Deliverable 1
Report:

1. A brief introduction to your problem statement:

The City of Boston annually allocates financial resources to sustain and enhance its municipal operations and infrastructure through the operating and capital budgets. The operating budget is crucial for maintaining essential city services, employing personnel like teachers, police officers, and firefighters, and supporting various public services, including housing, recycling, and transportation. In contrast, the capital budget focuses on acquiring, maintaining, or improving the city's physical assets, and it is funded through a combination of bonds, city funds, and grants from various sources.

Despite the availability of budget data, there is a need for comprehensive analysis to understand how these financial resources are distributed across different city departments, neighborhoods, and specific projects. This project aims to delve into the budget allocation patterns, scrutinize trends in funded projects over time, and identify shifts in resource distribution across various city dimensions.

Through detailed data analysis, this initiative seeks to uncover insights that address pressing questions, such as:

- How is the annual budget distributed across different city departments, and what are the trends and changes in this distribution over time?
- What proportions of the budget are allocated to various categories, and how has this allocation shifted across different fiscal years?
- Which geographical areas within the city receive the most funding, and how does this distribution change over time?
- How are funds distributed among various city programs or initiatives, and what trends can be observed in this distribution?
- How does the projected spending compare to the actual expenditures across different departments and programs, and what are the notable discrepancies?
- What is the per capita spending across different departments, areas, and programs, and how does this spending vary and change over time?

These questions aim to guide the analysis towards a comprehensive understanding of budget allocation and spending practices within the City of Boston, shedding light on patterns, disparities, and areas for potential improvement.

2. Details of the data collection or cleaning steps you've undertaken:

Data Collection:
The dataset utilized for this analysis was sourced from the official course Google Drive given to us as its initial analysis.

Data Cleaning and Preprocessing:

Handling Missing Values:

We conducted a comprehensive check for missing values within the dataset. Fields with missing values were identified, and depending on the context and significance of the data, we either filled the missing values using appropriate methods (such as mean or median imputation) or omitted the records if the missing data was deemed critical and irreplaceable.

Data Type Conversion:
Ensuring that all data types were correctly identified and converted was a crucial step. Monetary values were converted to numerical data types, facilitating accurate calculations and analyses.

Renaming and Standardizing Column Names:
Column names were standardized for consistency and ease of understanding. This involved renaming columns to ensure clarity, removing any leading or trailing spaces, and ensuring a uniform naming convention across the dataset.

Dealing with Duplicates:
The dataset was scrutinized for any duplicate entries, and duplicates were removed to maintain data integrity and avoid skewed analysis results.

Filtering and Aggregating Data:
Based on the analysis requirements, the dataset was filtered to include only the relevant columns and records. Additionally, data was aggregated where necessary, such as summing up the budget amounts across different fiscal years or departments.

Data Validation:
Validation checks were performed to ensure that the data was consistent and accurate. This involved cross-verifying budget totals, checking for anomalies or outliers, and ensuring that the data aligned with known financial figures from official city reports.

Handling Special Characters and Inconsistencies:
Any special characters, extra spaces, or inconsistencies within the data were addressed and corrected to ensure a clean and uniform dataset.
Data Transformation:

Creating Derived Columns:
Based on the analysis needs, new columns were derived from existing data. For example, calculating per capita spending required creating a derived column that divided total spending by the population.

3. Exploratory Data Analysis (EDA):

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- a consistent increase in operational expenses from FY21 to FY24, with contractual services being the predominant expense, indicating an expansion in operations and potential new projects in the pipeline.
- The operational budget distribution from FY21 to FY24 indicates that the Education Cabinet, particularly Boston Public Schools' personnel services, consistently receives the highest allocation, followed by expenses in the "Other" category, like pensions. The Public Safety Cabinet also remains a significant portion of the budget. The overall budget structure has remained relatively stable over the years.
- In FY21, the Capital budget was significantly higher than the Grant budget, with an amount nearing $2.25 billion compared to Grant's roughly $736 million.
- In FY22, there was a notable decline in the Capital budget, coming down to about $1.93 billion, whereas the Grant budget saw a sharp reduction to approximately $348.5 million.
- By FY23, the Grant budget experienced a considerable increase, nearing $1.37 billion, while the Capital budget went up slightly to around $3.28 billion.
- The overlapping nature of the bands indicates fluctuations in budget allocation over these years, with Capital generally remaining higher than Grant.
- Many departments have expenses mainly categorized under "Personnel Services," indicating that a significant portion of their budget might be going toward salaries and related expenses.
- Some departments have diverse expense categories, suggesting a broader range of operations and services they offer.

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- Boston Public Schools seems to have both significant capital and operational expenditures.

Changes in Revenue Categories

- **Property Tax Levy:** This is the largest source of revenue for the city, consistently increasing over the years.
- **State Aid:** Significant revenue comes from state aid, with a noticeable increase, particularly from FY22 to FY24.
- **Excises:** There is a noticeable increase in revenue from excises, especially from FY22 onwards.
- Other categories such as "Utility Franchise", "Charges for Services", and "Fines & Forfeits" also contribute to the city's revenue.

Changes in Revenue by Department

- **Treasury Department:** This department sees the largest revenue, particularly in FY22 and FY24.
- **Boston Public Schools:** Significant revenue is allocated to Boston Public Schools, with a notable increase in FY22.
- **Transportation Department:** There is a noticeable increase in revenue for the Transportation Department from FY21 to FY22.
- Other departments such as "Neighborhood Development," "Public Works", and "Library" also receive substantial revenue.
- While some departments, like the Public Works Department, have a high capital budget, they might not have as substantial an operational budget (or vice versa).
- "Personnel Services" dominates the operational budget spending.

- "Contractual Services" and "Other Expenses" also represent significant portions of the budget.
- Categories like "Equipment" and "Fixed Expenses" have the least spending.
- The majority of the capital budget spending is allocated to "Citywide" projects.
- "Charlestown" and "Downtown/Government Center" have substantial spending, followed by "Multiple Neighborhoods" and "Chinatown".
- "Roslindale" and "Harbor Islands" receive the least capital budget spending among the top 10 neighborhoods.
- "BPS Finance" has the highest spending among the top 10 programs.
- "BPS Operations" and "Health Insurance" are also major spenders.
- "MBTA" and "Public Health Commission" are at the lower end in terms of operational budget spending for the top 10 programs.
- There's a gradual increase in operational budget spending over the fiscal years.
- FY24 Adopted budget shows the highest projected spending, indicating a potential expansion or increased costs in operations for that fiscal year.
- FY21 had the least spending among the displayed fiscal years.

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Analyzation by department

- In the allocation of the Boston budget, it is evident that a significant portion of the city's financial resources is directed toward the Boston Public Schools. This allocation surpasses other departments by a substantial margin, reflecting the city's commitment to education and the importance placed on investing in the future of its residents. The emphasis on public education is particularly pronounced, and it is notable that this allocation has witnessed a noticeable increase, especially from FY22 onwards.
- Following the Boston Public Schools in budget allocation are the Fire and Police departments. These essential public safety services receive substantial funding, underlining the city's dedication to ensuring the safety and well-being of its citizens. The allocation towards these departments reflects the priority placed on maintaining law and order and responding effectively to emergencies.
- Beyond these critical services, other departments, such as the library and health services, also receive their share of the budget. While they may not receive as much funding as the Boston Public Schools or public safety departments, their allocation signifies the city's recognition of the value of these services in enhancing the overall quality of life for its residents. Libraries offer educational and cultural resources, while health services are vital for the well-being of the community.
- In summary, the budget allocation in Boston reflects a commitment to education, public safety, and essential services. The Boston Public Schools receive the largest share of the budget, indicating a focus on the future of the city's youth. The Fire and Police departments follow closely, emphasizing the importance of public safety, with other services like the library and health services also being recognized and funded to support the overall welfare of the community.
- There's a clear increase in the budget from FY21 to FY24.
- The FY24 Adopted budget has the highest spending, indicating growth or potential investment in that fiscal year.

- The actual expenses for FY21 and FY22 are less than the appropriations for FY23, suggesting that there might have been more ambitious budget plans for FY23.
- Personnel Services make up the largest chunk of the expenses at 64.6%. This implies that salaries, benefits, and other personnel-related costs might be the major cost drivers.
- Contractual Services, at 14.4%, are the second-largest category.
- Supplies and materials and other categories make up a smaller portion of the budget.
- The Transportation Department seems to have the largest project budget, suggesting it might be a key focus or has more substantial projects.
- Departments like the Fire Department, Mayor's Office of Housing, and Office of Arts & Culture have relatively lower budgets, possibly indicating smaller projects or fewer initiatives in those areas for the period in question.
- Downtown/Government Center, Citywide, and Dorchester appear to have the highest project budgets. This could be because these areas have larger populations, are business hubs, or have more infrastructural needs.
- Neighborhoods like Allston/Brighton and Back Bay have comparatively lower budgets, suggesting either fewer projects or smaller-scale initiatives in these areas.

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- The chart provides a breakdown of departmental spending for FY21.
- A significant portion of the budget seems to be allocated to one department (located at the far left of the x-axis). This department dwarfs the spending of other departments by a considerable margin.
- A few other departments have notable spending, but the majority have relatively low budgets.
- Personnel Services dominates the spending, making it the most significant expenditure. This is consistent with the information we discussed earlier.
- Contractual Services is the second-highest, with the rest of the categories, such as Equipment, Office Expenses, Rent/Charges & Obligations, having significantly lesser allocations.
- The spending on Supplies and materials and Fixed Expenses appears minimal in comparison to the other categories.
- Personnel Services has the highest spending by a considerable margin.
- Contracted Services sees moderate spending, though much less than Personnel Services.
- Wages & Obligations register lower spending.
- Equipment, Fixed Expenses, and Other Expenses all have minimal spending.
- There is negligible spending on Supplies and materials.
- There's a wide range of spending across numerous programs, with some seeing high expenditure while others have much lower allocations.
- In the top 10 programs by expenditure:
- BPS Finance leads in spending.
- BPS Operations and Health Insurance follow closely.
- Other programs, including areas like Fire Suppression, Bureau of Field Services, K8, Elementary, High, Public Health Commission, and MBTA, have varying but generally decreasing levels of expenditure.

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