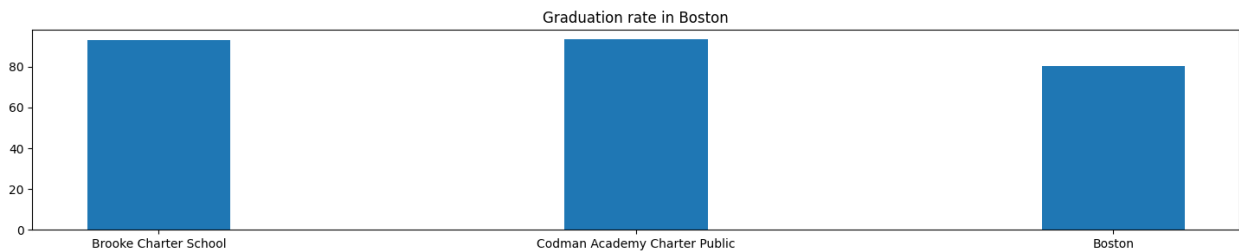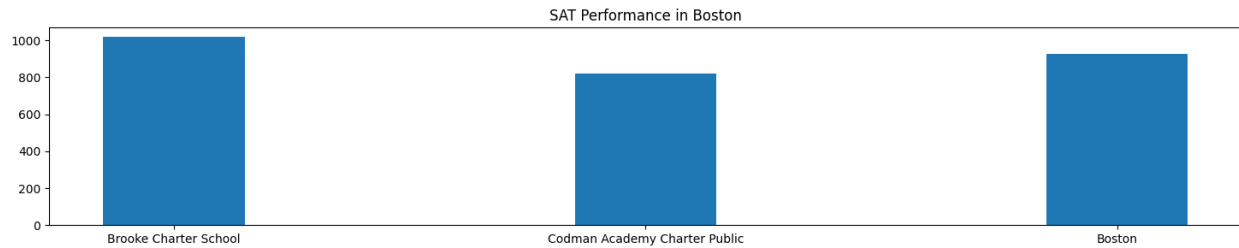
**Does transportation have impact on Gun Violence?**

Although there are various factors that may contribute to the prevalence of gun violence in schools, it appears that higher attendance rates and less absence do not have an obvious positive impact on reducing gun violence. Similarly, a decrease in the number of chronically absent students does not necessarily lead to a notable reduction in such incidents. Reducing absenteeism, in general, does not seem to have a clear, positive correlation with decreased gun violence either. However, it is important to note that lower enrollment rates may potentially lead to a negative effect on gun violence, as smaller student populations might create an environment that fosters increased tensions or feelings of isolation, which could contribute to violent incidents. Further research is needed to better understand the complex relationship between school attendance, enrollment, and gun violence.

We also analyze the the MBTA stops in each district compare to the shooting events.

MBTA stops proportion compare vs. shooting proportion in each district
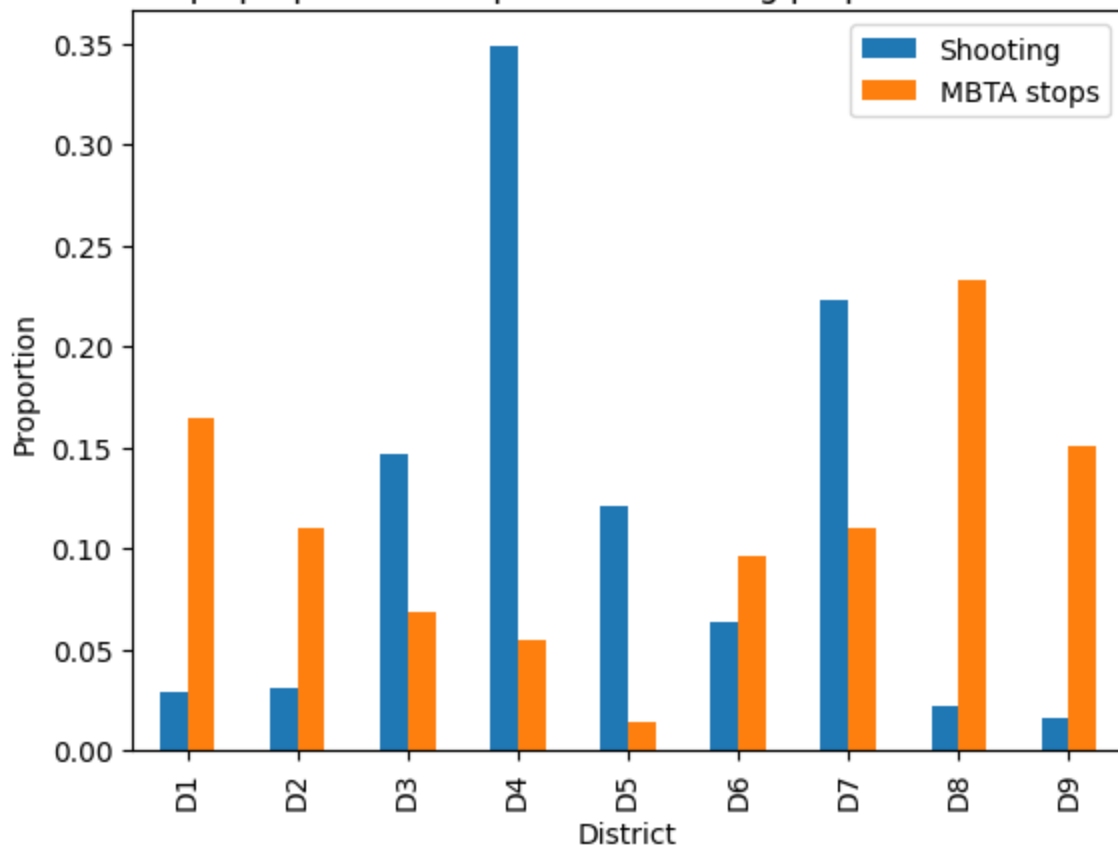
Challenges

There are many challenges associated with this project. One of them is the absence of geographical information for certain data sets, making it difficult to represent them on a map. Additionally, some data sets have different geographical naming conventions, making it challenging to establish correlations. Worse, some of them do not have longitude and latitude information, which lead to another problem: not able to classify the shooting event to each district. Especially for highly similar district D4 and D7 (overlap zipcode). Thus, this might lead to data inaccuracy. One objective we would like to have is to identify the relationship between the volume of pedestrian traffic and the incidence of shootings in a city, but unfortunately, we could not locate any data containing this information.

Team Member Contribution

Jialin Yu: Analyze Shape Dataset, and building shape plots that later are being used. Comparing the population distribution in different districts, shootings and crime locations in D4. Analyze relationship between location of police station and location of crime, including shootings events. Benchmarking the relationship between the number of MBTA stops with the frequency of shootings.

Yujie Yan: Collected the crime inccident from 2015 to 2021. Proccessed the data by filtering out shooting events and extracting the location for each incident. Identify the top 5 street with the highest shooting rate in district4. Plot the identified street on district4 map. Identify the pattern of crime in district 4 and rest of cities.

Jiahang Li: Violent & Crime Part, established what violence looks like in D4 and the whole city, extension data for school.

Youheng Yang: finished the Firearm transaction and analyzed the school district part.