ACLU Police Budget Project

Spring 2023 CS506 Data Science

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Introduction

The Boston police department is one of the most important departments to maintain the safety of Boston city and protect people's livelihood. In order to ensure that BPD has sufficient funds to maintain the smooth operation of its departments, in the overall budget issued by the government every year, BPD's budget will account for a high proportion compared with other departments. Therefore, it is of great significance to study how the BPD allocates this budget to assess the rationality of the budget amount. In this study, we followed the instructions of the American Civil Liberties Union (ACLU) to conduct a multi-angle analysis of the budget situation of BPD over the years, and incorporated the latest data in 2024 into the visualization part, which intuitively reflects the latest situation of BPD budget allocation. Additionally, we looked at the racial distribution of BPD officers from 2020 to 2023 to examine whether there is racial discrimination within the department. The specific report sections are divided as follows:

- Base Project：
    1) Visualize and analyze previous BPD budgets and police officers' earnings (according to time and categories)
    2) Improve the code of the previous visualization section to make the visualization part more accurate and informative
- Further Project：
    1) Based on the new budget data released in April 2023, update visualization part and give corresponding analysis to advocate for future budget allocations during the Spring budget negotiations with the Mayor and the Boston Police.
    2) Racial comparisons of BPD officials from 2020 to 2022 were visualized to determine whether BPD was racially discriminatory in recent years.

Data Collection

Our budget data on BPD over the years is mainly obtained from the data set provided by the client. For data not in existing datasets, we first search for the database mentioned in the report of the previous groups, and then search through the Boston government report. In the end, we used the following data sets in this report：

1.(FY16-23) Operating Budget - Datasets - Analyze Boston
2.Employee Earnings Report - Datasets - Analyze Boston
3. Roster (list of active officers)

4. Number of police officers: https://cde.ucr.cjis.gov/LATEST/webapp/#

5.BPD previous years budget:

   https://www.boston.gov/departments/budget#current-and-past-fiscal-year-budgets

6. The Mayor's recommended FY24 operating budget:

   https://data.boston.gov/dataset/operating-budget/resource/8f2971f0-7a0d-401d-8376-0289e3b810ba

Base Project

For this project, the main task of our group is to visualize BPD budget data to judge the rationality of BPD budget allocation in recent years. To this end, we proposed nine questions, gave corresponding visual graphs for each problem, and finally corrected the graph format of Q1-Q3 and Q5 according to the requirements of the client based on the ACLU format requirements.

These changes include, but are not limited to:

   - Informative headings

   - Font GT America Regular for Y axis and Bar values(size =18)

   - Font GT America Bold for Title(size = 11)

   - Used ACLU colors

   - Removed labels on Axis

   -Adjusted Highlighted Bar Values

Reasons why we did not use old codes as templates :
1. Fall 2022 team 1: many were line graphs, not in ACLU
2. Fall 2022 team 2: not all visualizations are in ACLU style

Visualization Part (old data)

In this section, we use budget data and BPD police payroll data, both up to 2023, to visualize and analyze data on nine key issues. The purpose is to identify trends and changes in budget allocations from previous years.

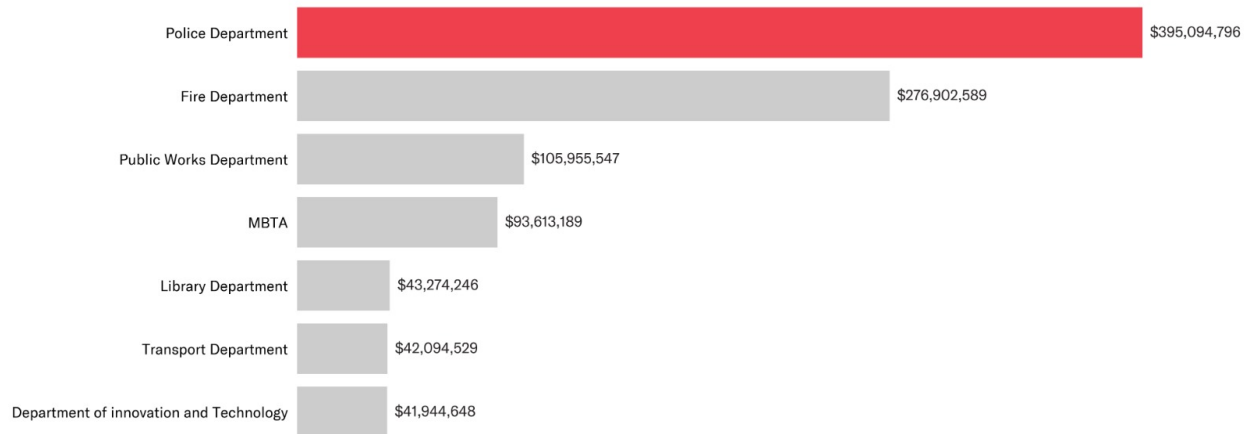## 1. Total Budget VS Previous Years

From 2020 to 2023, the BDP's overall budget and overtime budget are declining
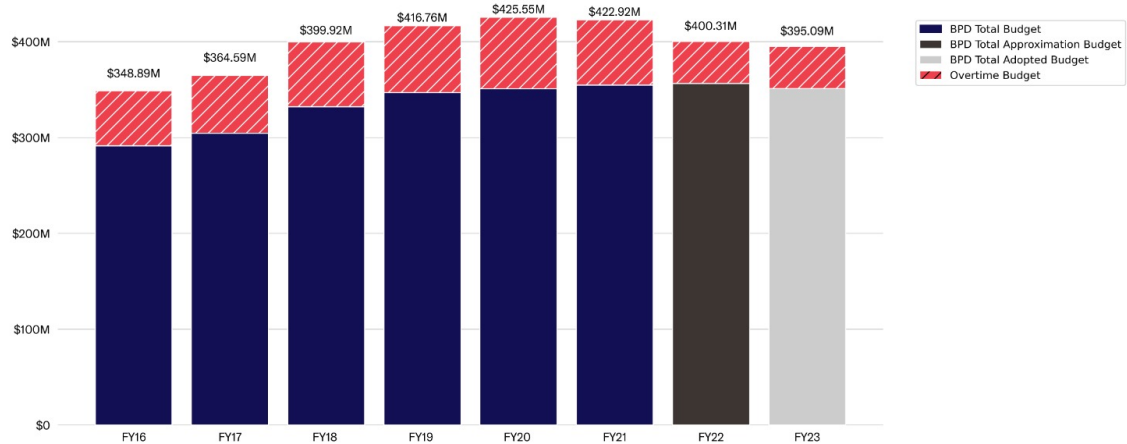
This chart shows a year-over-year budget comparison of the Boston Police Department from 2016 to 2023. The trend shows that the overall decline rate of the BDP budget is relatively slow, indicating that the government still needs to strengthen control. Until 2020, the BPD budget had an upward trend year by year, and peaked in 2020. In the three years since, the BPD budget has been declining. Compared to the peak in 2020, the adopted budget in 2023 is predicted to decrease by 7.15%, which means that the Boston government's policy on adjusting the BPD budget during these three years is effective. However, the annual BPD budget decline rate during these three years was 0.62%, 5.35% and 1.3%(predicted), respectively.
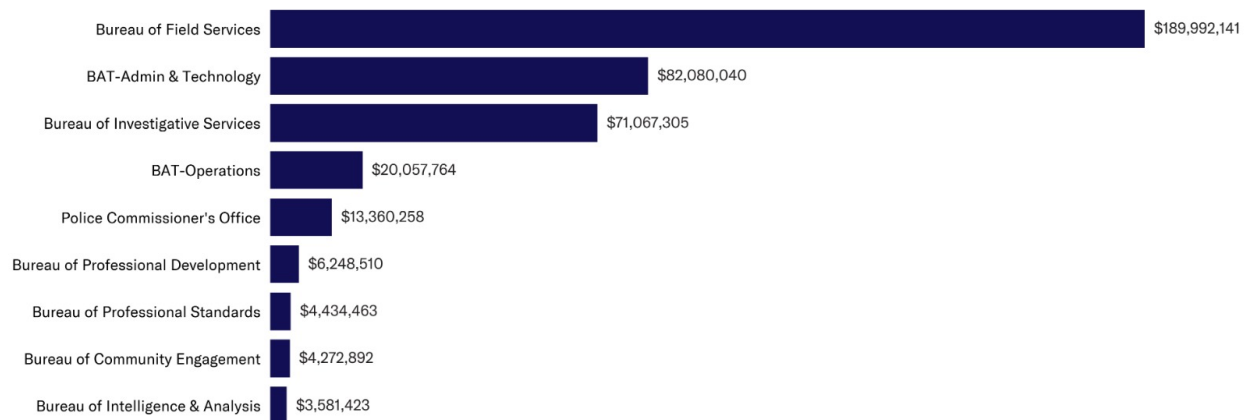
2. BPD Budget VS Other Department Budget

Boston Police Department has the largest adopted budget out of all departments excluding BPS

Department	Budget
Police Department	$395,094,796
Fire Department	$276,902,589
Public Works Department	$105,955,547
MBTA	$93,613,189
Library Department	$43,274,246
Transport Department	$42,094,529
Department of innovation and Technology	$41,944,648

The graph above shows the adopted budget of the seven most ranked departments in FY23, classified by department. BPD is the department with the highest budget, of which the budget is $39,509,479, exceeding the third-ranked Fire Department's budget by $11,819,211. Therefore, the BDP's budget may need to continue to shrink.

3. BPD Budget Spend Categories in FY23

Bureau of Field Services is the program with the highest total budget in FY23, twice as much as the second place.

Program	Budget
Bureau of Field Services	$189,992,141
BAT-Admin & Technology	$82,080,040
Bureau of Investigative Services	$71,067,305
BAT-Operations	$20,057,764
Police Commissioner's Office	$13,360,258
Bureau of Professional Development	$6,248,510
Bureau of Professional Standards	$4,434,463
Bureau of Community Engagement	$4,272,892
Bureau of Intelligence & Analysis	$3,581,423

The graph, categorized by program, shows the Boston Police Department's budget allocation for 2023. The top three projects are Bureau of Field Services, BAT-Admin & Technology and Bureau of Investigative Services, which account for 86.85% of the total budget. The Bureau of Field Services was the highest-budget program, which counts for $189.99M, more than double the number of second-place

programs. Compared with these three main categories, the remaining 6 categories account for less budget, and the difference is not big.

4. Number of Police Officers Received Vs Not Received Various Payroll


Payroll distribution over time
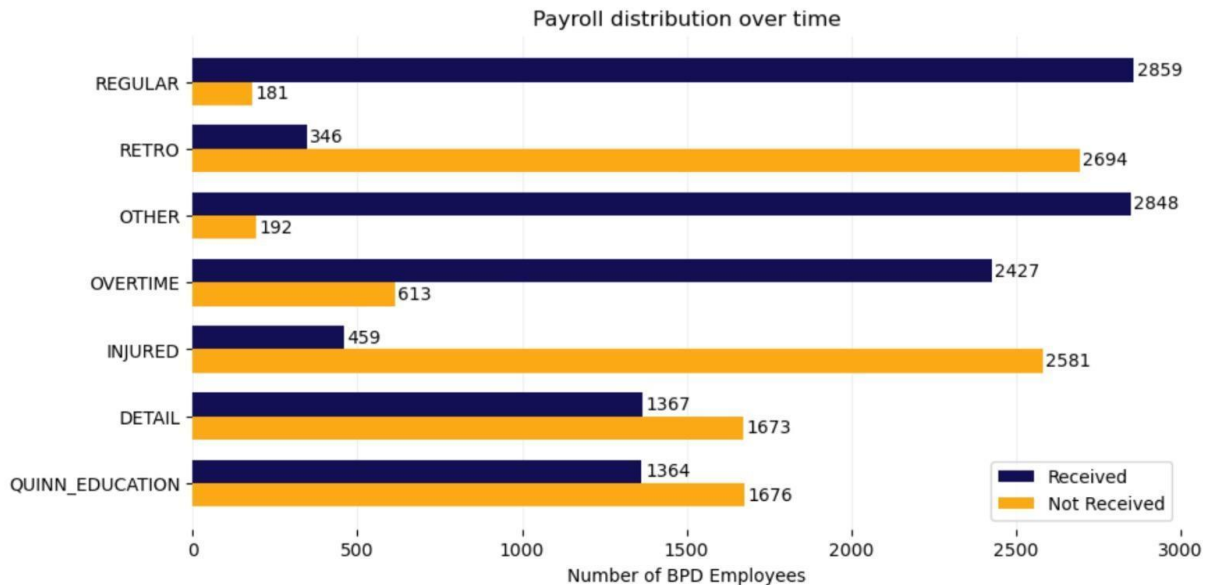
This graph shows how Boston police officers are paid in seven major income categories by comparing those who are paid with those who are not.

By comparing the receive status of each category, it can be seen that the three major categories of earnings, which are OTHER earnings, REGULAR earnings and OVERTIME earnings, can be received by more than 80% of police officers. Besides, half of the police officers can receive the PAID DETAIL earnings and EDUCATION INCENTIVE Earnings. As for injured earnings and retro earnings, only 15.1% and 11.4% of employees can receive them. Therefore, we can conclude that the main income of the vast majority of Boston police is obtained from OVERTIME payments, REGULAR payments and OTHER payments such as bonus incentive earnings, grievances and ect. Therefore, getting wages through overtime working is an important way for them to get wages.

5. Total overtime of top departments in FY22

The total overtime pay of Boston Police Department ranked Highest in FY22, 1.8 times that of BFD
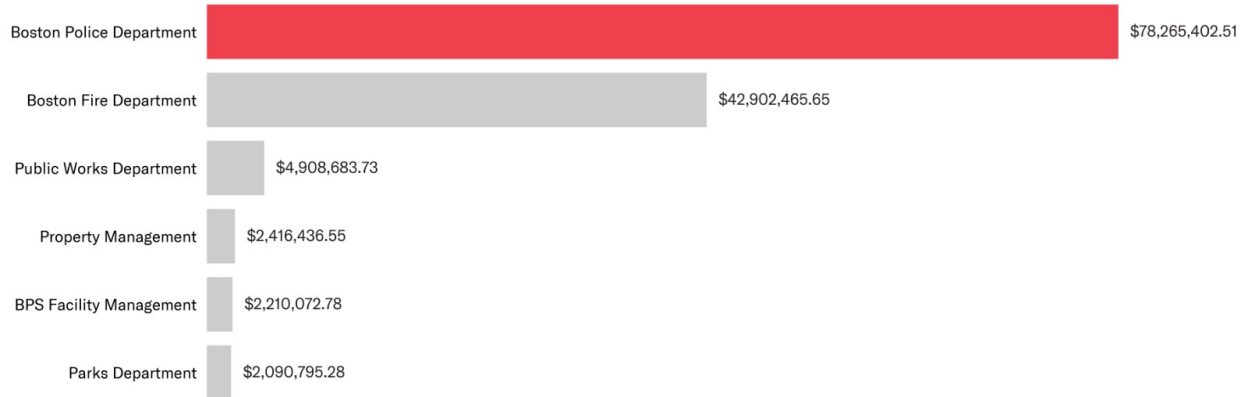
This graph is classified by department, showing the top 6 departments in Boston in the category of overtime pay in 2022. During 2022, the overtime pay of the Boston Police Department has been ranked first and far exceeded the second place Boston Fire Department for at least 30 Million dollars. In addition, the average overtime pay of other departments in 2022 is about 3.7% of the BPD OH pay, which further implies the irrationality of BPD's overtime pay.

6. Payroll distribution in FY22 (base, overtime, retro, detail, etc.)

Payroll Distribution FY 22
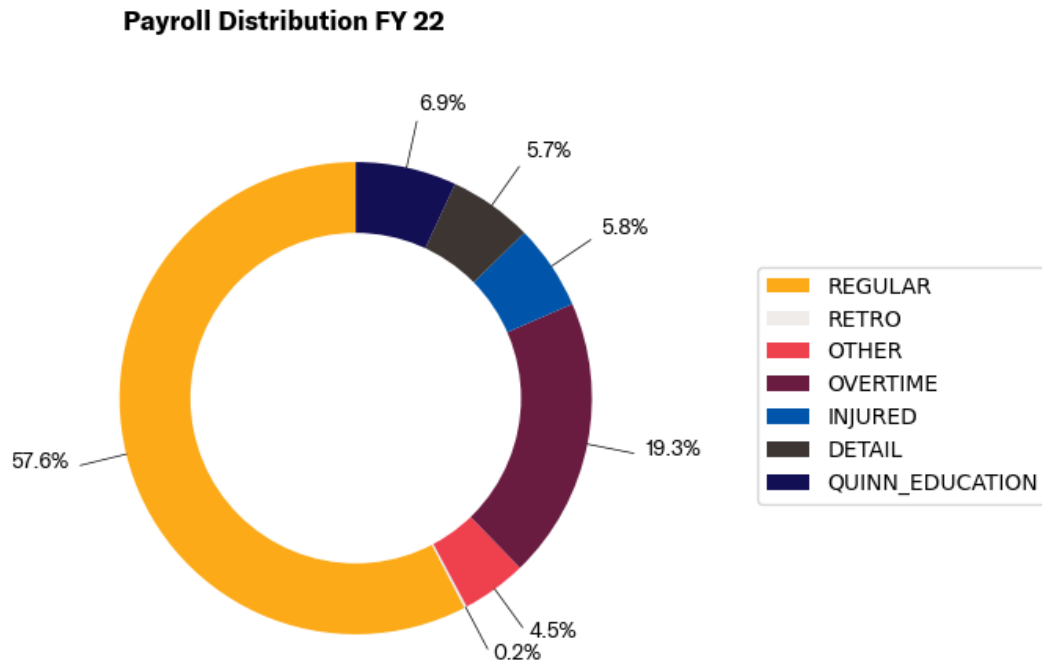
This pie chart shows the payroll distribution of Boston Police Officers in 2022. The income distributions that account for the most officers' income are regular pay and overtime pay, accounting for 57.6% and 19.3% respectively. These two income categories accounted for 76.9% of the overall income, and the rest of the payroll distribution accounted for 4.5%-6.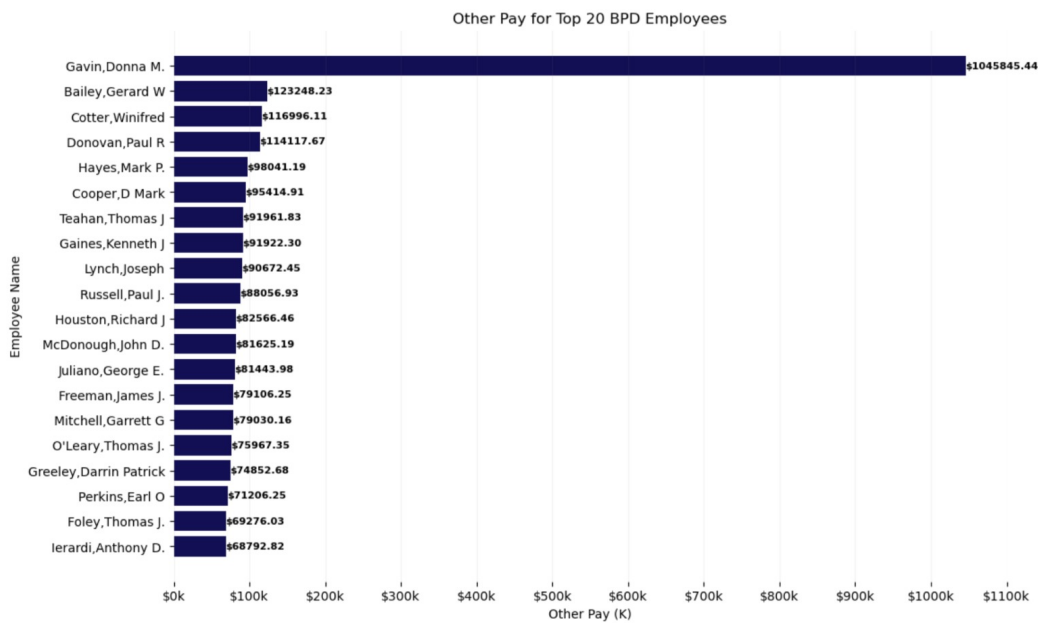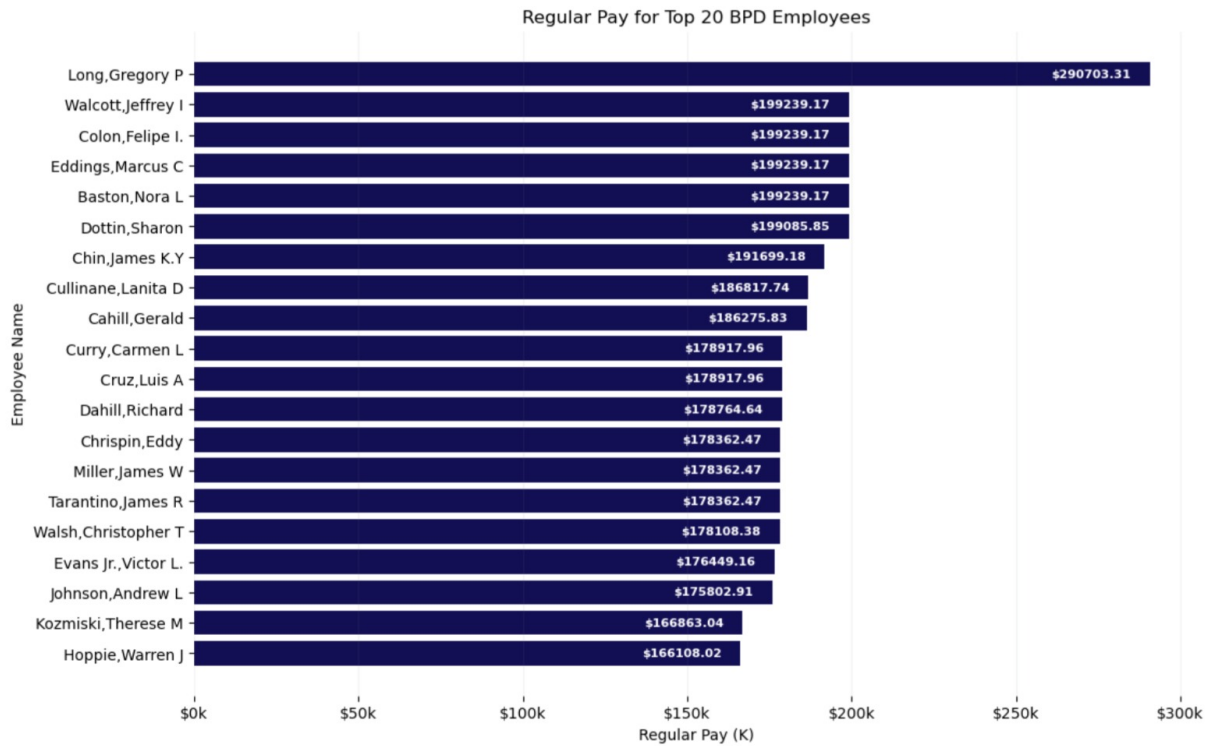9% respectively, which had little impact on the overall income. Therefore, when studying how much the personnel classification contributes to the BPD budget overrun, it is necessary to focus more on the rationality of setting the amount of regular pay and overtime pay.

7. Top 20 Earners (OT, Base, Other)

Overtime Pay for Top 20 BPD Employees

Employee Name	Overtime Pay
Demesmin,Stanley	$196515.25
Barrett,Thomas E.	$163494.70
Downey,Paul J	$163269.38
Acosta,Jose L	$151608.89
Johnson,Rick E	$150658.84
Brown,John M	$146754.36
Jones,Craig D	$144457.87
Smith,Sean P	$142692.38
Christie,Albert C	$141222.99
Moore,James A	$140518.00
Webb,Keith A	$134229.14
Medina,Richard L	$131171.81
Holder,Alvin S	$130488.01
Lewis,Richard G	$129723.59
Dambreville,Emmanuel C	$127284.50
Jones,Andrell J	$127264.45
Doherty,Sean M	$127166.88
Donlon,Paul L	$126132.07
Fitzgerald,John J	$125671.91
Juba,Dave E	$124431.75

Regular Pay for Top 20 BPD Employees

Employee Name	Regular Pay (K)
Long,Gregory P	$290703.31
Walcott,Jeffrey I	$199239.17
Colon,Felipe I.	$199239.17
Eddings,Marcus C	$199239.17
Baston,Nora L	$199239.17
Dottin,Sharon	$199085.85
Chin,James K.Y	$191699.18
Cullinane,Lanita D	$186817.74
Cahill,Gerald	$186275.83
Curry,Carmen L	$178917.96
Cruz,Luis A	$178917.96
Dahill,Richard	$178764.64
Chrispin,Eddy	$178362.47
Miller,James W	$178362.47
Tarantino,James R	$178362.47
Walsh,Christopher T	$178108.38
Evans Jr.,Victor L.	$176449.16
Johnson,Andrew L	$175802.91
Kozmiski,Therese M	$166863.04
Hoppie,Warren J	$166108.02

Other Pay for Top 20 BPD Employees

| Employee Name	Other Pay (K)
Gavin,Donna M.	$1045845.44
Bailey,Gerard W	$123248.23
Cotter,Winifred	$116996.11
Donovan,Paul R	$114117.67
Hayes,Mark P.	$98041.19
Cooper,D Mark	$95414.91
Teahan,Thomas J	$91961.83
Gaines,Kenneth J	$91922.30
Lynch,Joseph	$90672.45
Russell,Paul J.	$88056.93
Houston,Richard J	$82566.46
McDonough,John D.	$81625.19
Juliano,George E.	$81443.98
Freeman,James J.	$79106.25
Mitchell,Garrett G	$79030.16
O'Leary,Thomas J.	$75967.35
Greeley,Darrin Patrick	$74852.68
Perkins,Earl O	$71206.25
Foley,Thomas J.	$69276.03
Ierardi,Anthony D.	$68792.82

The above three graphs show the Top 20 Earners in the three categories of OT, Base and Other pay. From the perspective of the overall trend, the median of regular pay is the largest, reaching $178,918, followed by overtime pay, whose median is $140,519, and the median of other pay is only $88,056. According to this finding, the high basic salary and overtime pay is the main reason for the high income of high-income groups. In addition, except for those who rank the highest in each category, there is not much difference in

the income of the other officers in the two categories of regular and other pay. While the overtime category shows a clear decline, with a difference of $40,000 between the second and 20th ranks.

8. High level overtime analysis (base salary vs. overtime vs. other departments)
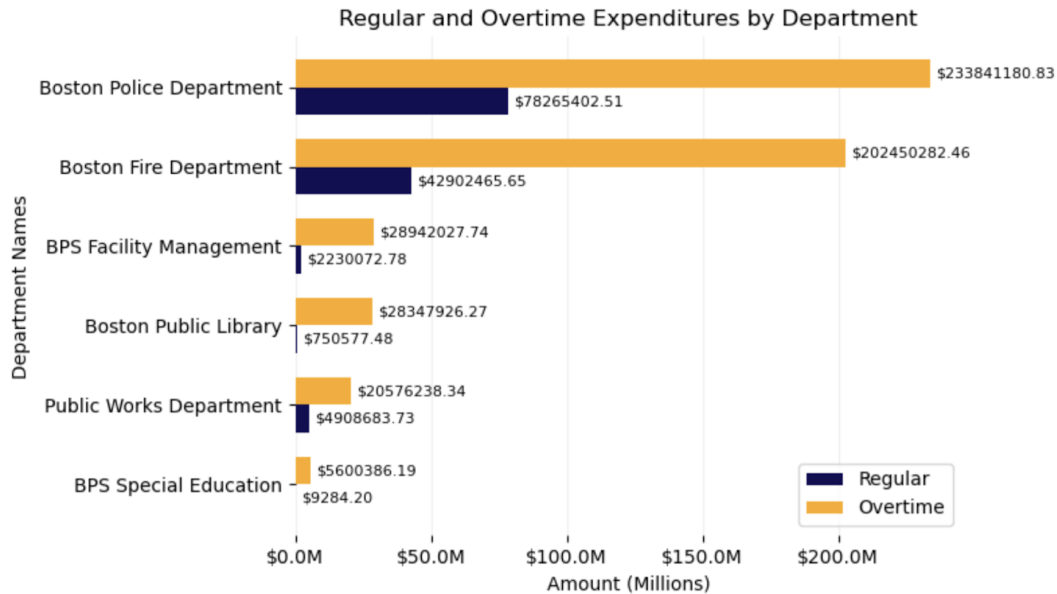
This graph is classified by sectors and analyzes the expenditures of each sector on regular salary and overtime salary in 2022. It can be clearly seen from the figure that the money spent by BPD on Regular and Overtime salary ranks the highest among the six departments. Compared with BPD, BFD's regular spending and overtime spending are about $30,000,000 less. What's more, the spending of other departments is 1/10 times of BPD, or even less.Therefore, it can be concluded that BPD spends too much on Regular and Overtime spending, which needs to be adjusted.

9. Number of employees vs. OT spend
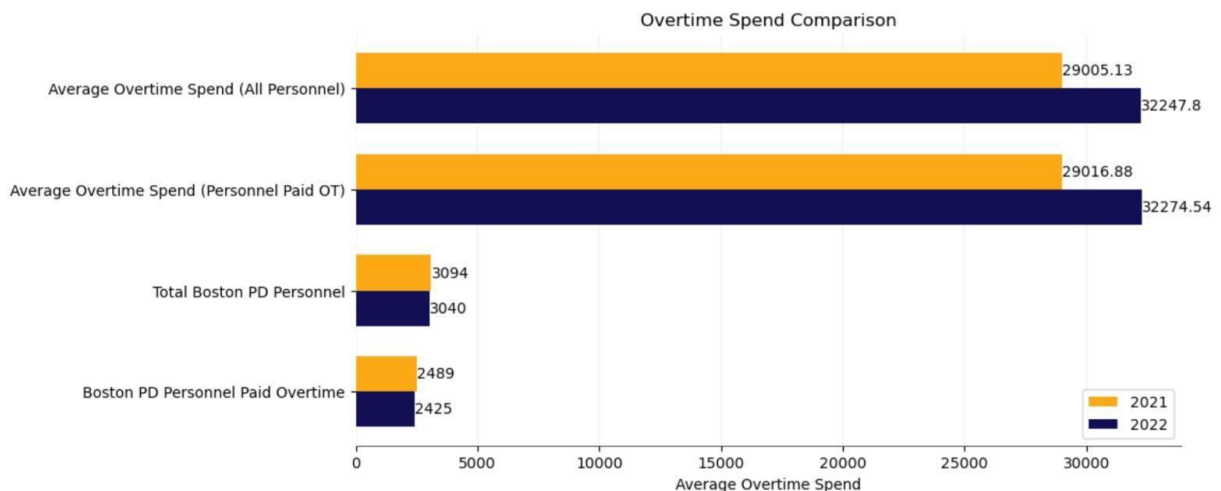
This graph illustrates the overtime spending comparison in 2021 and 2022. The number of both Total Boston PD Personnel and Boston PD Personnel Paid overtime are decreased. However, the average overtime spend of All Personnel and Personnel Paid OT increased. This difference implies that the Overtime Spending on both categories did not decrease in 2022.

Further Project

In this section, we use the latest budget data released by the government on April 10, 2023 to conduct a visual analysis of the three core issues of Q1-Q3 in the first part. These three questions are selected because they can more intuitively highlight the changes in the BPD budget and the overall government budget in the last year, and provide a basic analysis basis for the government to judge the rationality of the BPD budget. Then, we studied the racial classification of BPD officers based on the personal information of officials to determine whether there is racial discrimination within BPD in the second part.

Visualization Part I（new data）

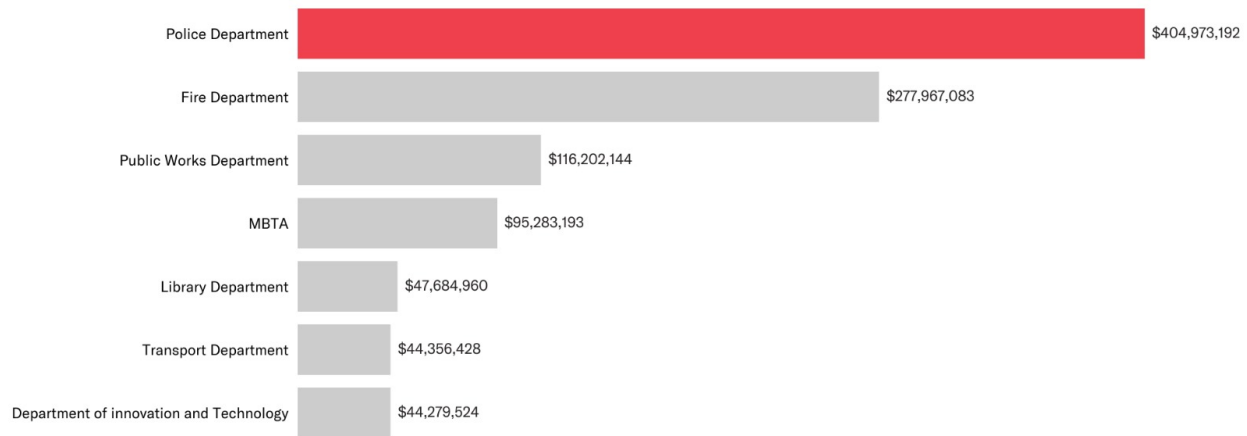### 1. Total Budget VS Previous Years

BDP's total recommended budget in FY24 increase for the first time after three years of budget cuts.
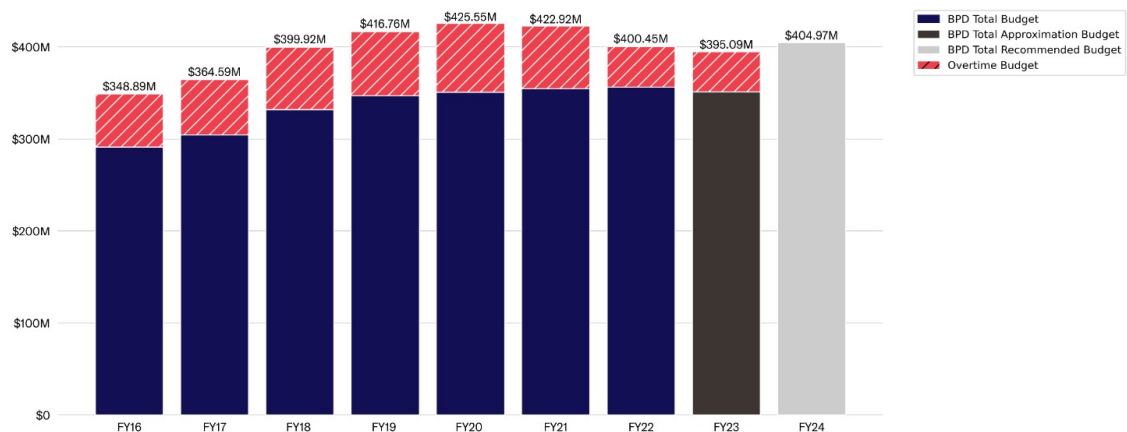
BDP's total recommended budget in FY24 is roughly $9 million higher than last year's budget. This is the first increase after three years of budget cuts.
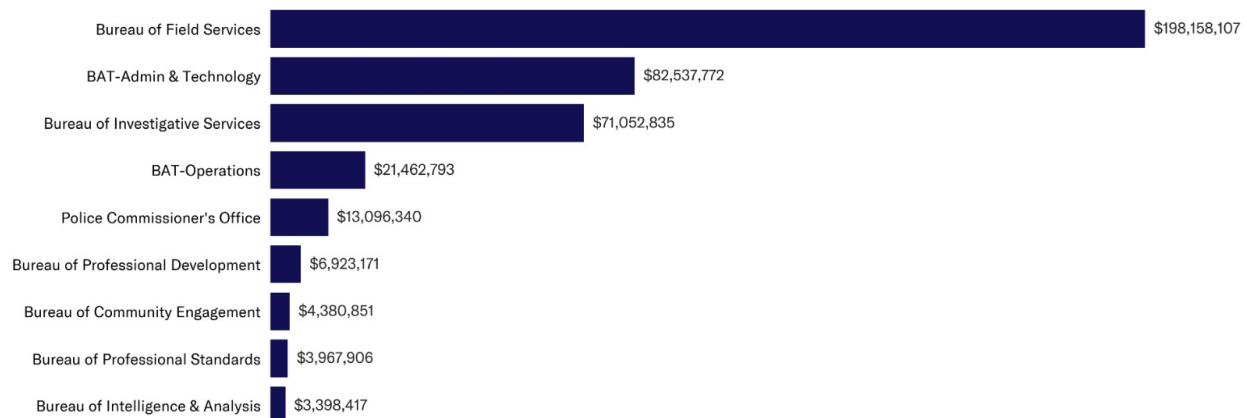
2. BPD Budget VS Other Department Budget

Boston Police Department has the largest adopted budget out of all departments in FY24

Department	Budget
Police Department	$404,973,192
Fire Department	$277,967,083
Public Works Department	$116,202,144
MBTA	$95,283,193
Library Department	$47,684,960
Transport Department	$44,356,428
Department of innovation and Technology	$44,279,524

Among the budget expenditures of various departments in Boston in FY24, BPD still ranks the highest, surpassing the second-placed Fire Department at $127,006,109. The ratio between the budgets of the BPD and BFD was even wider than last year, with an increase of 2.1%. In addition, the budgets of other departments increased, but not by much.

3. BPD Budget Spend Categories in FY24

The Bureau of Field Services is still the program with the largest total budget in 2024, with a larger budget than last year.

Category	Budget
Bureau of Field Services	$198,158,107
BAT-Admin & Technology	$82,537,772
Bureau of Investigative Services	$71,052,835
BAT-Operations	$21,462,793
Police Commissioner's Office	$13,096,340
Bureau of Professional Development	$6,923,171
Bureau of Community Engagement	$4,380,851
Bureau of Professional Standards	$3,967,906
Bureau of Intelligence & Analysis	$3,398,417

According to BPD budget allocation in FY24, Bureau of Field Services, BAT-Admin & Technology and Bureau of Investigative Services are still ranking as the top three BPD budget spend categories. Among them, the budget of the Bureau of Field Services has increased by $8,165,966 compared with last year, which is the largest increase in the amount of all categories. Although the budgets of five of the nine

categories have been reduced compared to last year, the overall budget of the BPD has increased significantly compared to the previous year due to the excessive increase in the budgets of other four categories.

Visualization Part II（Racial Comparison）

Black vs White Ethnic Group Distribution in Police Data FY 20

24.9%

BLACK
WHITE

75.1%

Black vs White Ethnic Group Distribution in Police Data FY 21

24.3%

BLACK
WHITE

75.7%

Black vs White Ethnic Group Distribution in Police Data FY 22

24.4%

BLACK
WHITE

75.6%

According to the racial comparison graph of the BPD police from 2020 to 2022, it can be seen that the number of black people accounted for about 32% of the number of white people on average during these three years. Although the number of police officers in both classifications shows a year-on-year downward trend, in 2021, the number of blacks will decrease by 4.5% compared with the previous year (2020), and the number of whites will decrease by 1.3%; in 2022, the number of blacks will decrease compared with the previous year 0.8%, and whites dropped 1.1%. It can be seen that the number of races within the BPD is not evenly distributed, and whites have a higher chance of serving as police officers. At the same time, judging from the three-year decline in the number of police officers, blacks have a higher probability of leaving (or retiring) than whites.

Conclusion

We obtained the following conclusions by visualizing the content related to the BPD budget.

First of all, BPD's budget is relatively high compared to other departments in Boston, and it has continued to rise this year. Secondly, for BPD officers, the main income of the vast majority of them is obtained from OVERTIME payments, REGULAR payments and OTHER payments. In the income ranking of officers, other payment accounts for a large part of the salary slips of the top officers, but the specific content of this part of the salary is not transparent. Third, the overall overtime payment of BPD is much higher than that of other departments, and spends too much on Regular and Overtime payment, which needs to be adjusted. Finally, there is racial discrimination in the distribution of police officers in BPD. The annual average only accounts for about 32% of the white race.

Limitation

Since our data set involves the position, salary level and salary classification of each BPD official, there is much missing data in this statistical process. Therefore, in our analysis process, we discarded official information with too many null values, which may lead to biased analysis. Therefore, if the follow-up team continues the research of this project, it is hoped that the team members can ask the client whether there is a more comprehensive internal data set to improve the analysis.

In addition, when conducting total budget research over the years, for the reason of missing data (proposed budget), we analyzed the data of appropriation budget, adopted budget and expense instead of analyzing the relationship of proposed budget and adopted budget. After comparing the data of , we believe that the definitions of the two are consistent. However, since the name of the budget category is inconsistent with that given by the client, we hope that the follow-up group can confirm this issue.

Due to time issues, we did not study the overtime payment content of BPD in depth. The follow-up team can study what BPD officers do during overtime to analyze whether they falsely report the length of overtime or laziness during overtime to determine whether the overtime payment is reasonable.

Appendix

Navigating through Code files

Code files: https://github.com/BU-Spark/ds-aclu-police-budget-analysis/tree/working-1

In the Git repo , we have uploaded the latest version of the code Template with the required graphs Suggested by Client. All the data is straightaway fed into the code files, which means that outputs can be visualized once running the cells. For Few files, the data is under folder Called " data" . when running please add the necessary path to the cells . For a detailed report on each graph , a report under the deliverable folder is created .

Team Contribution

Role	First Name	Contribution
Team Rep	Mohan Sai Krishna Thota	Mainly worked on the templates suggested by the Client on the graphs, including cleaning data and making visualization part. Also followed up the task completion and improved the report.
Team member	Anran Du	Mainly wrote the analysis and reports. Also confirmed how to solve the problem through visualization and the accuracy of the corresponding data.
Team member	Ajit Balla	Mainly worked on the templates suggested by the Client on the graphs, including cleaning data and making visualization part.
Team member	Srinivas Chellaboina	Mainly worked on the remaining questions, the graph template, and some modifications to earlier graphics have all been worked on.