The Trend and Distribution of the Budget of the Toronto Police Service

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Abstract

Budget spending is essential for assessing the officers' performance, evaluating the social conditions, and planning for future use of resources. This report utilizes data on the approved budget and actual expenditure of the Toronto Police Service to measure the trend and distribution and provide insight for some advocates of the funding of police services. The total amount of approved budget and expenditure illustrated the same trend of decreasing from 2016 to 2018 and growing substantially between 2018 and 2020. The actual expenditure appeared to be lower than the budget during the whole period, while the salaries expense took up the most significant proportion of the total spending. However, this report may be biased due to the possibility of inaccurate reports from the raw data published.

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1.Introduction

In order to provide the citizens with law enforcement and policing services, the Toronto Police Service(TPS) was established in 1834 as the oldest local police service in North America. It is overseen by the City of Toronto as one of its agencies, forming the largest municipal police service and one of the most significant police forces within the country. The officers of the TPS undertake a broad array of work. Despite the traditional duty of preventing and dealing with crime and being in charge of traffic service on 400-series highways of patrolling, they are also responsible for parking enforcement on all roads and public property, police dog services for suspects and missing people, resolving conflicts in communities, providing service to community mobilization unit, and reducing or preventing social disorder.

To accomplish the mission and goals, sufficient funding should be budgeted appropriately. Toronto City Council determines the TPS's annual budget by voting on the funding level. Between 1986 and 2012, the Real per capita police expenditures in Canada rose more than 45%. In 2019 and 2020, the TPS ranked as the most considerable expense among all agencies under the City of Toronto at \$1.035 billion and \$1.076 billion, exceeding the Toronto Transit Commission (TTC) (Toronto 2020). A public sector salary disclosure also demonstrates in 2013 that 37.29% of the Toronto police force earned more than \$100,0000 while the expenditure on police service had been increasing faster than the inflation and spending on other public agencies("Police and Crime Rates in Canada: A Comparison of Resources and Outcomes," n.d.,). Considering the high expenditure on the TPS, there had been a rising concern in Canada to defund the police to align with the decline in workload as the criminal code incidents per officer dropped by 36.8%("Police and Crime Rates in Canada: A Comparison of Resources and Outcomes," n.d.,). The movement of defunding police evoked from the United States due to the murder of George Floyd has also provoked the debate of whether to decrease the TPS budget and invest more public funding to promote public safety("Support for Defunding the Police Department Is Growing. Here's Why It's Not a Silver Bullet." n.d.).

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[1]This footnote will appear at the bottom of the page.: https://github.com/YiranMei/STA304

Therefore, it is essential to evaluate the police budget precisely to better measure the performance, understand its relationship with crime rates and public safety, assess the social order and security, and plan for more efficient use of public resources. In this report, open data published by the Toronto Police Service through the OpenDataToronto will be used to analyze the distribution and trend of the budget by commands and categories by using R (version 4.1.2). More specifically, package tidyverse(Wickham et al. 2019), dplyr(Wickham et al. 2021), ggplot2(Wickham 2016), and kableExtra(Zhu 2021) are utilized to analyze statistics, depict figures and tables, and generate the report.

2. Data

2.1 Data Source

The Toronto Police Services published this dataset on Oct 20, 2021, through OpenDataToronto. The annual approved budget and actual expenditure from 2016 to 2020 are included at a service-wide level. The approved budget refers to the operating funding authorized by the Council and the TPS board for each year, while the actual expenditure denotes the incurring operating expenses incurred for that year. The dataset was obtained directly from the OpenDataToronto Portal using the R package opendatatoronto(Gelfand 2020).

The data could be biased since there is a possibility that the report from the TPS committed fraud or mistakes. It might be overestimated or underestimated if the entries report were missing by mistake or intended to report falsely. It requires the further effort of auditing to ensure the validity of the report from the TPS and the accuracy of this report.

2.2 Data Characteristics

The reported data contains the approved budget and actual expenditure each year, classified by category and command from 2016 to 2020. There were 740 observations in the datasets with six characteristic variables: ID, year, type of metric, category, command and the amount. The first attribute ID was the identifier of each specific budget entry, while the second is the recorded year. The variable of type of metric indicates whether each entry is an approved budget or actual expenditure. The category variable specifies the budget category of the entry, including Salaries, Premium Pay, Benefits, Materials&Supplies, and Equipment. The command is a more detailed segmentation variable of each entry, stating the particular command of each entry among Centralized Service Charges, Corporate Support Command, Human Resources Command, Chief of Police, Information Technology Command, Parking Enforcement Unit, Priority Response Command, Specialized Operations Command, Toronto Police Services Board, and Communities&Neighbourhoods Command. A sample view of the dataset is displayed as below.

```
## # A tibble: 6 x 6
##    '_id'  Year Type_of_Metric       Category            Command          Amount
##   <int> <int> <chr>                <chr>               <chr>             <dbl>
## 1     1  2016 Actual Expenditures  Salaries            Centralized Servi~ 4.17e7
## 2     2  2016 Approved Budget      Premium Pay         Corporate Support~ 7.96e5
## 3     3  2016 Actual Expenditures  Benefits            Centralized Servi~ 8.70e7
## 4     4  2016 Actual Expenditures  Premium Pay         Centralized Servi~ 4.42e5
## 5     5  2016 Approved Budget      Materials & Supplies Corporate Support~ 2.65e5
## 6     6  2016 Approved Budget      Equipment           Corporate Support~ 4.5 e3
```

We group the entries by actual expenditure and approved budget into two new datasets to compare the projected and actual expenditure. Moreover, the actual expenditure of the TPS is more helpful to our goal of measuring the performance and making an efficient plan, while the approved budget is merely projected. The updated datasets are displayed below.

```
## # A tibble: 6 x 6
##   '_id'  Year Type_of_Metric       Category            Command             Amount
##   <int> <int> <chr>                <chr>               <chr>                <dbl>
## 1     1  2016 Actual Expenditures  Salaries            Centralized Servi~ 4.17e7
## 2     3  2016 Actual Expenditures  Benefits            Centralized Servi~ 8.70e7
## 3     4  2016 Actual Expenditures  Premium Pay         Centralized Servi~ 4.42e5
## 4     7  2016 Actual Expenditures  Materials & Supplies Centralized Servi~ 1.36e7
## 5     8  2016 Actual Expenditures  Equipment           Centralized Servi~ 1.18e6
## 6    11  2016 Actual Expenditures  Services            Centralized Servi~ 6.96e7


## # A tibble: 6 x 6
##   '_id'  Year Type_of_Metric  Category            Command             Amount
##   <int> <int> <chr>           <chr>               <chr>                <dbl>
## 1     2  2016 Approved Budget Premium Pay         Corporate Support Co~  7.96e5
## 2     5  2016 Approved Budget Materials & Supplies Corporate Support Co~  2.65e5
## 3     6  2016 Approved Budget Equipment           Corporate Support Co~  4.5 e3
## 4     9  2016 Approved Budget Services            Corporate Support Co~  8.92e5
## 5    10  2016 Approved Budget Revenues            Corporate Support Co~ -5.42e6
## 6    13  2016 Approved Budget Salaries            Human Resources Comm~  3.60e7
```

2.2.1. Amount of Approved Budget and Actual Expenditure

To interpret more clearly and more simply, we create a new variable called amount_by_billion that transforms the amount from dollar to billion dollars. From the summary Table 1&2 of the actual expenditure and approved budget in billion, we can see that the most outstanding amount of a single budget entry from 2016 to 2020 reached $276.15621 Billion. In contrast, the maximum budget approved was $307.9751 Billion, greater than the actual expenditure. The minimum amounts were ($86.03997) Billion for the actual expenditure and ($86.9982) Billion for the approved budget. A negative budget indicated a revenue entry that generated income for the TPS. The mean of actual expenditure and approved budget of $14.38856 Billion and $14.5210 Billion was significantly large compared to the median of $1.02123 Billion and $0.89705 Billion, which implied an extreme skewness to the right.

Table 1: Actual Expenditure and Approved Budget

min	Q1	median	Q3	max	IQR	mean	sd
-86.03997	0.0458644	1.021234	8.529463	276.1562	8.483598	14.38856	46.40723

min	Q1	median	Q3	max	IQR	mean	sd
-86.03997	0.025	0.8004	7.280675	307.9751	7.255675	14.52097	48.24182

In Table 3&4 and Figure 1, we calculate and present the total amount of each year of both actual expenditure and approved budget. The pink line represents the trend of actual expenditure, and the green one is the approved budget. As we can see, the TPS's actual expenditure incurred each year was always lie below the approved budget level. Moreover, both lines follow a similar trend that the amounts slightly decreased from 2016 to 2017. The actual expenditure inclined in 2017, while the approved budget declined moderately, and then they both surged in 2019. In 2020, they increased less significantly.

Table 2: Actual Expenditure and Approved Budget

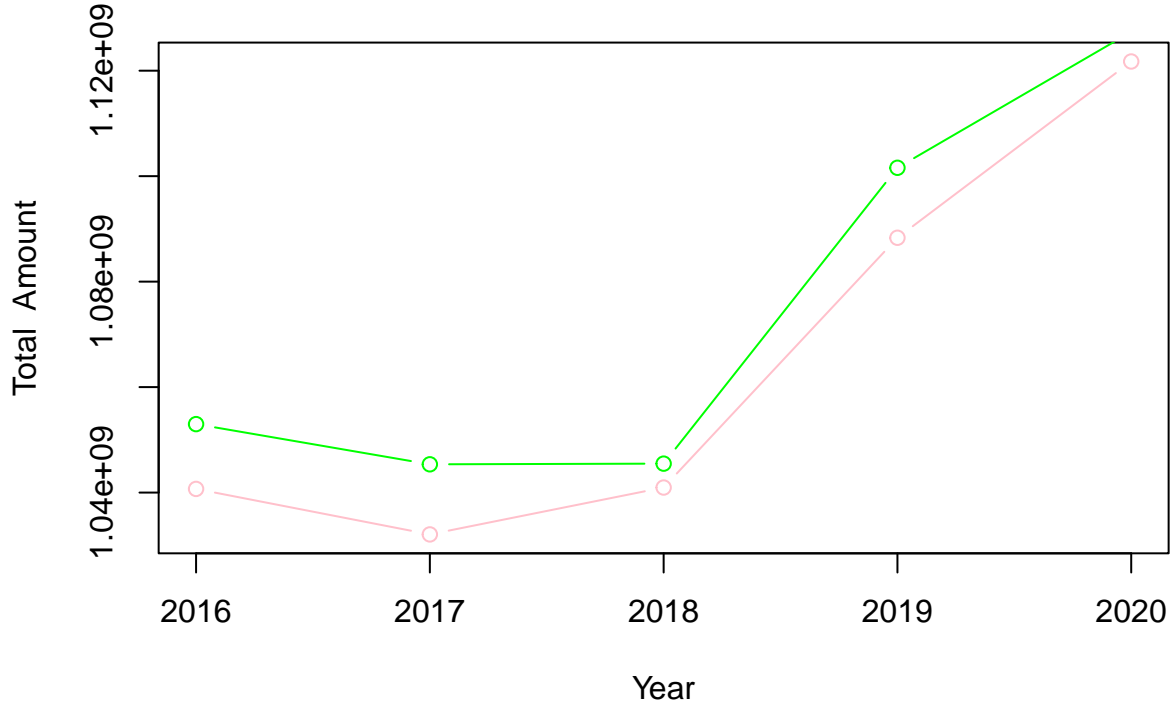| Year	TotalAmount	Year	TotalAmount
2016	1040689114	2016	1052977900
2017	1032065847	2017	1045357200
2018	1040955110	2018	1045484100
2019	1088316726	2019	1101585800
2020	1121741680	2020	1127353900

Figure 1: Annual Total Amount

2.2.2. Amount of Each Category

From summarizing and plotting each actual expenditure entry's amount by category in Table 5 and Figure 2, it is perceivable that the salaries took up the majority of the spending. The minimum amount, median, and maximum were the highest among all. The TPS's second-largest expense from 2016 to 2018 was the benefit, which incurred $1.061639 of the spending.

Table 3: Entry Amount by Category

| Category	min	max	mean	median	Total_Amount
Benefits	1088.30	96470303	20030933.2	6921080.29	1061639461
Equipment	0.00	8549302	859845.8	98772.16	44711981
Materials & Supplies	228.55	17978913	1878738.4	394760.51	99573134
Premium Pay	0.00	27056848	5711559.2	1064098.43	302712638
Revenues	-86039974.70	0	-13441743.6	-1678707.52	-712412410
Salaries	3239.20	276156213	74667350.4	33003100.10	3957369570
Services	16997.63	81948503	10758001.9	1884260.78	570174103

4
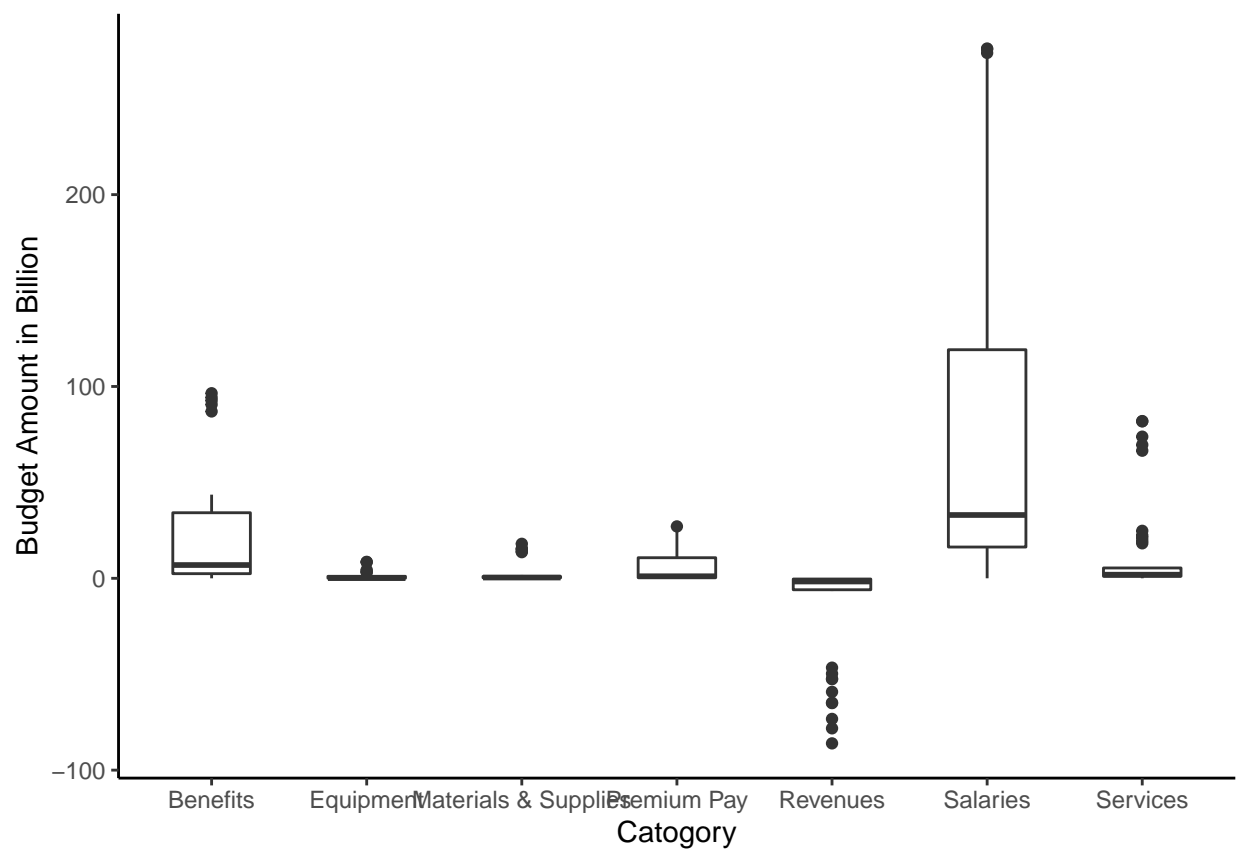
Figure 2: Amount of Each Category

In Figure 3, we can observe and compare the expenditure on each category in each year. It is clear that salaries always spent the highest amount every year, and the salaries expense slightly decreased from 2016 to 2018 and then started to grow to a higher level. The revenues demonstrate an opposite trend that increased from 2016 to 2018 and then dropped. The expenditure on premium pay and services also showed a similar tendency as the revenues. The second-largest expense, benefit, remained steady over the period and the spendings on equipment and materials&supplies. The rank of each category also persisted the same every year.
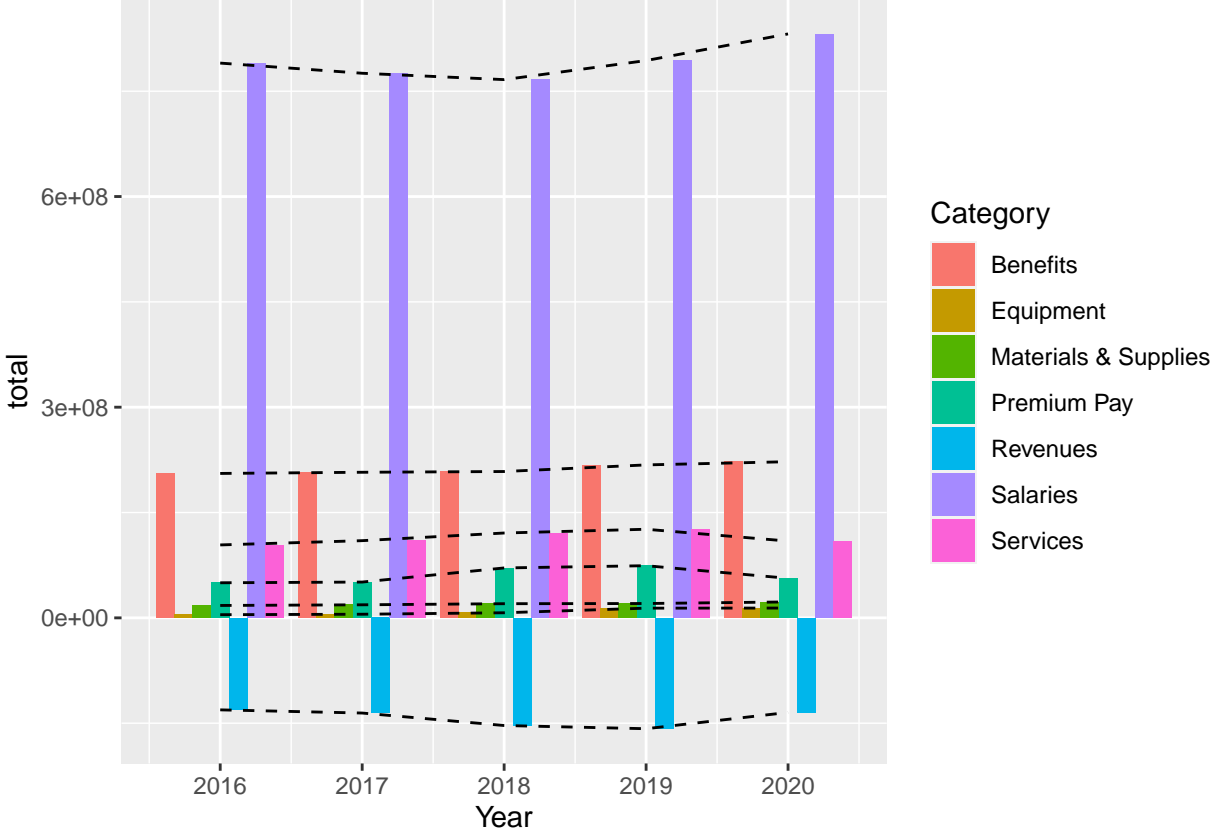

Figure 3: Amount of Each Category By Year

2.2.3. Amount of Each Command

In Table 6, we summarize the statistics of each entry by command type. The Priority Response Command spent the highest expenditure at $1.4299 Billion, while the second-largest expense was incurred for Communities & Neighbourhoods Command at $1.4100 Billion. The command type that spent the least was the Toronto Police Service Board, of only $10.7256 Million.

Table 4: Entry Amount by Command

Command	min	max	mean	median	Total_Amount
(blank)	-257804.0	848491.9	75589.75	6715.99	1511795
Centralized Service Charges	-86039974.7	96470303.3	21563547.20	15146635.02	754724152
Chief of Police	-305364.5	11010145.3	1581193.99	312153.57	55341790
Communities & Neighbourhoods Command	-912945.2	233978535.3	40284690.39	1046158.07	1409964164
Corporate Support Command	-6437534.2	40206687.5	5926853.69	729836.03	207439879
Human Resources Command	-1229314.2	48796852.7	6754768.07	1423734.57	236416882
Information Technology Command	-2001520.9	24740745.5	5902483.59	1138638.07	206586926
Parking Enforcement Unit	-2032382.3	31992910.8	6268518.44	2490136.74	219398145
Priority Response Command	-59191232.0	276156212.7	40854480.83	1102327.35	1429906829
Specialized Operations Command	-6650695.5	142436766.0	22621493.70	4008879.93	791752279
Toronto Police Services Board	-3187460.8	3822057.7	306446.74	6278.13	10725636

Figure 4: Amount of Each Command By Year

By observing the distribution of expenditure on each command each year in Figure 4, we can see that the rank of the command changed over time. The spending on Communities & Neighbourhoods Command were the largest in 2016 and surpassed by the expense on Priority Response Command afterwards. The spending on Specialized Operations Command demonstrated a steady trend of climbing each year and reached the third largest expense in 2020. The expenditure on Centralized Service Charges transited from increasing to decreasing in 2019 and ranked fourth in 2020. The spendings on Corporate Support Command, Human Resources Command, Information Technology Command, and Parking Enforcement Unit followed a similar trend before 2019. After that, the expense on Information Technology Command grew relatively significant in

2019 and then declined slightly in 2020. The Chief of Police and Toronto Police Services Board expenditures remained at the level of least amount during the period.

Reference

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