CITY BUDGET - TEAM F

Deliverable 2 Presentation

PROBLEM STATEMENT

The overall goal of this project is to analyze the budget of the City of Boston. In the analysis, we will try and understand how the budget is spread across various categories like departments and geography and showcase how it has changed over time.
This project is important because it has the potential to have an impact on the lives of millions of people. This data-driven approach not only ensures efficient use of public funds but also engages citizens in the budgetary process, fostering trust in government and promoting informed governance practices.
This is what motivated our team to opt for this project. It will provide transparency and help demand accountability from the budget planners. By analyzing spending patterns across departments, budget categories, geography, and programs, we can make informed decisions, identify disparities, and evaluate program effectiveness.

DATA COLLECTION

We have worked with these official data sources provided by Boston city government:

- Operating Budget Data : Offers a comprehensive breakdown of annual expenditures, detailing allocations for various departments such as education, police, and housing, and encompassing costs for services and personnel like teachers and firefighters
- Capital Budget Data : Sheds light on large-scale investments in the city's physical assets. It elaborates on funding sources, from bonds to grants, and provides explicit project descriptions and allocations.
- Revenue data : Gives details of the revenue generated by Boston City which supports the City Budget.
- Socio-economic data : This dataset provides a thorough exploration of the demographics in each neighborhood, offering an in-depth analysis of race, poverty rates, and household income.

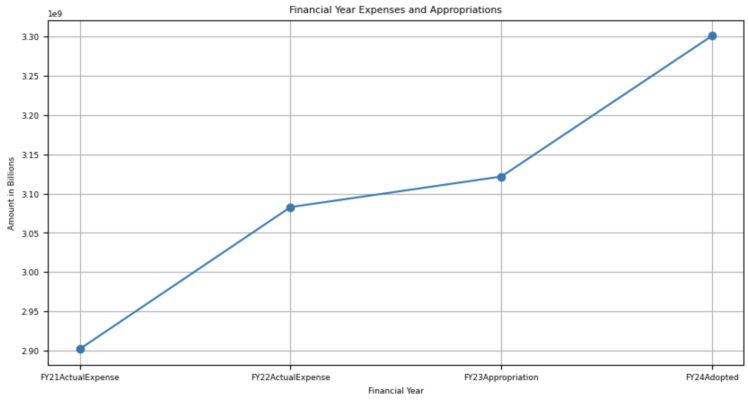
DATA CLEANING

We have removed rows which had even 1 column value that was missing or erroneous.

1. Changed column names - remove spaces
2. Remove extra spaces from values
3. Replace #missing with Nulls

EXPLORATORY DATA ANALYSIS

Figure 1 shows the total Operating budget over the years. There has been a 7.5% increment from 2021 to 2023.
The Capital Budget data has the budget allocation for a project for the first year (2024), the combined budget for the next 4 years as well as the total budget approved for the project. (As shown in figure 2)



Comparison of the Operating and Capital Budget for 2024 shows that Capital budget is a very small portion(~18% of the overall city budget)

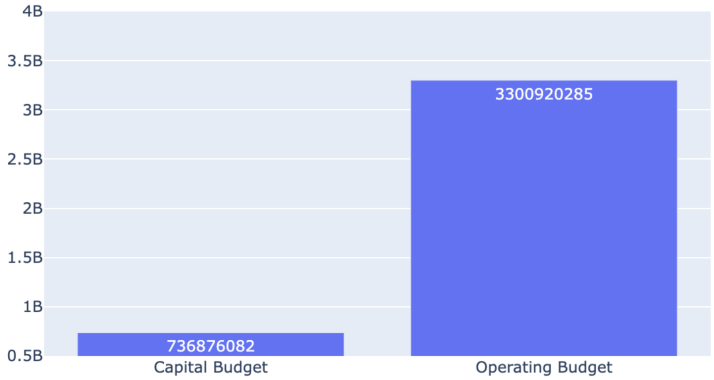
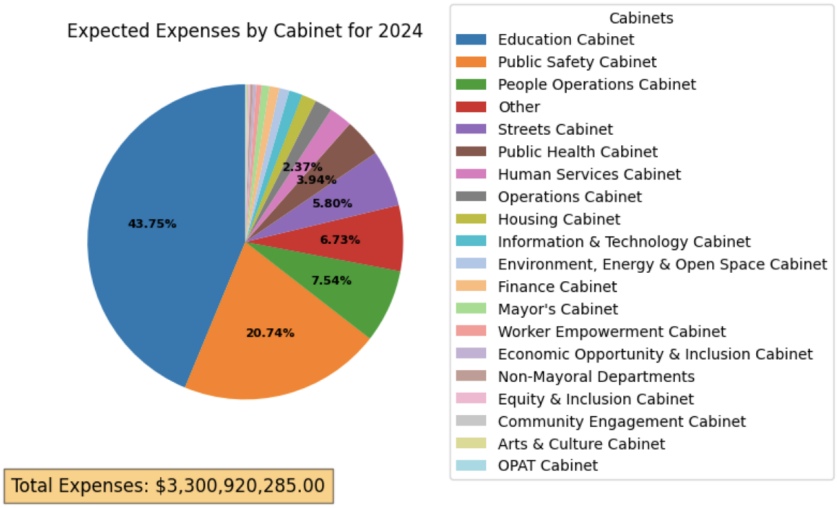
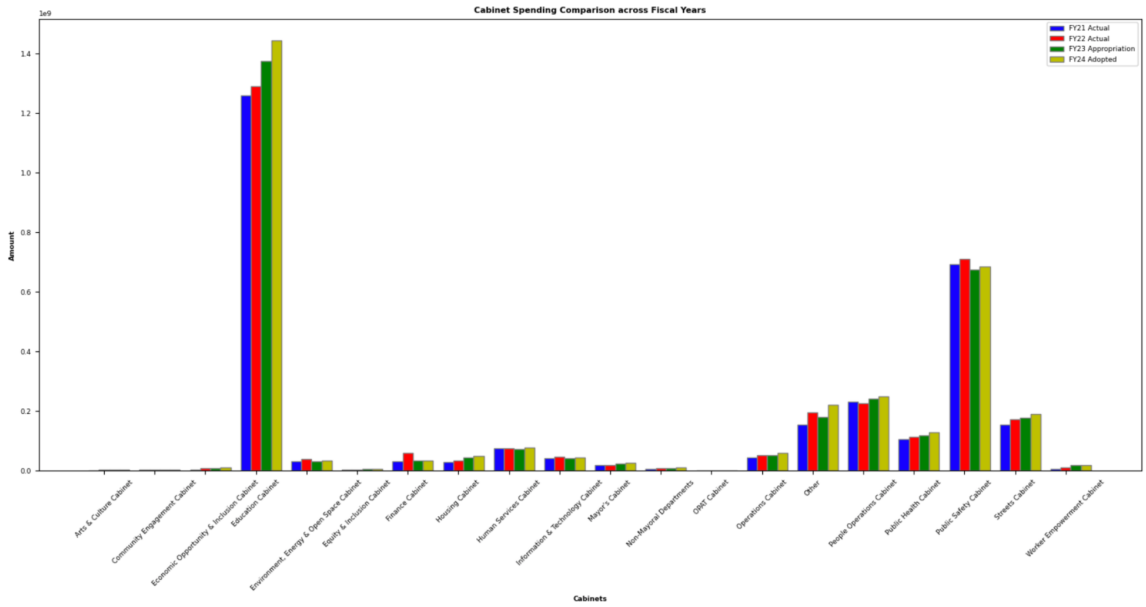


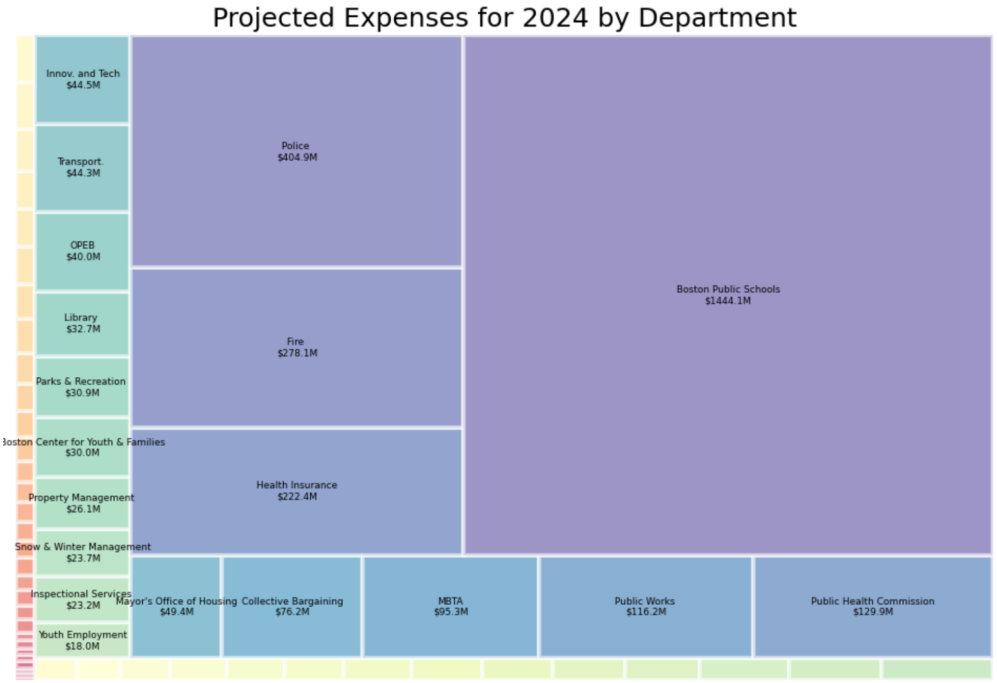
Figure 4 shows the Operating Budget distribution by cabinet.

- The total expenses increased from approximately $2.9 billion in 2021 to $3.3 billion in 2024.The proportions allocated to most cabinets seem relatively stable over the years, with minor fluctuations.
- 'Non-Mayoral Departments' and 'Worker Empowerment Cabinet' appear in the 2022 chart onward





- The most significant spending is observed in the Public Safety Cabinet and the Education Cabinet across all fiscal years. This indicates a consistent priority given to these areas by the city.
- The trend from FY21 Actual to FY24 Adopted shows an increase for most cabinets, which might be due to inflation, expansion of services, or new initiatives that require additional funding



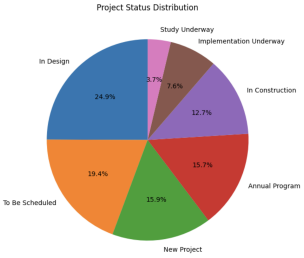
Boston Public Schools : Consistently has the largest portion of the budget across all years followed by Police and Fire Departments.

CAPITAL BUDGET GRAPHS

Over the next five years, a total of 433 projects are slated to be either initiated or brought to completion, reflecting the city's commitment to continuous improvement and sustainable development

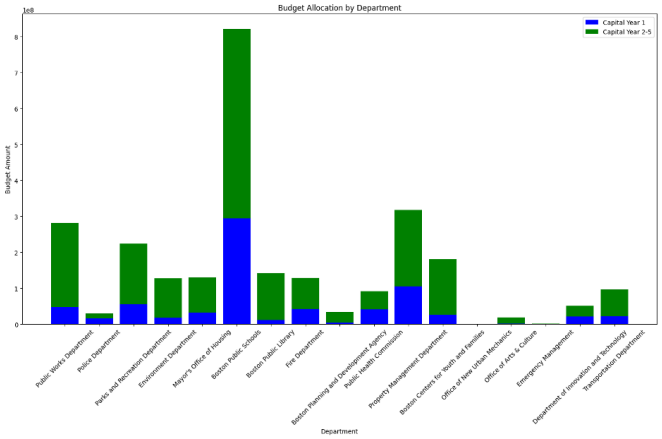
Capital budget split by project Status

Phase in the Project Pipeline	Description	Percentage
1	New Project	15.90%
2	Study Underway	3.70%
3	To Be Scheduled	19.40%
4	In Design	24.90%
5	Annual Program	15.70%
6	Implementation Underway	7.60%
7	In Construction	12.70%

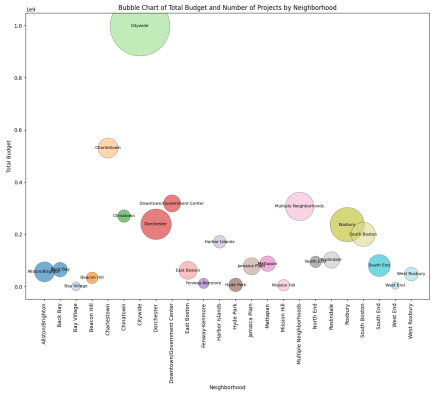


This shows that various projects are fairly evenly present in various stages of the pipeline which shows that the City is doing a good job in planning ahead and also that perhaps ‘Design’ takes the most time.

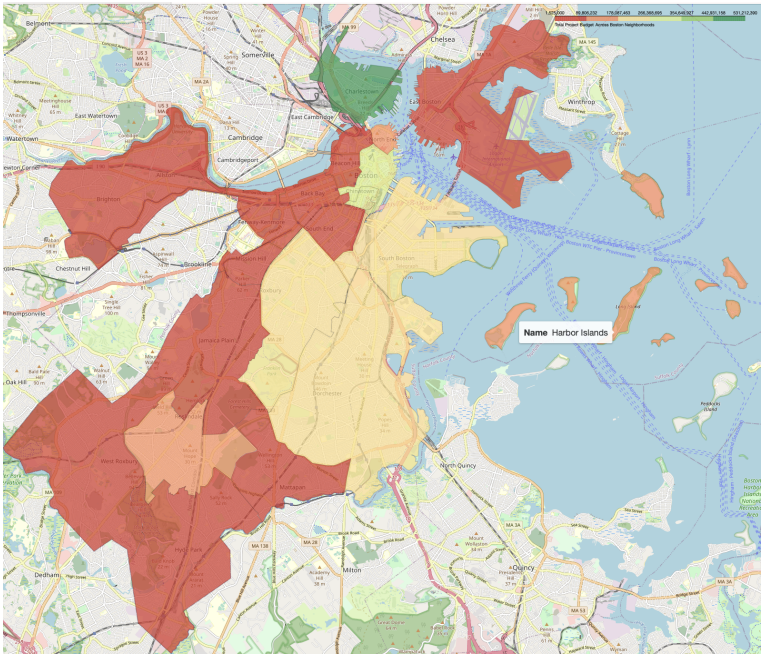
Distribution of the capital budget among various city departments, differentiating between the allocations for the immediate fiscal year (Capital Year 1) and the subsequent four-year period (Capital Years 2-5)



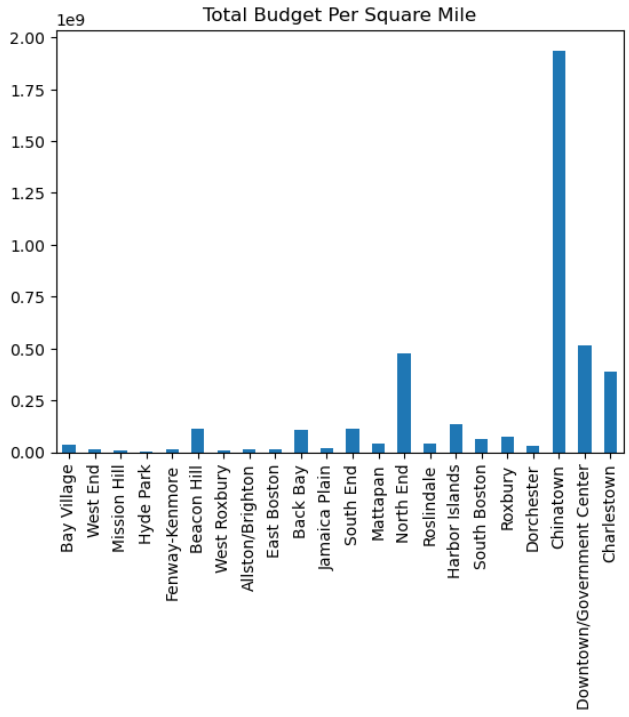
Distribution among various neighborhoods

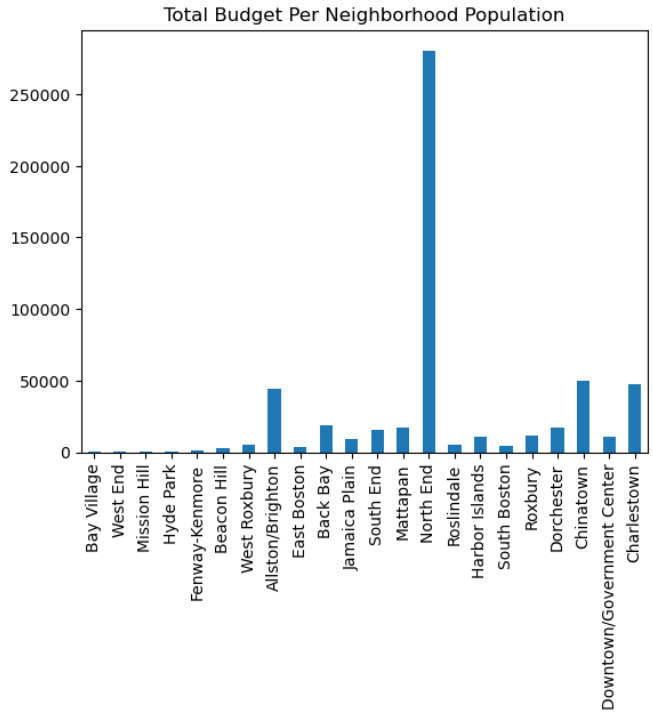


There is a wide range of total budgets for projects in each neighborhood, from Charlestown ($531,212,390.00) to Bay Village ($1,525,000.00). This is mostly due to the disparity in the amount of projects per neighborhood–ranging from 44 (Roxbury) to 2 (West End)–and the scale of each project–ranging from $223,591,467.00 (Chinatown) to $575,000.00 (Bay Village).

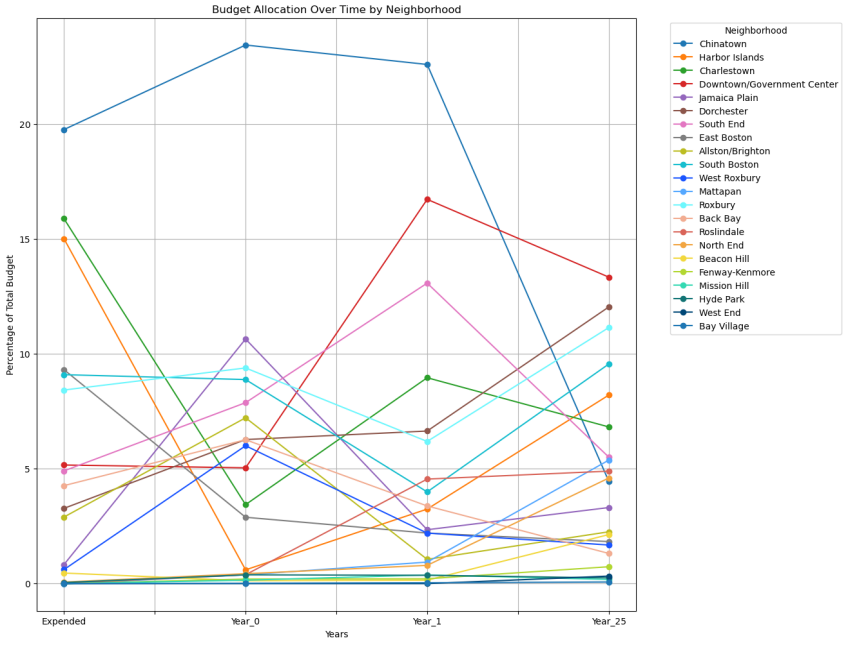


Chinatown stands out with the highest budget per square mile, followed by Downtown/Government Center and North End with $4.77 hundred million per square mile. Which means that some of the neighborhoods with the smallest areas are getting a lot of budgets for projects in comparison to larger ones such as Allston/Brighton. This disparity in budget allocation could be due to the population density of the areas involved. There are some neighborhoods like Allston/Brighton, Dorchester, and North End, where the budget per neighborhood population is higher than the one of other neighborhoods in comparison to the budget per area. There are still some disparities that are not necessarily explained by area or population, which could be due to the infrastructure qualities and needs of various neighborhoods.





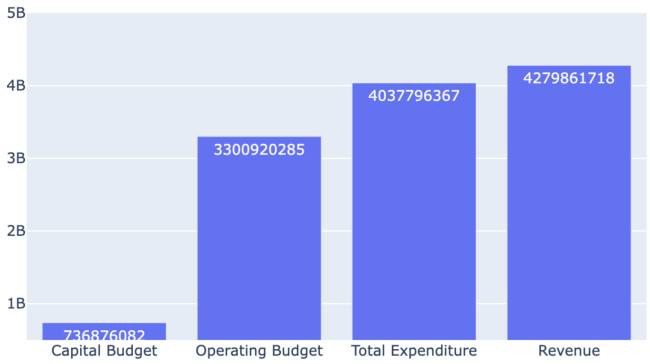
The trends of changes in the distribution of the total budget over the years of the Capital Plan is better condensed by the following line chart.

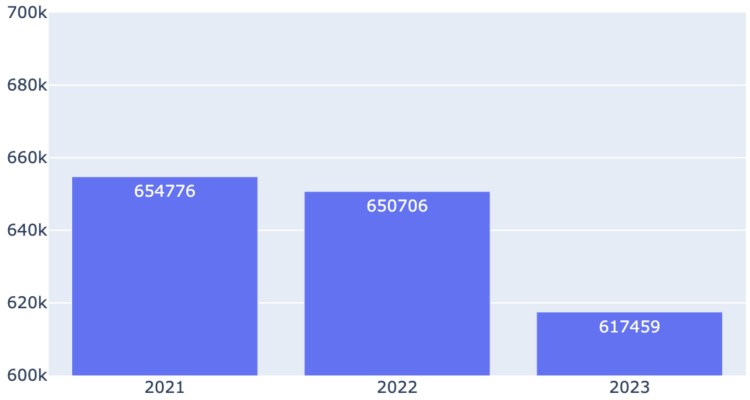


2024 Projected Revenue vs Expenditure

The revenue is higher than Total Expenditure therefore, Boston City can afford the planned Capital Budget and Operating Budget for 2024

BOSTON CITY BUDGET PER CAPITA = 6540





EXTENSION PROJECT PROPOSAL
EXTENSION PITCH

There are 3 extension projects that will be working on

1. Impact of Revenue : To understand the impact the Revenue generated by a Cabinet or Department has on the budget allocated to it.
2. Analyze the budget on demographic lines by exploring trends based on race, poverty rates, and household income. We have the data for how
3. Comparison : Compare the budget distribution of Boston with the budget distribution of Philadelphia and identify similarities and differences.

RATIONALE

Impact of Revenue is important to consider as if allocating a higher budget(capital) can help in increasing revenue significantly then that should be done as that can then be used to help millions of Boston residents.

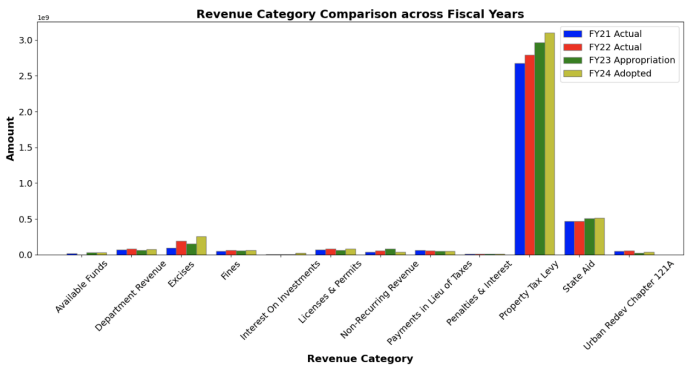
The City tries to be Optimal in the budget distribution. Exploring the budget distribution on demographic trends highlights any hidden inefficiencies or biases and through this we can also identify what improvements would lead to a fairer budget.
Comparison with a similar city can help in better distribution as it can show what changes could be made and also help avoid blind-spots similar to what zero-base budgeting can do.

QUESTIONS FOR ANALYSIS

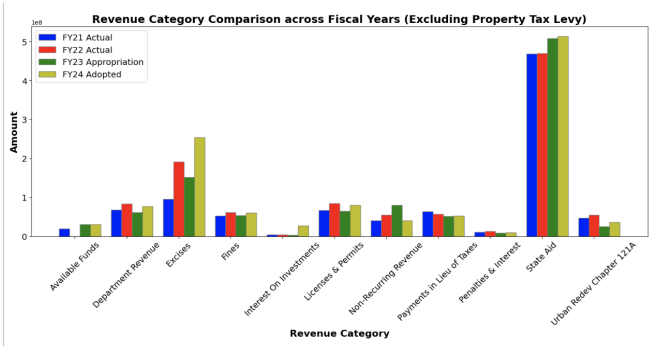
1. Which Cabinets and Revenue categories produce the highest Revenue
2. How the Revenue produced by a Department/Cabinet relates to the budget allocated to it
3. Do household income, poverty rates and racial demographic of a neighborhood play a role in the budget allocated to it
4. What changes can be made to the budget division of Boston City based on Philadelphia's budget distribution.

PRELIMINARY ANALYSIS AND VISUALIZATIONS FOR EXTENSION PROJECTS

Revenue distribution by Expense Category

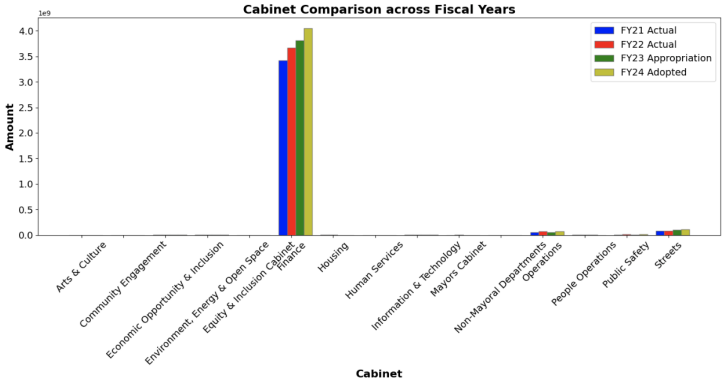


The "Property Tax Levy" stands out significantly, indicating its dominant role in revenue generation. Therefore, we exclude this category and graph again to see changes in other categories more clearly.

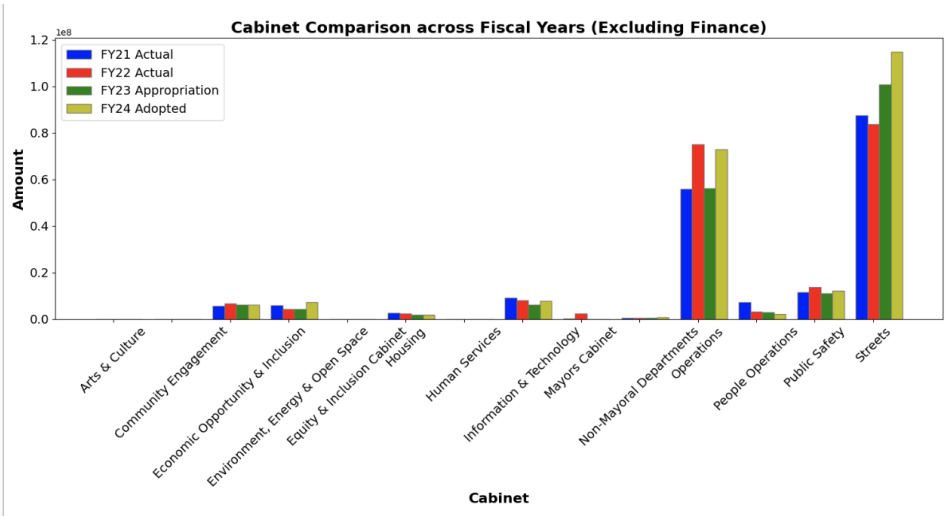


The majority of other revenue categories exhibit consistent trends across the years with slight fluctuations. Some categories, such as "Interest on Investment" and "Penalties & Interest ," have minimal values throughout

Revenue distribution by Cabinet

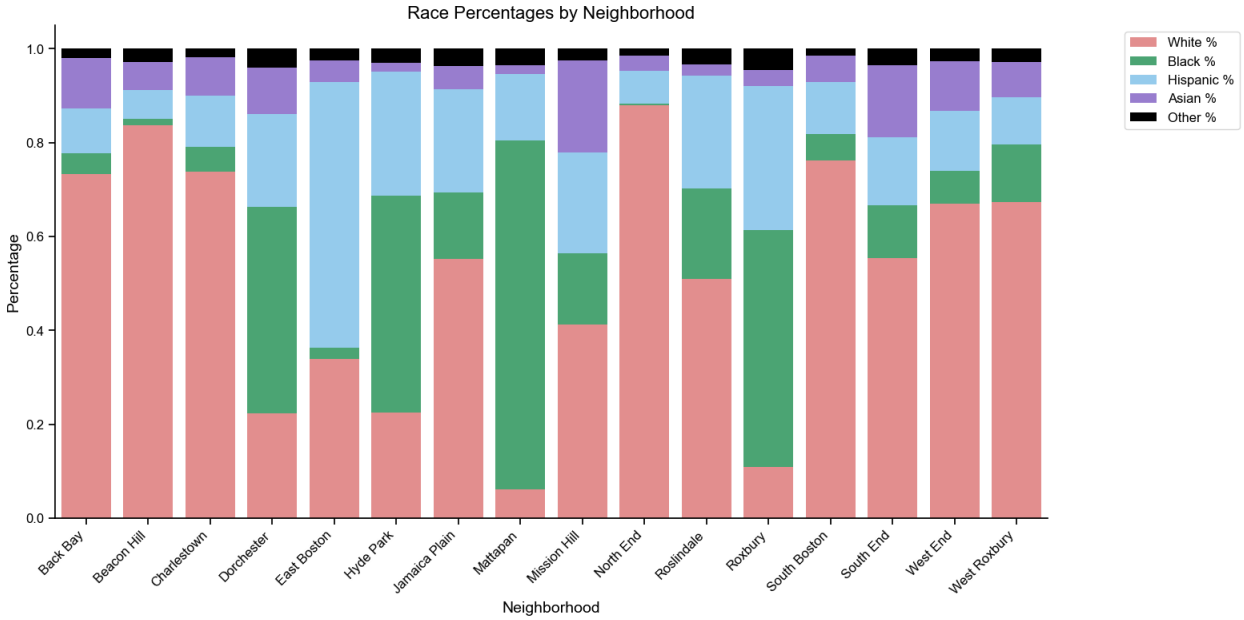


The "Finance" cabinet significantly dominates in terms of revenue across all years, overshadowing other cabinets. This is consistent with the prior graph where ‘Property Tax Levy’ dominates the revenue in terms of Revenue Category because the Finance Cabinet is responsible for collecting property tax.



While cabinets like 'Arts & Culture', 'Environment, Energy & Open Space', and 'Human Services' have no contribution to revenues, the majority of cabinets see consistent funding patterns across the years.

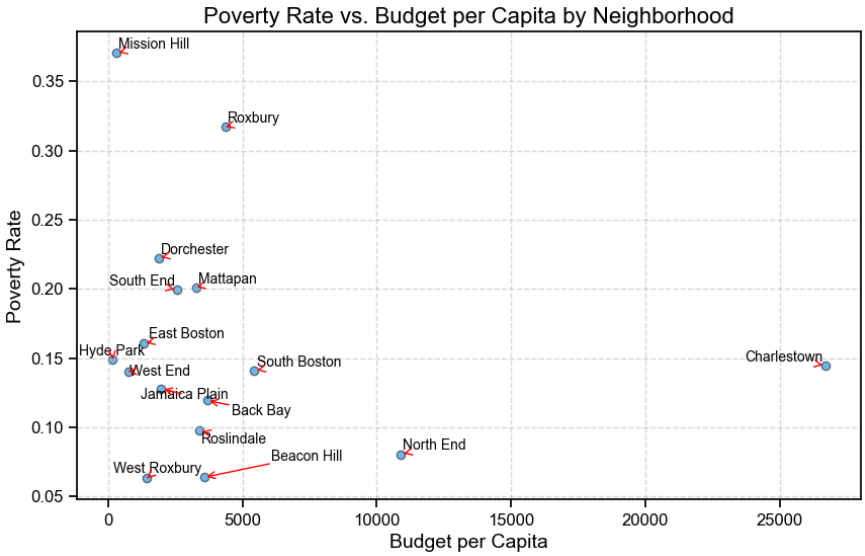
SOCIO-ECONOMIC DATA



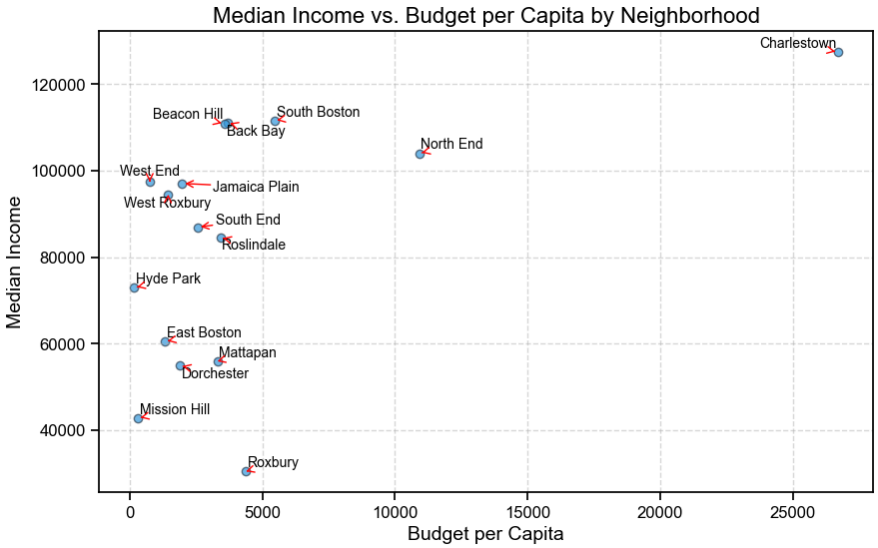
The stacked bar chart illustrates that the majority of neighborhoods are predominantly white. However, Dorchester, Hyde Park, Mattapan, and Roxbury are predominantly Black/African American, while East Boston is majority Hispanic. Mission Hill stands out with a more even distribution of races, possibly due to its proximity to nearby universities.

The average for majority white neighborhoods is 5174.46, and the average for majority non-white is 2434.12. Removing Charlestown gives 3216.91 and 2434.12 respectively. Excluding Charlestown, predominantly white neighborhoods exhibit an almost $1000 higher

budget per person compared to majority non-white neighborhoods. This aligns with subsequent graphs indicating that these non predominantly white neighborhoods also have a higher poverty rate than other areas.



The graph suggests a slight trend of higher budget per capita for neighborhoods with lower poverty rates.



Similar to the last graph, this one suggests a very slight trend of higher budget per capita for neighborhoods with higher median income.

DATA SOURCE FOR PHILADELPHIA BUDGET DISTRIBUTION :

INDIVIDUAL CONTRIBUTIONS

Alex Bapista
Created bar charts for Capital Budget distribution : by department, by neighborhood
Explored Socio-Economic Data and created charts Budget per capita vs Median Income and Poverty Rtes, Racial distribution per neighborhood.

Jason
Created piecharts for Operating Budget distribution by Cabinet for all 4 years
Created tree graphs for spending by cabinet and department across all 4 years
Created line graph for government spending by year across

Maria Sofia Mercado Arevalo
Performed data cleaning for Revenue dataset.
Preprocessed geographical Boston data to plot Total Budget by Neighborhood map.
Created bar charts for Total Budget Per Neighborhood Population and per Square Mile.
Created pie charts for Total Budget Distribution by Neighborhood for all years, and for each individual year of the Capital Plan. Additionally, a line chart to capture these distribution trends.

Haokun Wu
Created ‘Revenue Category’ comparison histograms across financial years - with and without Property Tax and Cabinet comparison across fiscal years histograms - with and without Finance.
Cleaned the code and created a codebase for all the graphs and analysis done by the team

Naima Abrar
Performed data cleaning for Capital Budget dataset
Prepared stacked bar chart for Capital Budget distribution by department
Created bubble charts for budget allocations by neighborhood
Created a bar chart for the top 10 programs with the highest budget allocation
Created a pie chart that shows the project pipeline and workflow
Created project allocation by Neighborhood histogram

Gauravdeep Singh Bindra
Created word cloud charts for EDA
Created bar charts for Total Operating Budget yearly comparison, Capital Budget 1st vs 2-5 Split, Capital vs Operating Budget, Boston Population, Revenue Yearly comparison, Revenue vs Expenditure, Data Cleaning Process
Created histograms for all years for Operating Budget distribution by Cabinets
Created heatmap for Operating budget binning comparison by Dept
Created the presentation for Deliverable 1, CheckpointA, Deliverable 2
Prepared extension project proposal.
Performed allocation of work, kept regular meetings and did follow ups for all deliverables.