# Deliverable 4

## 1. Background + Motivation (what is this project about, who will use it, for what purpose, in what context etc.)

The goal of the project as a whole is to evaluate whether the city's funding is equitably distributed. A project of this scope advocates for positive change in the Boston community. What makes this project intriguing is that "equity" is the driving force behind the distribution. It ensures that the money is not being allocated to the "overarching community" but to those truly in need of the funds. We chose this project because it allows us to analyze the deciding factors that play a role in these distributions. It is important to analyze where the funds that we provide for the less fortunate in our neighborhoods actually end up. Through analysis of that data we can determine whether a redistribution of funds is necessary; e.g. we may need to add additional funds to a certain area or see if funds are being directed into the wrong hands. As members of the Boston community, it is necessary for us to be proactive and conscious of the factors that impact our environment.

## 2. Previous work (have there been other / different attempts toward these goals in the past?)

For this project specifically, money was already being distributed amongst communities in previous years. Our goal was to ensure that the money is being equitably distributed. To the best of our knowledge, this is a new undertaking and in-depth research has not been conducted on this in the past.

## 3. Data collection

We analyzed the census data to determine the communities that we should expect to be targeted by the city's programs and align these findings with our PM. To achieve an equitable distribution of funds, communities of color and poorer communities should be receiving a larger proportion of funds and licenses than wealthier white communities.

We determined that Dorchester, Roxbury, Mattapan, and Hyde Park are the neighborhoods that should receive the largest proportion on funds.

We then analyzed the data on business and liquor licenses administered by the city of Boston. The result showed that Dorchester is the largest receiver of these licenses.

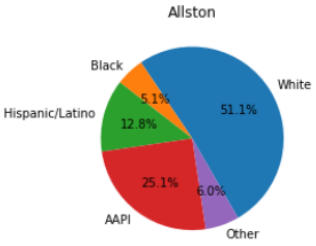
The analysis of the Business Grants dataset also showed Dorchester as the largest receiver of aid. However, by normalizing this data according to population, we can observe that Back Bay and Chinatown/Financial District were actually the largest recipients of the business grants(per capita) throughout the Covid pandemic.

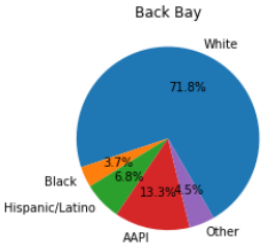
We performed analysis on the Capital Investment dataset for FY21-25 that represents approved and ongoing projects in the city of Boston, including details on the department that is executing the project and the neighborhood it is occurring in. From this data, we can observe behavior of each department in the city of Boston. For example, the Parks and Recreation department has the largest number of ongoing projects, but each project has a small budget compared to the project budgets of other departments. Furthermore, the Parks and Recreation department allocates a smaller total amount of money to Capital Investments than other departments.

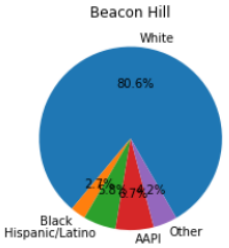
Placeholder from feedback: Analyze the neighborhood each department is most active in.

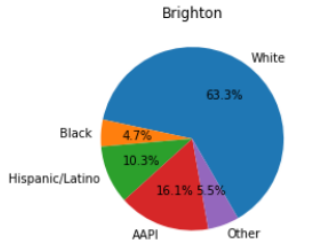
We can see a change in this data from our previously analyzed datasets, as Dorchester does not receive a large number of Capital Investments. In fact, if we normalize this data according to population, we can observe that the Harbor Islands is the largest recipient of Capital Investments by far. Some investigation into these projects shows that many of the approved projects are large renovations to the islands and the bridges connecting them and a planned renovation of the Fire Department Academy located on these islands. This “neighborhood” has a population of 401 people according to the census, so these large projects skewed the normalization significantly. By removing this skew, we can still observe that the target communities are not receiving a significant amount of capital investments compared to neighborhoods like Charlestown.

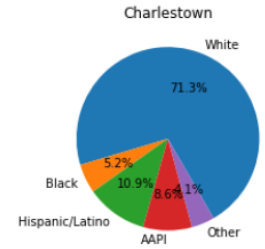
4. Data visualization and exploration

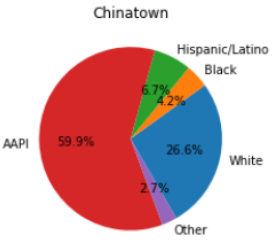


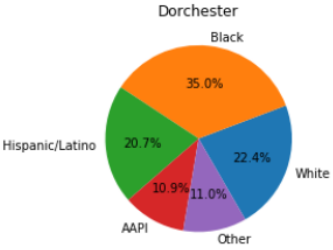



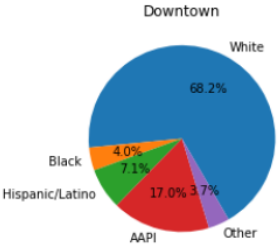



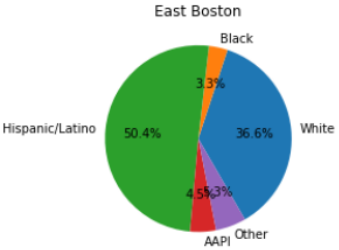



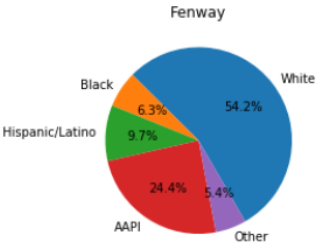



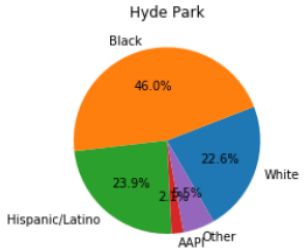



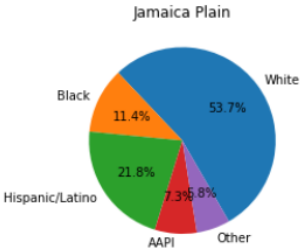



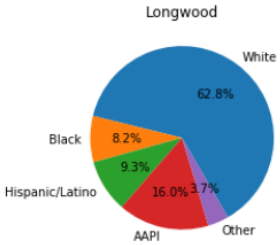



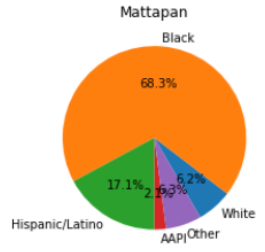



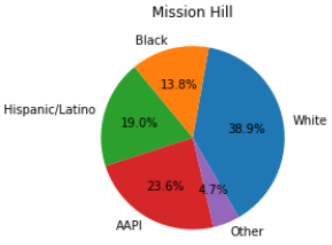



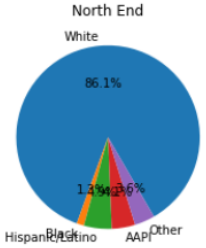



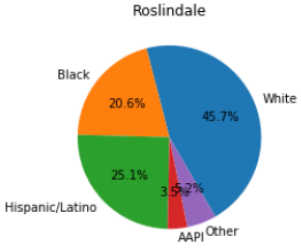



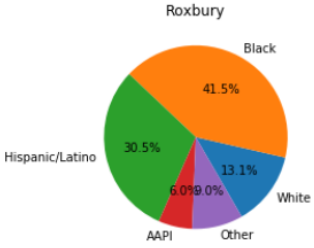



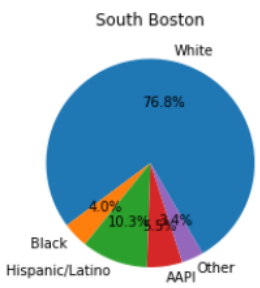



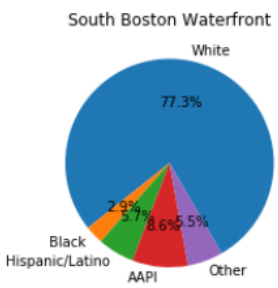



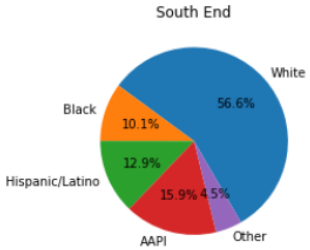



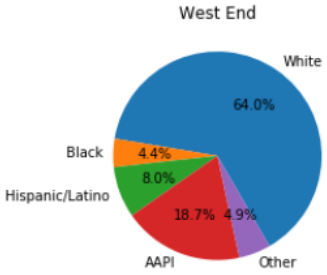



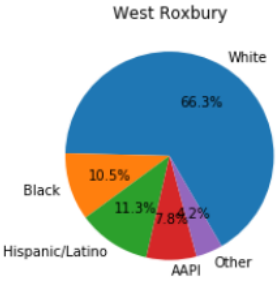



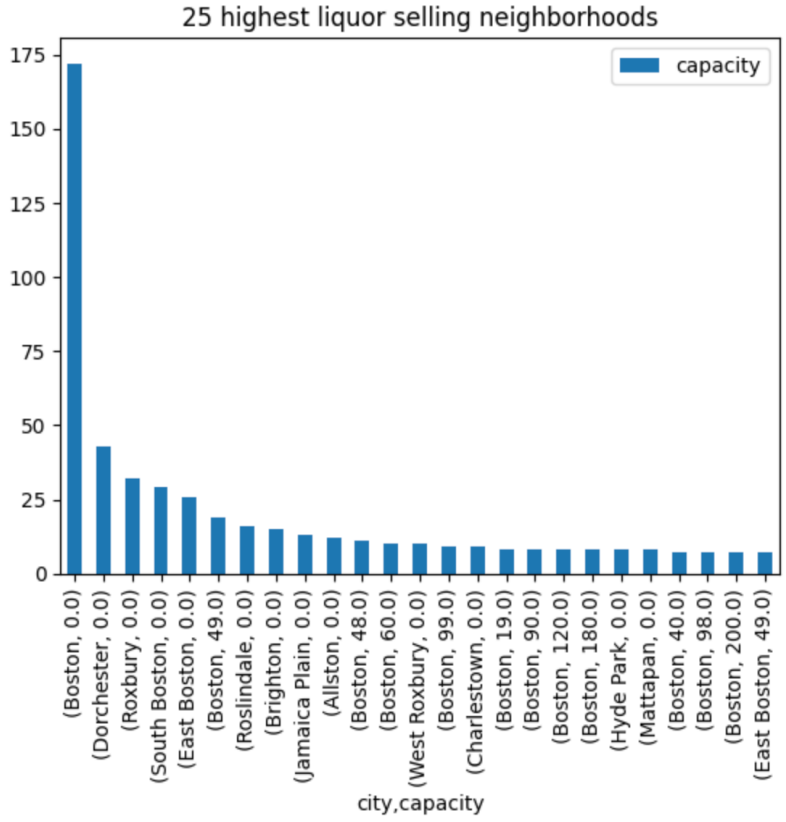

South Boston
White
76.8%
4.0%
10.3%
5.4%
Black
Hispanic/Latino
AAPI
Other

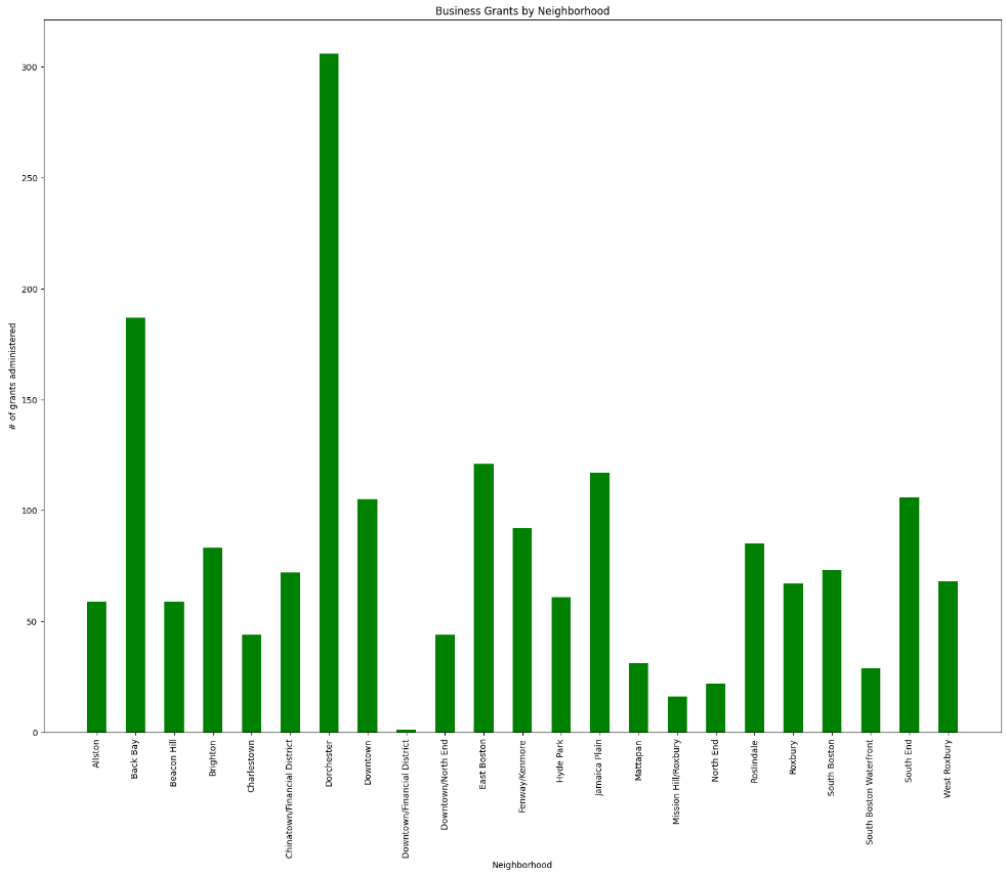

South Boston Waterfront
White
77.3%
2.9%
5.7%
8.6%
5.5%
Black
Hispanic/Latino
AAPI
Other

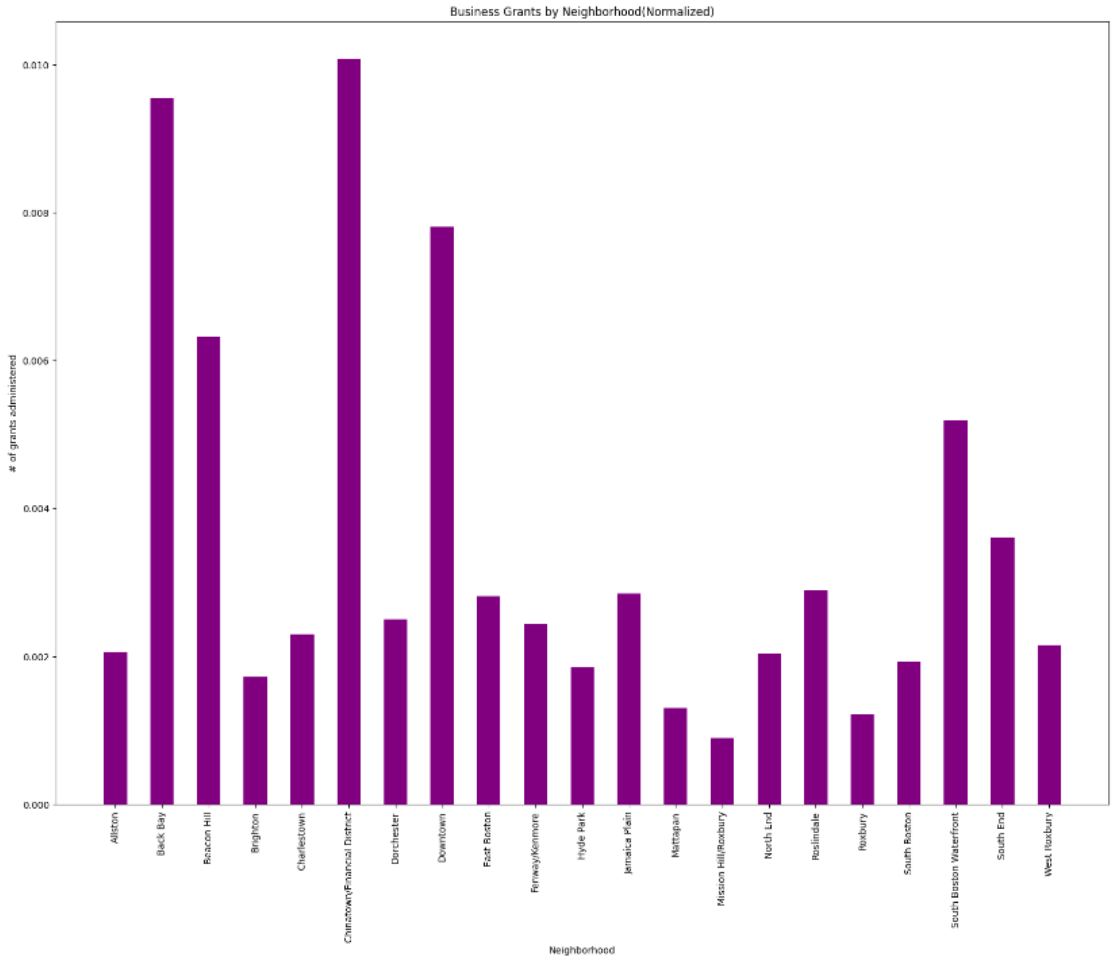

South End
White
56.6%
Black
10.1%
12.9%
Hispanic/Latino
15.9%
4.5%
AAPI
Other

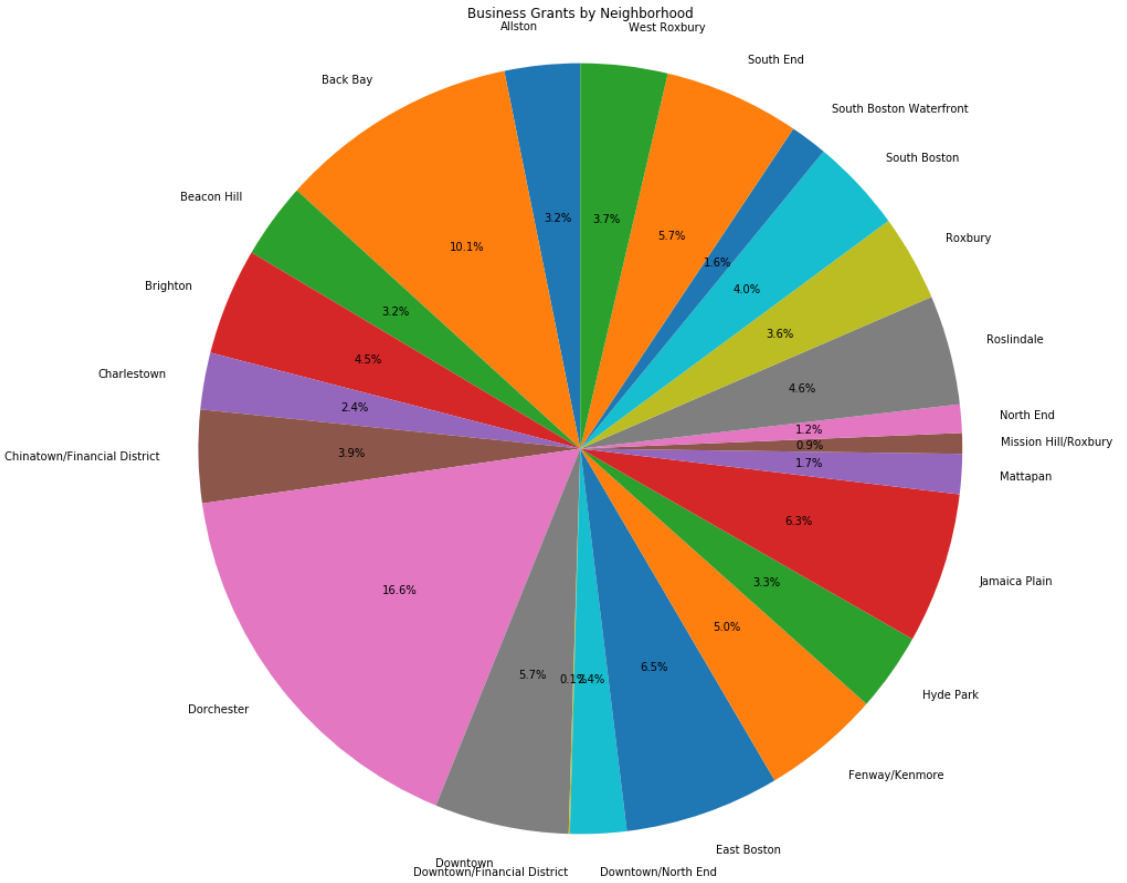

West End
White
64.0%
Black
4.4%
8.0%
Hispanic/Latino
18.7%
4.9%
AAPI
Other

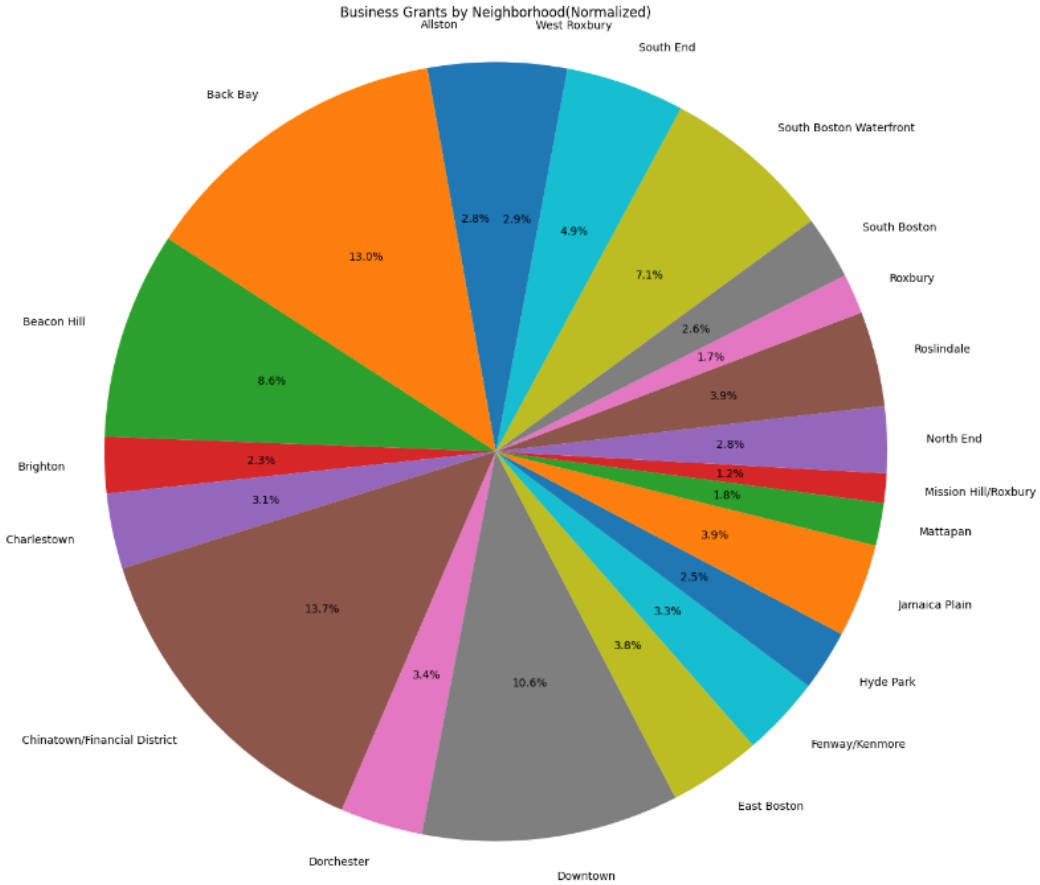

West Roxbury
White
66.3%
Black
10.5%
11.3%
7.8%
4.2%
Hispanic/Latino
AAPI
Other

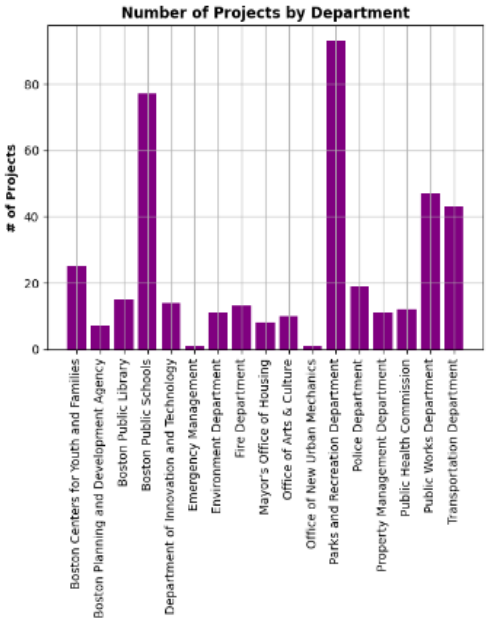

25 highest liquor selling neighborhoods
capacity
175
150
125
100
75
50
25
0
(Boston, 0.0)
(Dorchester, 0.0)
(Roxbury, 0.0)
(South Boston, 0.0)
(East Boston, 0.0)
(Boston, 49.0)
(Roslindale, 0.0)
(Brighton, 0.0)
(Jamaica Plain, 0.0)
(Allston, 0.0)
(Boston, 48.0)
(Boston, 60.0)
(West Roxbury, 0.0)
(Boston, 99.0)
(Charlestown, 0.0)
(Boston, 19.0)
(Boston, 90.0)
(Boston, 120.0)
(Boston, 180.0)
(Hyde Park, 0.0)
(Mattapan, 0.0)
(Boston, 40.0)
(Boston, 98.0)
(Boston, 200.0)
(East Boston, 49.0)
city,capacity

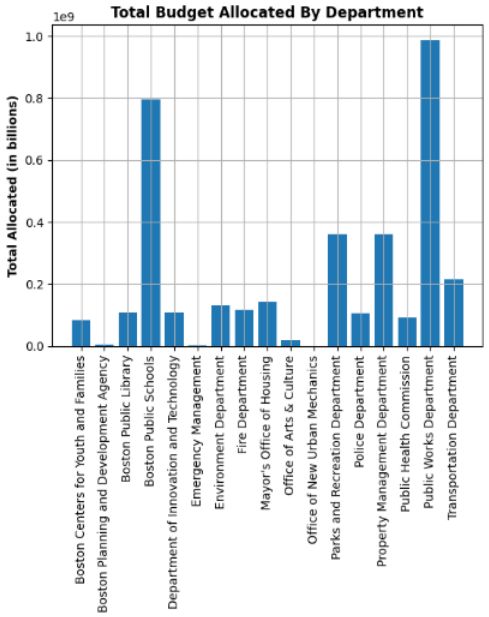

Business Grants by Neighborhood
# of grants administered
0
50
100
150
200
250
300
Allston
Back Bay
Beacon Hill
Brighton
Charlestown
Chinatown/Financial District
Dorchester
Downtown
Downtown/Financial District
Downtown/North End
East Boston
Fenway/Kenmore
Hyde Park
Jamaica Plain
Mattapan
Mission Hill/Roxbury
North End
Roslindale
Roxbury
South Boston
South Boston Waterfront
South End
West Roxbury
Neighborhood

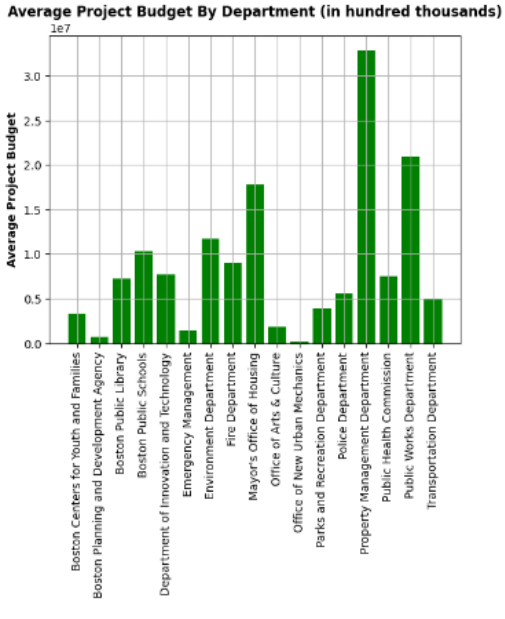

Business Grants by Neighborhood(Normalized)
# of grants administered
0.000
0.002
0.004
0.006
0.008
0.010
Allston
Back Bay
Beacon Hill
Brighton
Charlestown
Chinatown/Financial District
Dorchester
Downtown
East Boston
Fenway/Kenmore
Hyde Park
Jamaica Plain
Mattapan
Mission Hill/Roxbury
North End
Roslindale
Roxbury
South Boston
South Boston Waterfront
South End
West Roxbury
Neighborhood

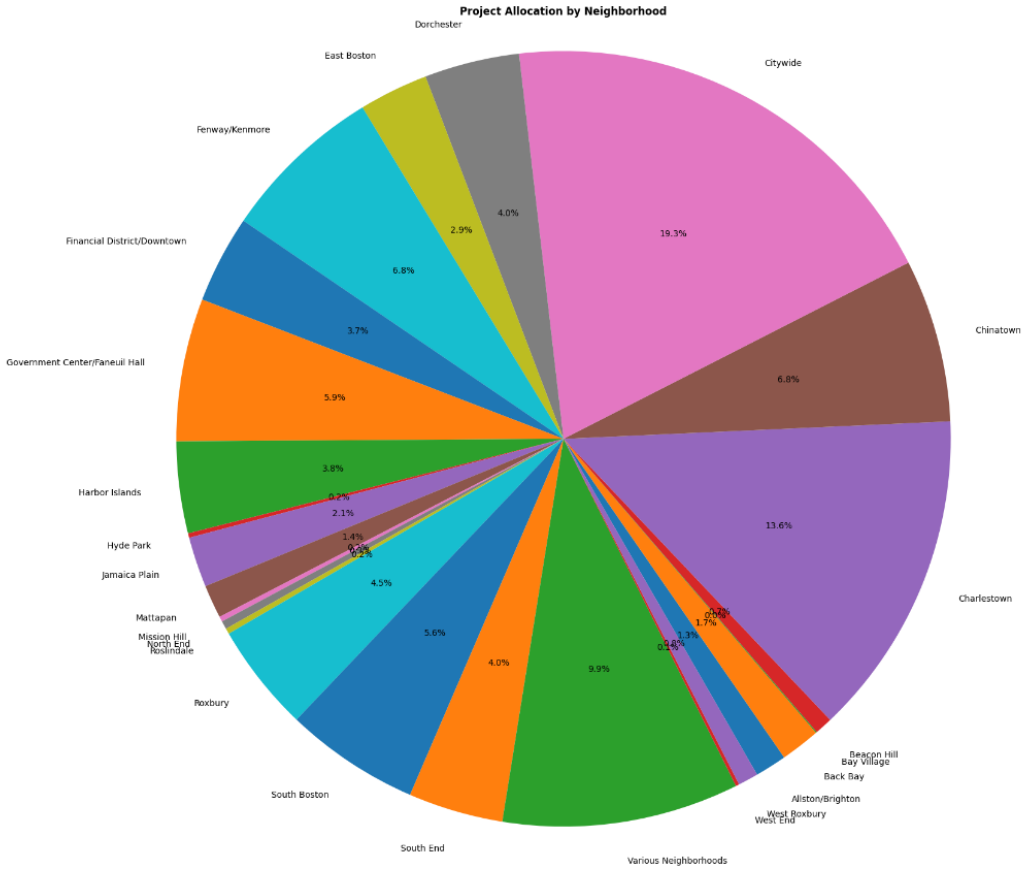

Business Grants by Neighborhood
Allston
West Roxbury
South End
South Boston Waterfront
South Boston
Roxbury
Roslindale
North End
Mission Hill/Roxbury
Mattapan
Jamaica Plain
Hyde Park
Fenway/Kenmore
East Boston
Downtown/North End
Downtown/Financial District
Downtown
Dorchester
Chinatown/Financial District
Charlestown
Brighton
Beacon Hill
Back Bay
3.2%
3.7%
5.7%
1.6%
4.0%
3.6%
4.6%
1.2%
0.9%
1.7%
6.3%
3.3%
5.0%
6.5%
2.4%
0.1%
5.7%
16.6%
3.9%
2.4%
4.5%
3.2%
10.1%

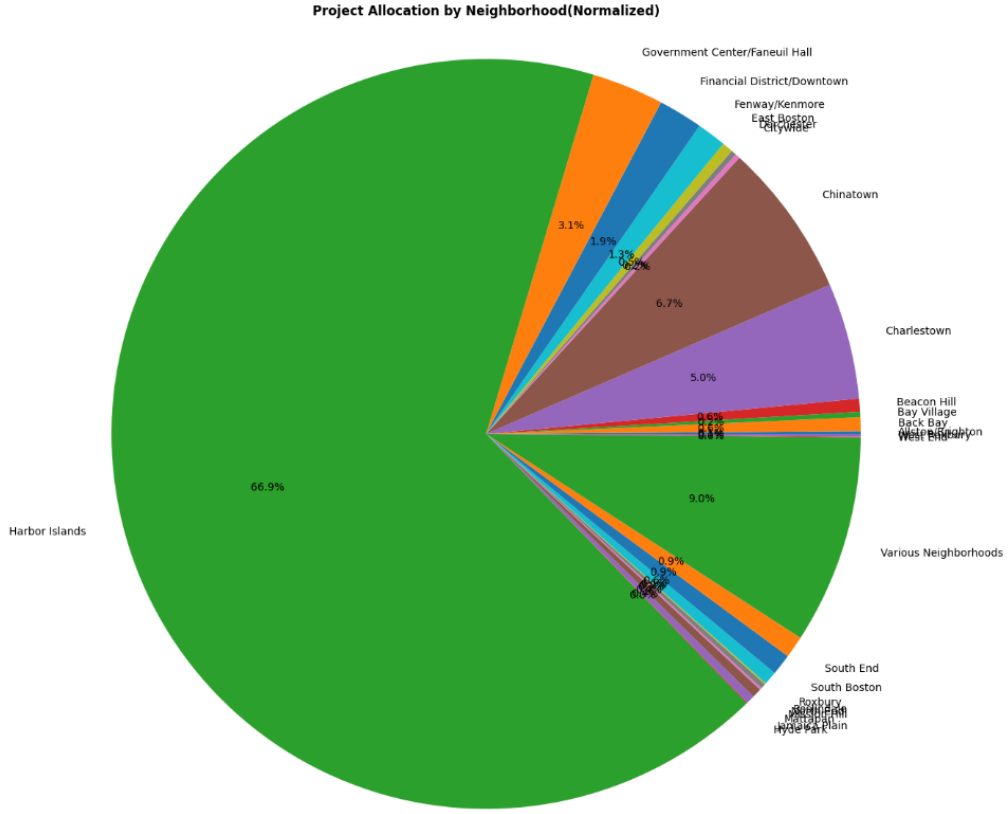

Business Grants by Neighborhood(Normalized)
Allston
West Roxbury
South End
South Boston Waterfront
South Boston
Roxbury
Roslindale
North End
Mission Hill/Roxbury
Mattapan
Jamaica Plain
Hyde Park
Fenway/Kenmore
East Boston
Downtown
Dorchester
Chinatown/Financial District
Charlestown
Brighton
Beacon Hill
Back Bay
2.8%
2.9%
4.9%
7.1%
2.6%
1.7%
3.9%
2.8%
1.2%
1.8%
3.9%
2.5%
3.3%
3.8%
10.6%
3.4%
13.7%
3.1%
2.3%
8.6%
13.0%

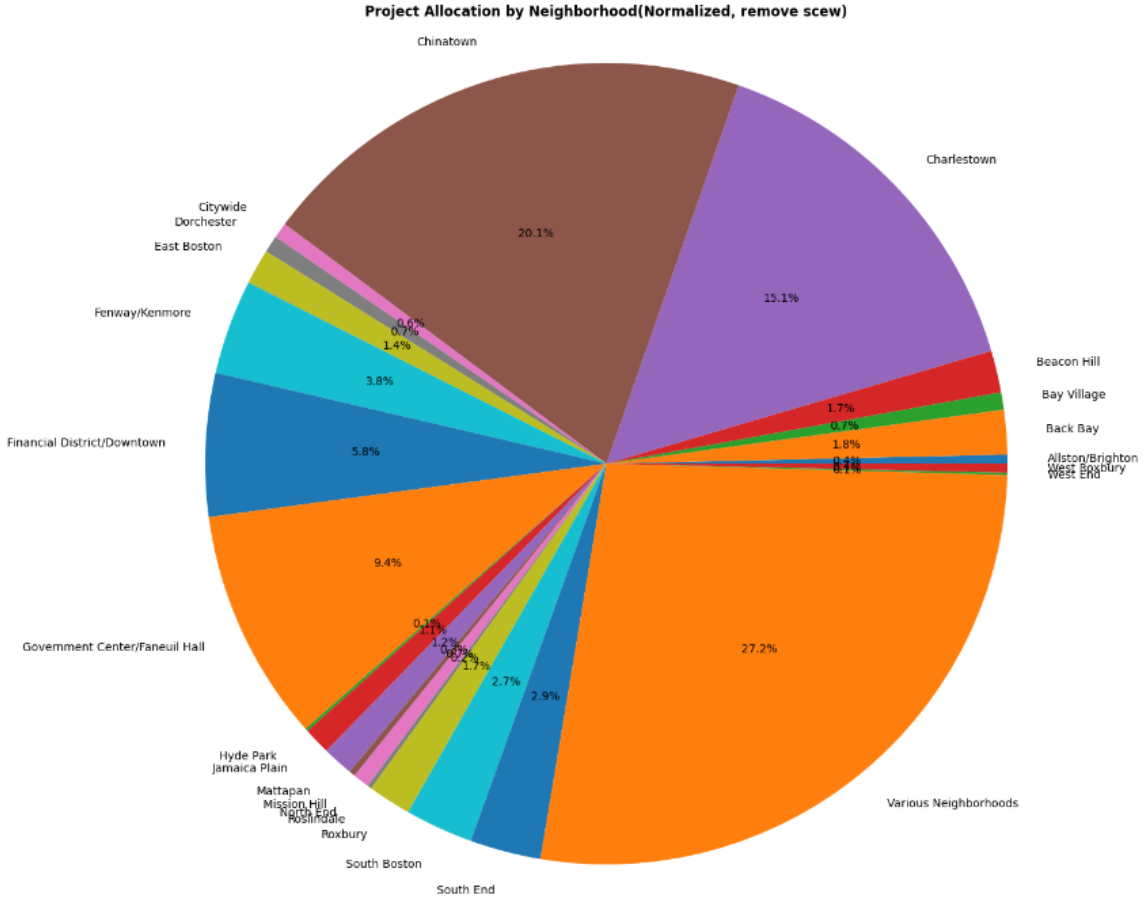

Number of Projects by Department
# of Projects
0
20
40
60
80
Boston Centers for Youth and Families
Boston Planning and Development Agency
Boston Public Library
Boston Public Schools
Department of Innovation and Technology
Emergency Management
Environment Department
Fire Department
Mayor's Office of Housing
Office of Arts & Culture
Office of New Urban Mechanics
Parks and Recreation Department
Police Department
Property Management Department
Public Health Commission
Public Works Department
Transportation Department


Total Budget Allocated By Department
1e9
Total Allocated (in billions)
0.0
0.2
0.4
0.6
0.8
1.0
Boston Centers for Youth and Families
Boston Planning and Development Agency
Boston Public Library
Boston Public Schools
Department of Innovation and Technology
Emergency Management
Environment Department
Fire Department
Mayor's Office of Housing
Office of Arts & Culture
Office of New Urban Mechanics
Parks and Recreation Department
Police Department
Property Management Department
Public Health Commission
Public Works Department
Transportation Department

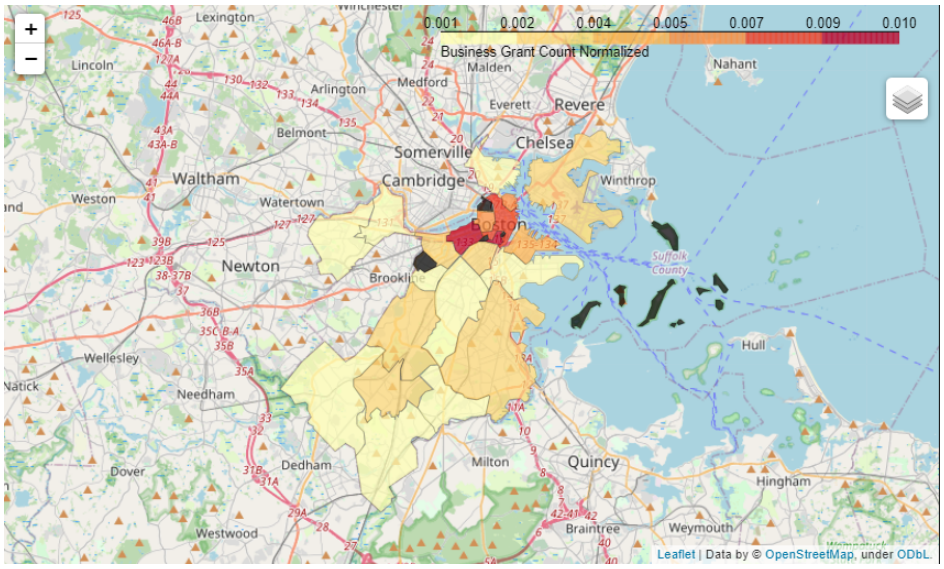

Average Project Budget By Department (in hundred thousands)
1e7
Average Project Budget
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Boston Centers for Youth and Families
Boston Planning and Development Agency
Boston Public Library
Boston Public Schools
Department of Innovation and Technology
Emergency Management
Environment Department
Fire Department
Mayor's Office of Housing
Office of Arts & Culture
Office of New Urban Mechanics
Parks and Recreation Department
Police Department
Property Management Department
Public Health Commission
Public Works Department
Transportation Department


Project Allocation by Neighborhood
Dorchester
East Boston
Citywide
Fenway/Kenmore
Financial District/Downtown
Government Center/Faneuil Hall
Harbor Islands
Hyde Park
Jamaica Plain
Mattapan
Mission Hill
North End
Roslindale
Roxbury
South Boston
South End
Various Neighborhoods
West End
West Roxbury
Allston/Brighton
Back Bay
Beacon Hill
Bay Village
Charlestown
Chinatown
19.3%
6.8%
13.6%
9.9%
4.0%
5.6%
4.5%
6.8%
3.7%
5.9%
3.8%
2.9%
4.0%


Project Allocation by Neighborhood(Normalized)
Government Center/Faneuil Hall
Financial District/Downtown
Fenway/Kenmore
East Boston
Chinatown
Charlestown
Beacon Hill
Bay Village
Back Bay
Harbor Islands
Various Neighborhoods
South End
South Boston
Roxbury
3.1%
1.9%
6.7%
5.0%
66.9%
9.0%
0.9%

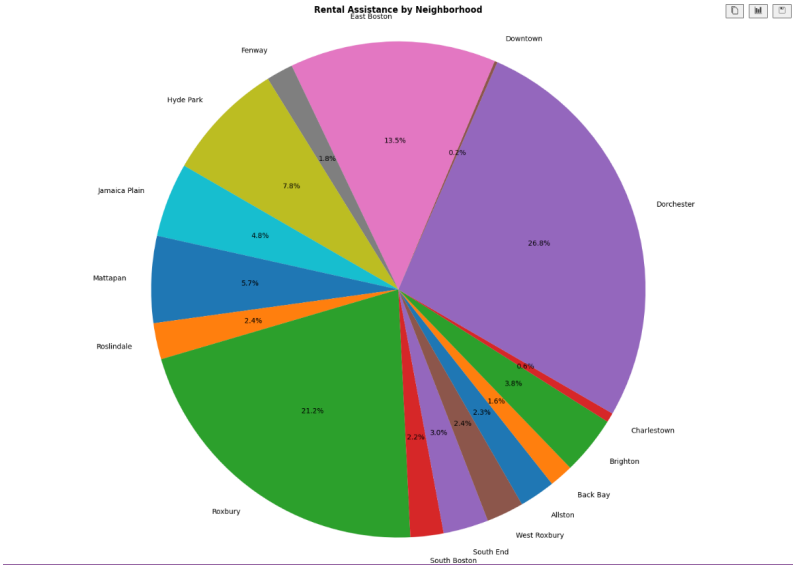

Project Allocation by Neighborhood(Normalized, remove scew)
Chinatown
Charlestown
Citywide
Dorchester
East Boston
Fenway/Kenmore
Financial District/Downtown
Beacon Hill
Bay Village
Back Bay
Government Center/Faneuil Hall
Hyde Park
Jamaica Plain
Mattapan
Roxbury
South Boston
South End
Various Neighborhoods
20.1%
15.1%
3.8%
5.8%
9.4%
27.2%
2.9%
2.7%

Heatmap for the amount of business grants given to each neighborhiid normalized for population :

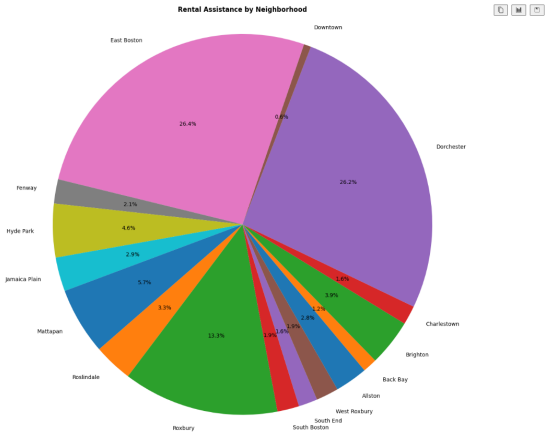



We also analyzed the rental assistance funds:

April 2021 - September 2021:



Oct 2020 - Mar 2021




**5. Results obtained / questions answered**

We wanted to answer the question “Where are the city’s economic development licenses? Which communities are benefitting? Which communities are being left out?” We found that most economic development licenses, including liquor, food, and common victualler, which every establishment that has the capabilities of cooking, preparing, and serving food in-house needs, end up going to Boston and the second most go to Dorchester. We also found that business grants are largely allocated to Dorchester and Boston whereas the other neighborhoods are really lacking in these licenses and grants. Boston and Dorchester benefit greatly from this because they get more money flowing into their communities. With more businesses that have more licenses these neighborhoods can attract more people to their community and therefore more money.

We found that pretty much every other boston neighborhood gets left out as we can see from the data above. They do not receive as many grants and licenses and that affects the amount of money going into these neighborhoods from the city.

However, the normalization of the data shows that, while Dorchester receives the highest number of licenses and business grants, they are proportionally not receiving as much as other neighborhoods. In fact, none of the target neighborhoods are receiving an equitable amount of aid from the city.

**6. Interpretation + limitations of results**

Throughout the progress of this project the limitations we went through were that the data was difficult to analyze all together since a lot of the data is not really related and there are a lot of empty columns/missing data. The datasets that we analyzed are very different and each serve a specific purpose for the city of Boston. Many have details associated with their specific purpose but are unrelated to any of the other data. It was difficult to ensure that we were including all the necessary details from each dataset in our analysis.

Some more specific limitations we noticed is the way that all the data is listed is a little bit different, so we have to accommodate for that. For example some data about costs start with a '$' whereas others don't, so when merging the data we had to be careful and watch out for inconsistencies such as that. Furthermore, some datasets categorize their neighborhoods differently. For example, the Harbor Islands is a very significant recipient of Capital Investments, but is not part of the census data for the city of Boston. Furthermore, some of the Capital Investment neighborhoods are grouped together, for example Mission Hill and Roxbury are grouped together in the Business Grants dataset, but Roxbury also has its own independent category. This makes analysis difficult, as Mission Hill is not a target community, so should investments in the "Mission Hill/Roxbury" neighborhood be recognized as equitable investments?

Specifically for the Capital Investments dataset, many of the projects were categorized under "Various Neighborhoods" or "Citywide". This makes it difficult in our analysis to determine whether the funds are hitting the target communities.

**7. Challenges faced**

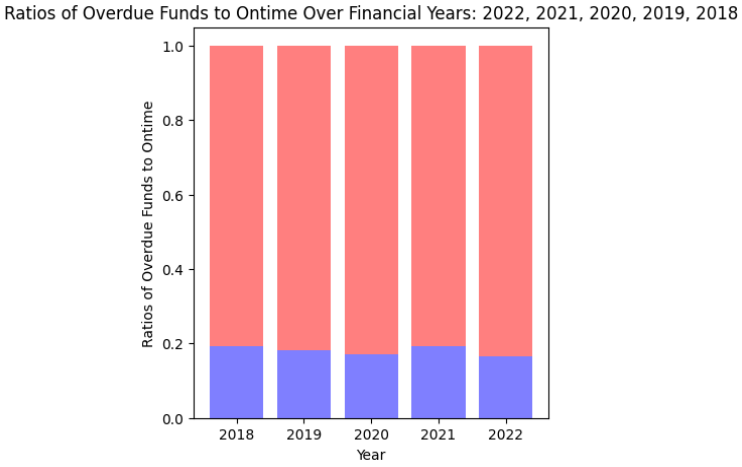
One challenge that we faced was the limited access to data. Our initial idea for the extension project was not able to reach fruition because we were not able to access data of capital investments from years prior. From the survey data, we can see that many Boston residents also want a greater access to the data of the city's budget.

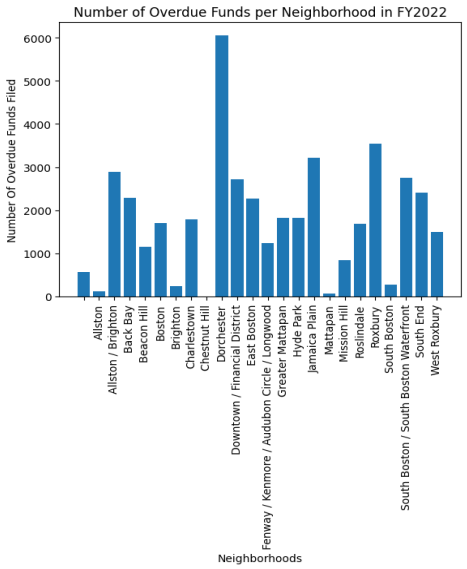
Additionally, we struggled to normalize the data. As stated above, there was some inconsistency with how each dataset labeled each neighborhood. Neighborhoods were sometimes grouped together and some data included sub-neighborhoods/neighborhoods that were not included in the census data. Because of this, knowing the population of the area that a specific dataset was referencing was difficult. For example, The Capital Investments dataset connected Allston and Brighton into one Allston/Brighton neighborhood. To normalize this data, we added the population of these two neighborhoods together. It also included the Harbor Islands, whose population we collected from: https://www.city-facts.com/harbor-islands-long-island-boston.

**8. Explanation of the Extension**

Originally, our team planned on analyzing the behavior of the city's expenditure by department. We intended on looking at historical Capital Investment data and determining to what extent a change in leadership impacts the behavior and spending of each department. However, as mentioned under challenges, we were unable to get access to the appropriate data and thus proceeded with the 311 extension project.

On reviewing the data, we noticed that each request had a column, categorizing the request as either 'ONTIME' or 'OVERDUE'. After walking through the data, we decided to calculate the number of overdue requests per neighborhood. Doing so will help us get a better understanding of which neighborhoods may not be getting sufficient funding, since their service request never got fulfilled. We had data available for years 2011 to 2022, but decided to only use data from the past 5 years to ensure results were as accurate and up to date as possible.



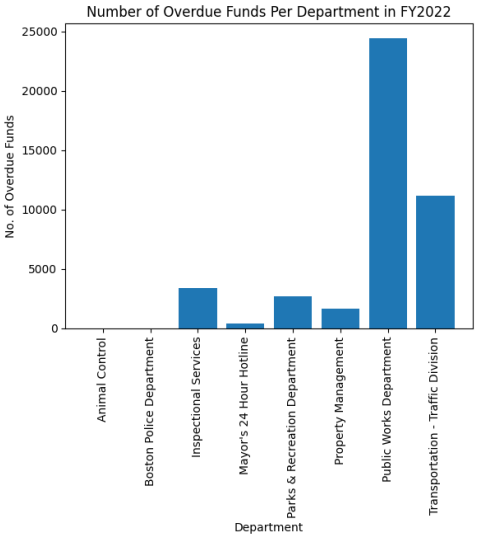




## 9. Suggestions for the future of this project/ Solutions

To pose suitable recommendations and solutions for this project, our team decided to incorporate the needs of the Boston residents and analyze the departments that they believe require more funding. To do so, we made use of the 311 Service Requests data.

As seen in the above graphs, we can use the latest 2022 data to analyze which neighborhoods had the maximum number of overdue service requests. As seen through the data, Dorchester seems to be the neighborhood that has the greatest number of overdue service requests. To make suitable predictions for a more equitable fund distribution, more funds can be distributed to areas with higher number of overdue service requests, such as Dorchester and Roxbury.

We also used the data to figure out which departments need most funding by analyzing the proportions of overdue funds to the number of service requests reported to each department. From the bar plot we can see that the public works department has the largest number of requests reported and largest number overdue requests. Thus, it would be equitable to provide more funds toward the the public works department. We can also see that the Boston Police department and Animal Control department have the least number of overdue service requests. This could mean that the resources provided to these departments are already equitable and do not require major changes.




| | |
|---|---|
| Animal Control | 4 |
| Boston Police Department | 2 |
| Inspectional Services | 3371 |
| Mayor's 24 Hour Hotline | 376 |
| Parks & Recreation Department | 2686 |
| Property Management | 1621 |
| Public Works Department | 24426 |
| Transportation – Traffic Division | 11185 |