City of Boston: City Budget

by
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Introduction

There are two primary datasets that are used in this analysis. The first dataset, FY24 Recommended Operating Budget[1], includes the detailed breakdown of the operating budget for the City of Boston. It provides information on the budget allocations for different departments, services, and personnel expenses such as teachers, police officers, and firefighters. The second dataset, FY24 Recommended Capital Budget Plan[2], includes the capital budget for the City of Boston, specifying the funding sources, project descriptions, and budget allocations for acquiring or improving physical assets owned by the city. The 2020 Boston Census was used for questions addressing the population size and demographic.[3]

This paper will discuss data cleaning and allocation, spending based on budget areas, and address some additional analysis. We will start by exploring spending by department (pg. 2), program (pg. 4), expense categories (pg. 5), and geography (pg. 6). The second section analyzes per capita spending (pg. 9) as well as addressing budget allocations based on race and ethnicity (pg. 10).

Data Cleaning:
The raw data frame for the FY24 Recommended Operating Budget consisted of 8 columns and 900 rows. The first step of cleaning the data included removing any extra white spaces from all columns and then replacing *#Missing* values with *Nan* (null values). Rows containing any null values were dropped, leaving 656 rows or 72.89% of the original data. Lastly, all FY data types were changed from *object* to *float64*.

The raw data frame for the FY24 Recommended Capital Budget Plan consisted of 22 columns and 433 rows. The first step of cleaning the data included cleaning the column *Total_Project_Budget* type from *object* to *int64*. All column names were then stripped of excess whitespaces. Next, columns that would not be analyzed were dropped from the data frame, including *Scope_Of_Work*. All *int64* columns replace the value *0* with *Nan* (null values). Each column that contained less than 100 non-null values was also dropped from the dataset. This included *Authorization_Future*, *External_Funds*, and all *Grant* columns, as they did not have a sufficient size to make inferences from. The original dataset included 17 unique *Department* values and 20 unique *PM_Department* values. None of the rows were deleted, leaving the cleaned data frame consisting of 11 columns and 433 rows.


[1] Operating budget - dataset - analyze Boston. (n.d.). https://data.boston.gov/dataset/operating-budget

[2] Capital budget - dataset - analyze Boston. (n.d). https://data.boston.gov/dataset/capital-budget

[3] 2020 census for Boston - Boston neighborhood data - analyze Boston. (n.d). https://data.boston.gov/dataset/2020-census-for-boston/resource/5800a0a2-6acd-41a3-9fe0-1bf7b038750d

Budget Areas

Spending by department:

The average annual spending across all departments increased by approximately 5.59% per fiscal year. There was a 6.56% relative increase between FY21-FY22, a 3.56% increase between FY22-23, and a 6.65% increase between FY23-FY24. This is equivalent to a $235M, $136M, and $263M increase accordingly. While the average annual spending is increasing, it is not as substantial as it may seem when accounting for inflation and was less than the inflation rate for the fiscal year 2023. The chart below shows the absolute increase in the operating budget over time.
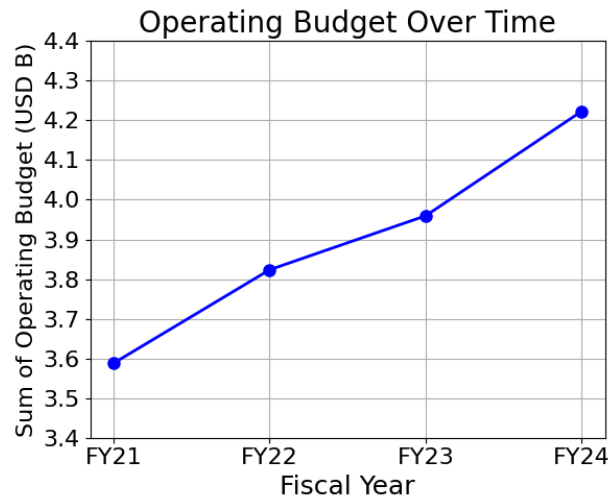
The annual inflation rate for the years of 2021- 2024 as provided by the Bureau of Labor Statistics[4] shows an increase by approximately 5.07% per fiscal year. There was a 5.35% inflation rate for FY22, a 5.75% inflation rate for FY23, and an ongoing inflation rate of 4.10% for FY24.

Next, we take a closer look at the individual departments. All additional percentages do not account for the inflation rate between the years. The three departments that experienced the highest increases in funding, relative to itself, between the four fiscal years include:

1. Execution of Courts: 136.81% increase
2. Annual Audit Costs: 133.88% increase
3. Reserve for Collective Bargaining City: 117.21% increase

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This data excludes the OPAT department, as it was conceived in 2022. As well as the Workers' Compensation Fund department, which could be labeled as an outlier because of the 19272.49% increase between FY21-FY22 versus only a 17.35% increase between FY22-FY24. Despite its existence for years, the Worker's Compensation Fund department saw limited funding until FY21-FY22.

Next, we identify the largest percentage decrease in funding over the four-year fiscal period. The three departments that experienced the highest decrease in funding, relative to itself, between the four fiscal years include:
1. Office of Finance: 20.12% decrease
2. Suffolk County Sheriff Dpt.: 8.32% decrease
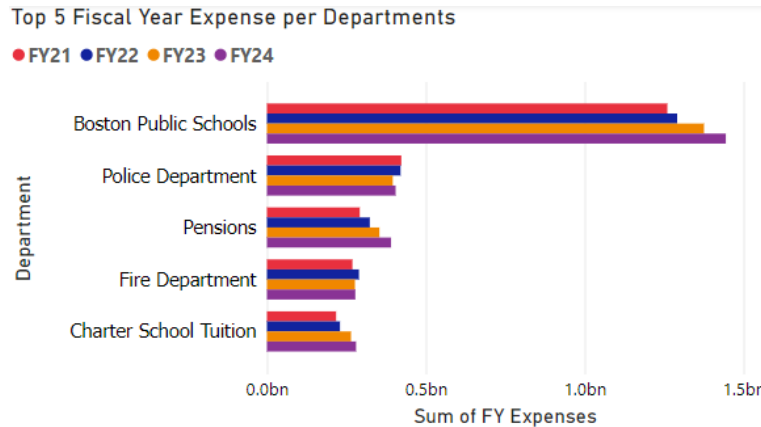3. Library Department: 4.89% decrease

With the addition of the Police Department and the Central Fleet Management Department to the three departments listed above, all other 61 departments saw an increase in funding, even if it did minimally. The decrease in the police department funding could potentially be due to the newly appointed Mayor Michelle Wu, who approved the Boston City Council operating budget cuts, which included a $31M cut over time for the Police Department.[5] The large depreciation in the Capital Budget for the Library Department between FY22 and FY23 included machinery and equipment, fixtures and improvements.[6]
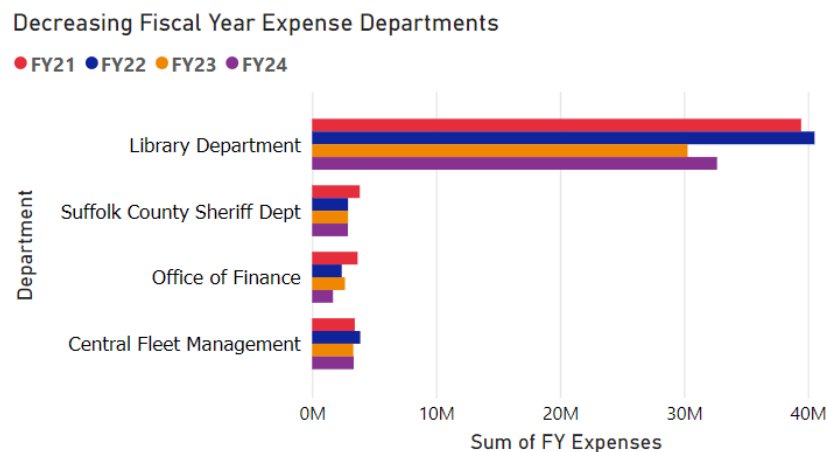
This figure displays the departments that experienced a decrease in overall funding over the four-year fiscal period. This figure excludes the Police Department because of its significantly larger budget (~400M) and to better visualize the decrease in the other four departments.

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[5] Cawley, G. (2023, June 14). *Boston City Council approves $4.2B budget with $31M in police cuts*. Boston Herald. https://www.bostonherald.com/2023/06/14/boston-city-council-approves-4-2b-budget-with-31m-in-police-cuts/

[6] Financials-23.PDF. (n.d.). https://www.bpl.org/wp-content/uploads/sites/30/2023/11/Financials-23.pdf

Top 5 Fiscal Year Expense per Departments

● FY21 ● FY22 ● FY23 ● FY24

This figure displays the top 5 funded departments over the four-year fiscal period. This figure includes the Police Department, which despite its decrease in funding, still ranked second overall.

We can see in the bar chart above that the overall top-spending city department is Boston Public Schools with an average percentage of the total expenses being 34.45%. This is followed by the Police Department at 10.59% and Pensions at 8.70%. The top three departments account for approximately 53.74% of the total city expenses. The top spending departments all fall within similar categories of education, safety, and health.

Spending by program:

The programs are a subordinate unit in a City Department or Agency, which connects itself to the analysis of each department's spending. Labeled within parentheses below is the department the program is under. Overall, 23 programs saw a decrease in funding and 163 programs saw an increase in funding.

The three programs that experienced the highest increases in funding, relative to itself, between the four fiscal years include:
1. Trust (Treasury Department): 764.70% increase
2. Execution of Courts (Execution of Courts): 136.81% increase
3. Annual Audit Costs (Annual Audit Costs): 133.89% increase

It is important to note that this data excludes the OPAT Commission, Civilian Review Board (CRB), and the Internal Affairs Oversight Panel (IOAP), as each of those programs was conceived in 2022. As well as the Workers' Compensation Fund and Trust programs, due to their unusually large budget increase between FY21 and FY22. In addition to the increase in wages

and the cost of living, COVID-19 affected people's ability to show up for work, which is a potential reason for the large increase for the Workers' Compensation Fund.[7]

The three programs that experienced the highest decrease in funding, in proportion to itself, between the four fiscal years include:
1. Affirmative Action (Human Resources): 29.22% decrease
2. Middle (Boston Public Schools): 21.85% decrease
3. A&F(Office of Finance): 20.12% decrease
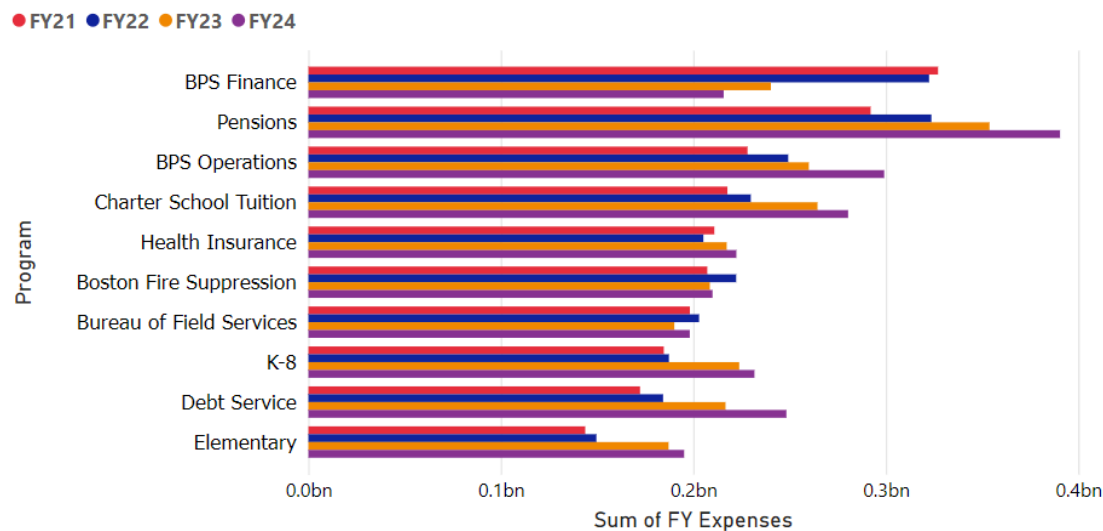
This figure displays the top ten funded programs, a subcategory to the departments, over the four-year fiscal period.

We can see that the overall top-spending city program is Pensions with an average percentage of the total expenses being 8.72%. For FY24, the Cost-of-Living Adjustment (COLA) was approved for eligible recipients by Governor Healey.[8] This is followed by the BPS Finance at 7.10% and BPS Operations at 6.65%. Similar to the departments, the top spending programs all fall within similar categories of education, safety, health, with the addition of financial services.

Spending by budget (expense) category:

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[7] U.S. Bureau of Labor Statistics. (2024, February 7). *Changing compensation costs in the boston metropolitan area - December 2023 : Northeast Information Office*. U.S. Bureau of Labor Statistics. https://www.bls.gov/regions/northeast/news-release/employmentcostindex_boston.htm

[8] *Cola (cost-of-living adjustment) updates (MSRB)*. Mass.gov. (n.d.). https://www.mass.gov/info-details/cola-cost-of-living-adjustment-updates-msrb

The City of Boston contains the 7 main expense categories, which include: Personnel Services, Contractual Services, Current Charges & Obligations, Fixed Expenses, Supplies & Materials, Equipment, and general Other Expenses. For a full description of each expense category, refer to Appendix A.

Across all expense categories, the ranges span from million to billion. The sum of FY21 Expenses ranged from 32.68M to 1.88B, FY22 Expenses ranged from 30.16M to 1.96B, FY23 Appropriation ranged from 32.51M to 2.03B, and FY24 Budget ranged from 38.90M to 2.11B. The categories Personnel Services and Fixed Expenses show an increase for each FY. All other categories experience some type of fluctuation, even if minimal.
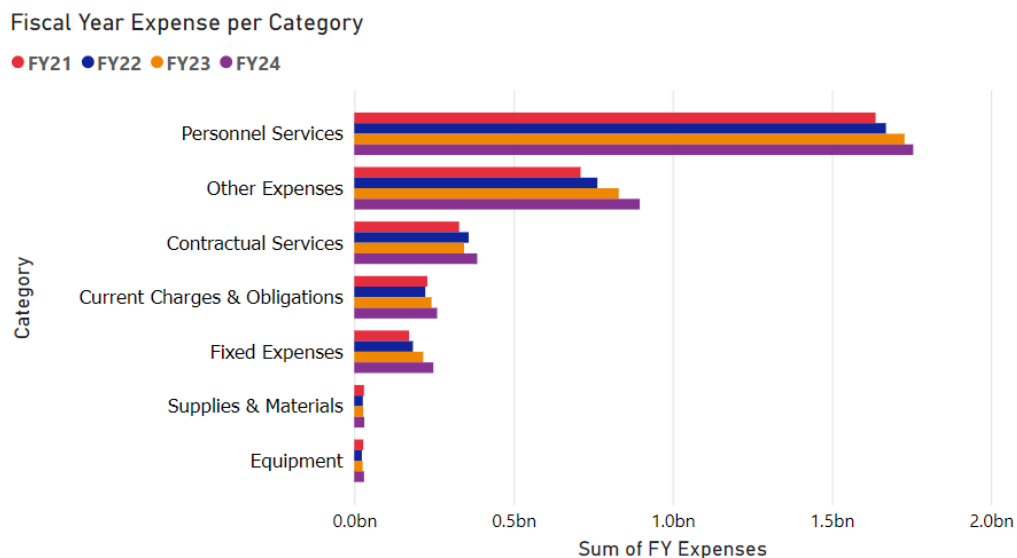
This figure displays all seven expenses of the expense categories over the four-year fiscal period.

Personnel Services are by far the *largest* expense category each year, accounting for just over 50%. Starting at $1.88B in FY21 and increasing to $2.03B by FY23. The next highest expense is Contractual Services, accounting for around 12% of the total spending for each FY. All other expense categories are less than 10% individually. The lowest expense category was the Equipment, with an average budget of $33.56M, which accounted for merely 0.86%.

Spending by geography (which areas receive the most funding):

Excluding projects that spanned more than one neighborhood, the three largest-funded neighborhoods, accounting for just under 40% of the total budget, include:
1. Charlestown: $531.21M (18.85%)
2. Downtown/Government Center: $318.42M (11.30%)
3. Chinatown: $271.27M (9.63%)

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The three lowest-funded neighborhoods, accounting for less than 0.5% of the total budget, include:

4. Bay Village: $1.53M (0.05%)
5. West End: $5.00M (0.18%)
6. Million Hill: $5.24M (0.19%)
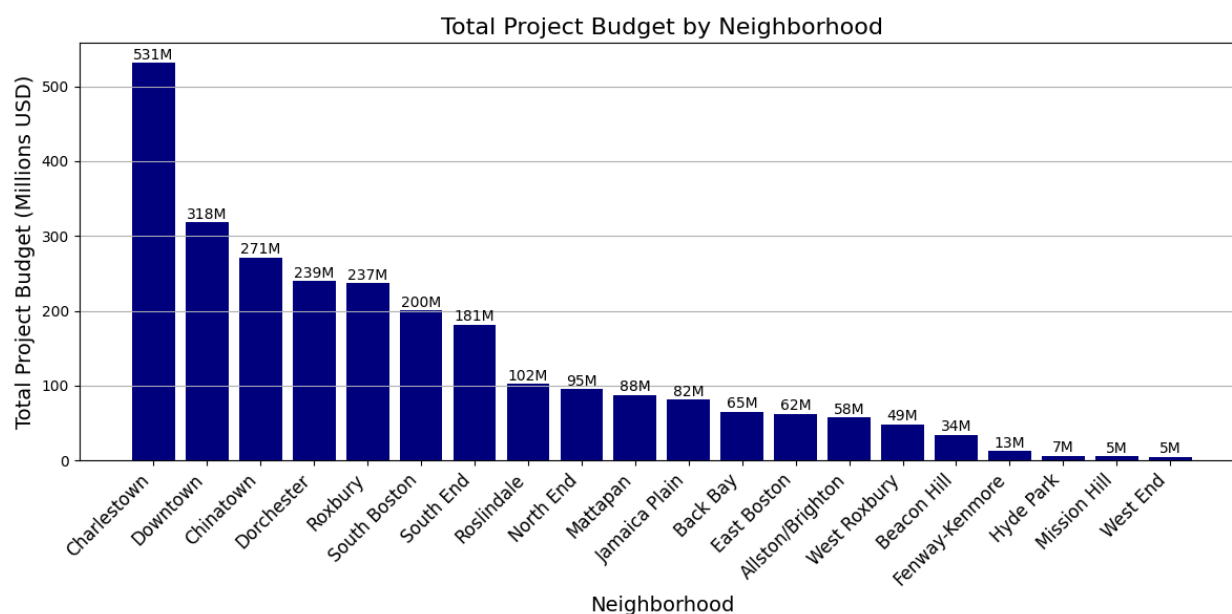
This figure displays all Boston neighborhoods total project budget over the four year fiscal year period in descending order.

Standardizing this model through the total square miles of each neighborhood, we get slightly different results. The three largest-funded neighborhoods by square miles include:

1. Chinatown: $2260.60M per sq mi (increasing 2 spots)
2. Downtown/Government Center: $513.57M per sq mi (maintaining spot)
3. North End: $477.23M per sq mi (increasing 6 spots)

Chinatown received around 4x more funding per square mile than the next highest funded neighborhood. This is likely due to recent high budget projects such as the *Affordable Housing Project*, which secured $26M in 2023.[9] The size of each neighborhood ranges from 0.12sq mi for Chinatown to 7.29 sq mi for Dorchester. Charlestown, which had the highest total project budget, falls into fourth place with a value of $390.60M per sq mi. In total, 8 out of the 20 neighborhoods have a budget of over $100M.

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[9] *Chinatown Affordable Housing Development*. Boston.gov. (2023, May 18). https://www.boston.gov/buildinghousing/chinatown-affordable-housing-development

Following the COVID-19 outbreak, Boston received $551.7 million through the American Rescue Plan Act (ARPA).[10] Nearly half of this sum, totaling $236 million, was directed towards housing initiatives. For further details on authorized ARPA funds, please refer to Appendix B. Similarly, *Supporting Pandemic Affected Community Enterprises* (SPACE) Grant Program sought to support small businesses that were forced to shut down during the pandemic.[11] Given the prevalence of locally owned businesses in Boston's Chinatown, it's probable that many benefited from these measures. This helps to explain the relatively high budget allocation for Chinatown, despite its size of only 0.12 square miles.

The three lowest-funded neighborhoods by square miles include:
1. Hyde Park: $1.45M per sq mi (dropping 2 spots)
2. West Roxbury: $8.86M per sq mi (dropping 4 spots)
3. Mission Hill: $9.53M per sq mi (increasing 1 spot)
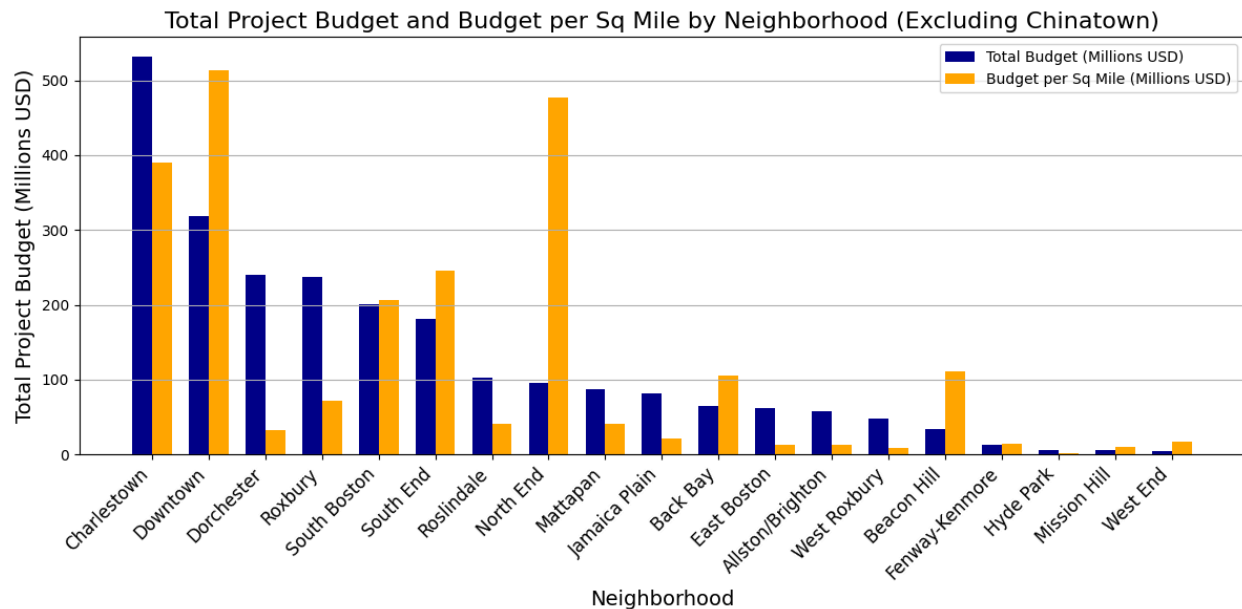
This figure displays all Boston neighborhoods total project budget per square mile in descending order, excluding Chinatown due to its substantially larger amount.

From the chart above, which places Total Budget and Total Budget per Sq Mile, we can see that certain neighborhoods have a substantially larger per Sq Mile budget. Those neighborhoods, including Chinatown which is not displayed in the graph, are all located next to each other near

[10] *Boston's American Rescue Plan*. Boston.gov. (2021, June 7). https://www.boston.gov/departments/mayors-office/equitable-recovery-people-boston#:~:text=How%20much%20does%20the%20City,Appropriations%20Act%20in%20December%202020
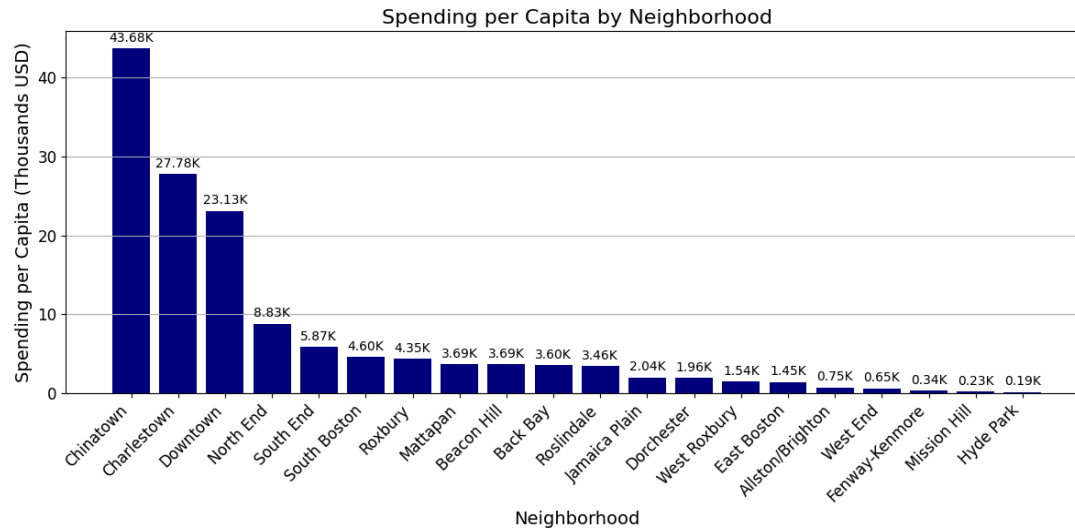
[11] *Space grants*. Boston.gov. (2022, October 14). https://www.boston.gov/economic-opportunity-and-inclusion/space-grants

central Boston and have a square mile size all less than 1. For additional visualization, please refer to Appendix C.

Further Analysis

Per capita expenditure (spending per citizen):

Per capita expenditure (PCE) divides the total expenditure by the total population of a given economy.

Compared to the original chart that shows total project budget by neighborhood, the three largest-funded neighborhoods per capita include:
1. Chinatown: $43.68K (increasing 2 spots)
2. Charlestown: $27.78K (dropping 1 spot)
3. Downtown/Government Center: $23.13K (dropping 1 spot)

Aside from those three neighborhoods, all other 17 neighborhoods received less than $10K per capita expenditure with 5 of those 17 receiving less than 1K.

The three lowest-funded neighborhoods per capita include:
1. Hyde Park: $0.19K (dropping 2 spots)
2. Mission Hill: $0.23K (maintaining spot)
3. Fenway-Kenmore: $0.34K (dropping 1 spot)

There is less variation amongst the PCE chart and the total project budget by neighborhoods than the Square Miles chart and the total project budget by neighborhoods.

Correlation between Race/Ethnicity and Budget Allocation:

When testing the census data, there is no strong correlation between race and budget. Neighborhoods known to be predominantly white and well off, such as the West End and Back Bay, and not amongst the top funded neighborhoods despite their reputation. Further analysis could potentially show correlation between race and allocated budget, but due to Boston's overall primarily white population, there is not sufficient data to support that race effects allocated budget with a regression model.

Conclusion

The review of Boston's budget offers insights into how funds are allocated across various city sectors. While certain departments like the Execution of Courts and Annual Audit Costs saw increased funding, others like the Office of Finance and Suffolk County Sheriff Department faced reductions. These shifts reflect the city's adaptability in responding to evolving priorities.

Moreover, the analysis found a diverse array of program spending, with a focus on areas such as education, safety, and health. With newly appointed Mayor Wu in office and an 8% increase for FY2025, her plan is to make Boston more equitable and affordable for residents; 56% will be allocated to education and public safety expenses.[12] Despite fluctuations, ongoing investment in these critical areas remains evident, reflecting Boston's commitment to essential services. This approach ensures that resources are directed towards addressing community needs effectively.

Future Insights:
As we progress with this project, there are several avenues for improvement and additional analysis to consider. Firstly, it would be valuable to examine trends in budget allocation based on census data. Beyond just exploring race and ethnicity, understanding how changes in population size affect budget distribution across neighborhoods could yield valuable insights. While the current report focuses on Boston neighborhoods geographically, there's potential for deeper analysis into specific points of interest that align with both the PM Department and the neighborhood. Although coding for this was initiated, it remains incomplete for this report.

Additionally, while the report draws inferences about which neighborhoods benefit from post-pandemic programs like the ARPA and SPACE Grant, it lacks conclusive evidence without examining the specific locations where each funding section is allocated. A more detailed analysis in this regard would be valuable.

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[12] Rios, S. (2024, April 10). *Boston mayor seeks budget increase amid expected revenue shortfall*. WBUR News. https://www.wbur.org/news/2024/04/10/michelle-wu-boston-budget

Appendix A

Expense Categories Description

Personnel Service costs cover items such as employee salaries, overtime, and benefits.
Contractual Services represents services procured to support departmental operations such as telecommunications, utilities, and other operational services.
Supplies and Materials covers costs such as gasoline for vehicles, office supplies, and other general supplies to support departmental operations.
Current Charges include required expenses for things like health insurance, bonds, and health liability expenses.
Equipment costs include purchases like computers, financing costs for vehicles, and information technology and telecommunication equipment.
Other costs include large items like employee pensions and capital bond debt service and charges assessed by the Commonwealth of Massachusetts.[13]

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[13] *FY23 operating budget*. Boston.gov. (2022, January 20).
https://www.boston.gov/departments/budget/fy23-operating-budget

Appendix B

Authorized ARPA Funds

$236 million *in unprecedented funding for* safe, healthy, and affordable housing

$95 million *to ensure the stability of* core City services

$62.2 million *to promote* economic opportunity and inclusion

$49.5 million *to advance* climate resilience *and* improve mobility

$35 million *to ensure* an equitable public health response to the ongoing pandemic

$26.4 million *to support* behavioral and mental health

$26.2 million *to* strengthen arts and culture *and* activate our neighborhoods

$17.7 million *to focus on* early education and childcare

$3.6 million *for* program evaluation and equitable administration[14]

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[14] *Boston's American Rescue Plan*. Boston.gov. (2021, June 7).
https://www.boston.gov/departments/mayors-office/equitable-recovery-people-boston#:~:text=How%20much%20d
oes%20the%20City,Appropriations%20Act%20in%20December%202020

Appendix C

Bubble Map of Total Project Expense by Neighborhood

Total Project Expense by Neighborhood

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