LA City 311 Call Center Service Improvement Analysis

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❖ Executive Summary

This report provides an analysis and evaluation of historical service performance of 311 Call Center from time period 2014 to 2016, mainly emphasizing on service quality and operation efficiency with defined metrics and controlled mechanisms. By conducting various data analysis with R programming, we have identified some critical business findings and trends related to demographics, social factors, and economic landscape of Los Angeles. Based on comprehensive understanding of the service information, we have proposed several key strategic recommendations to make government services more proactive and to improve the operational efficiency as well as to potentially optimize cost through resource allocation.

❖ Methods of Analysis

- Constructed exploratory graphics and models to identify trends and patterns of service data from several R packages such as ggplot2, dplyr, lubricate, ggmap, stringr, and gridExtra
- Leveraged Shiny techniques to turn our analysis into interactive web application
- Interpreted exploratory analysis and drew meaningful inferences from data visualization
- Developed strategic recommendations for the improvement of 311 call center services by integrating with business scenarios

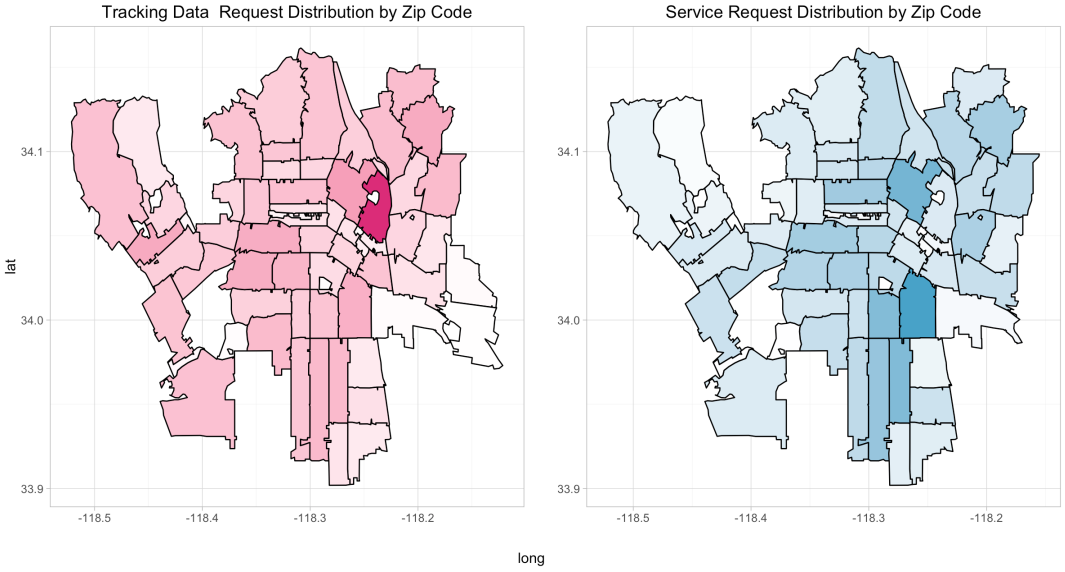
Dataset Description:
- 311 Call Center Tracking data (2011 - 2015)
- 311 Call Center Service Request data (2015 - 2016)
- CensusReporter API related to neighborhood and zip code level statistics

Dataset Selection：

At the beginning, we went through a dataset selection to obtain a better focus for the analysis of this project. Since the Service Request dataset had more relevant information we would address such as request source, geographic coordinates, or council districts, we were going to conduct analysis primarily based on this dataset and use another one as a supplement.

❖ Analytical Findings

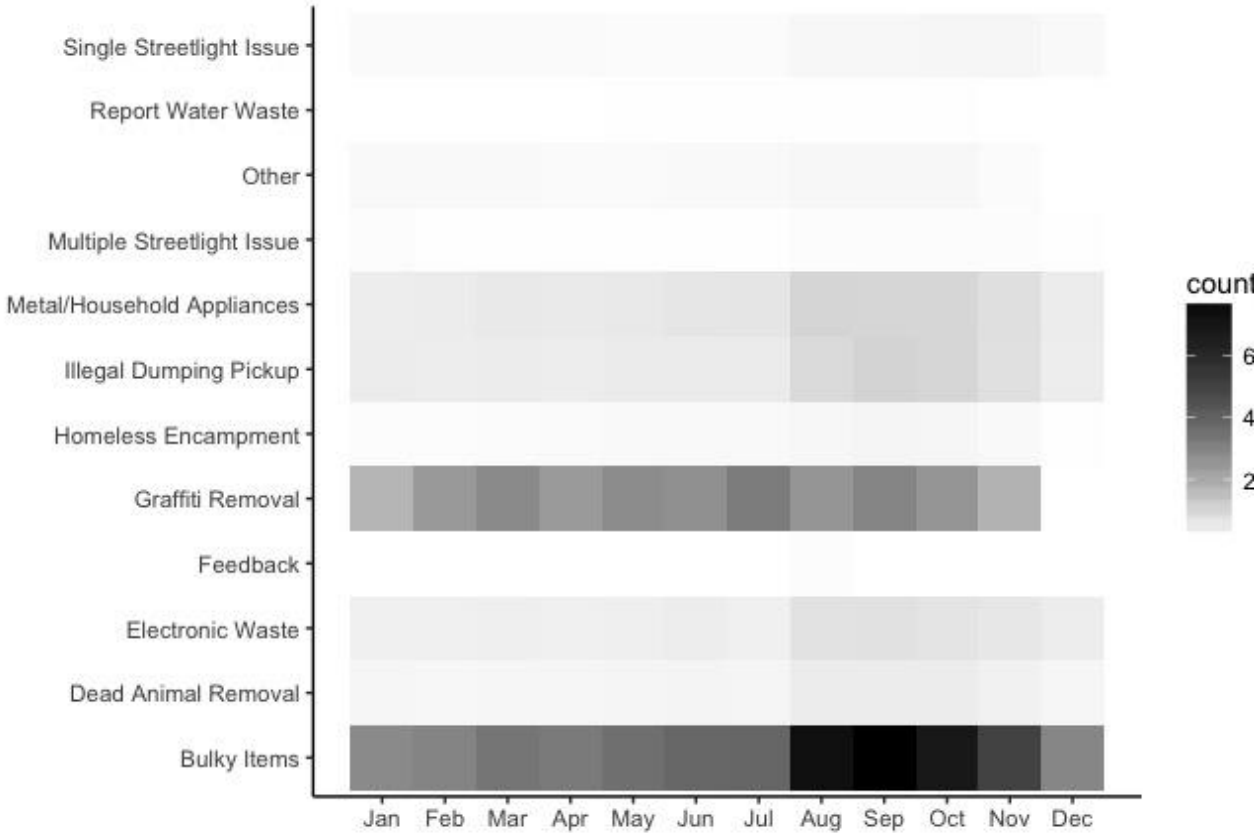
<u>Geographic Demonstration</u>

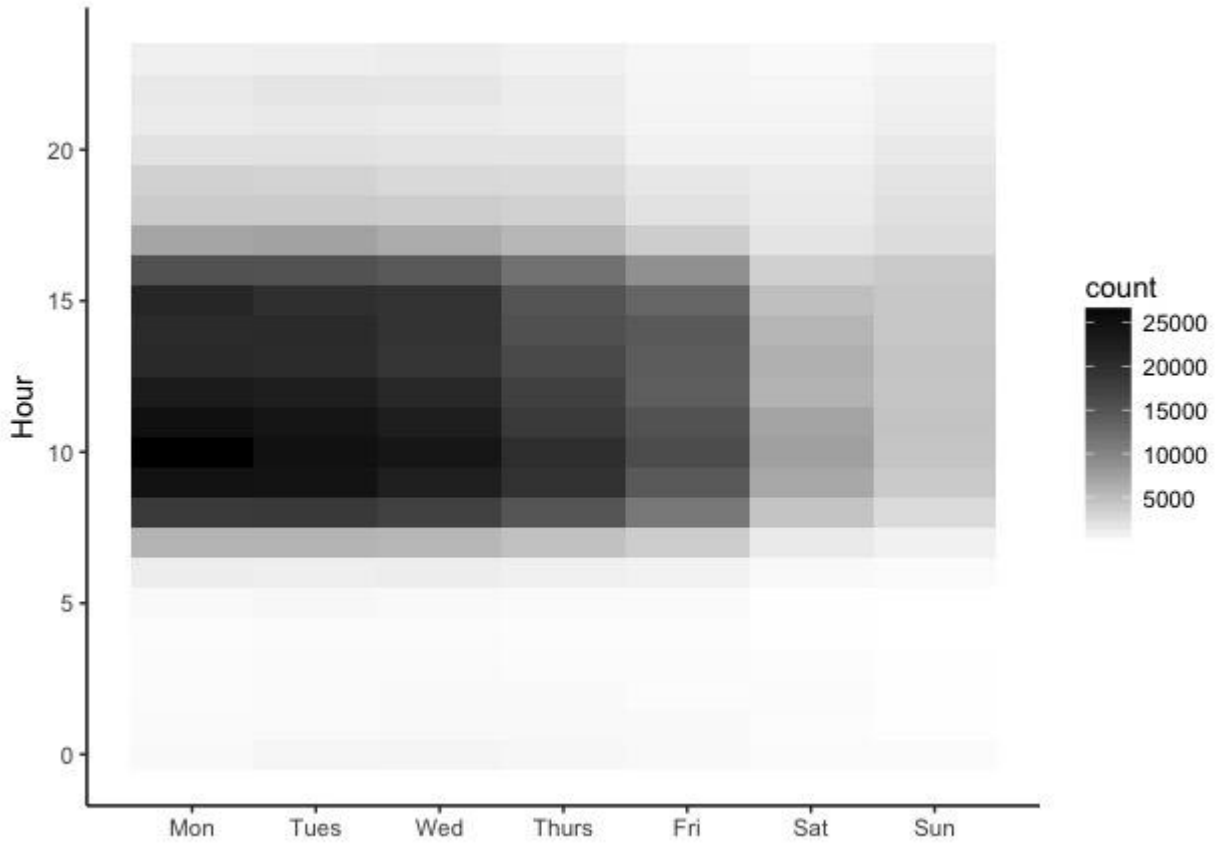


Basically, we scraped data for all zip codes in Los Angeles from Internet, and combined with our two 311 call center datasets separately. Then we created two maps to visualize how service request volumes were distributed in different areas. The most conspicuous difference was that the areas with highest request volumes were different.

<u>Seasonality</u>

- Request Volume Seasonality

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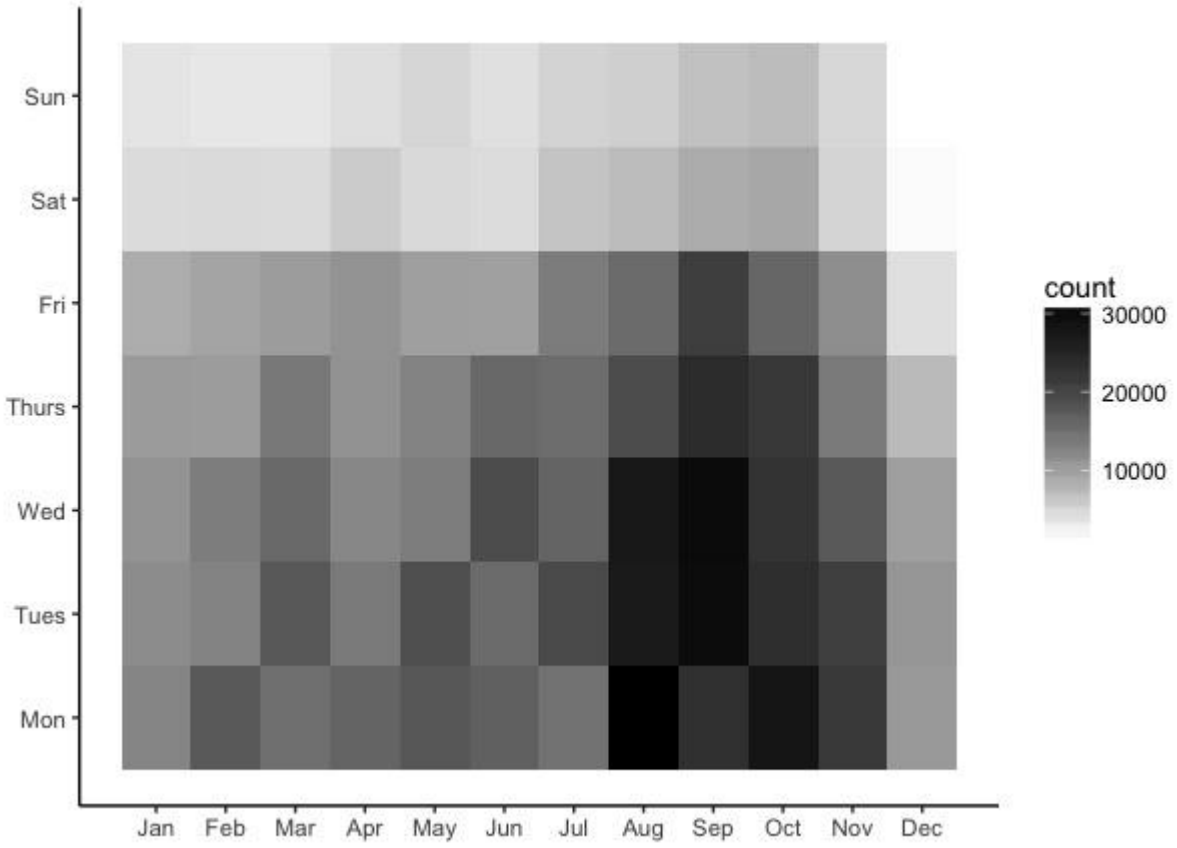
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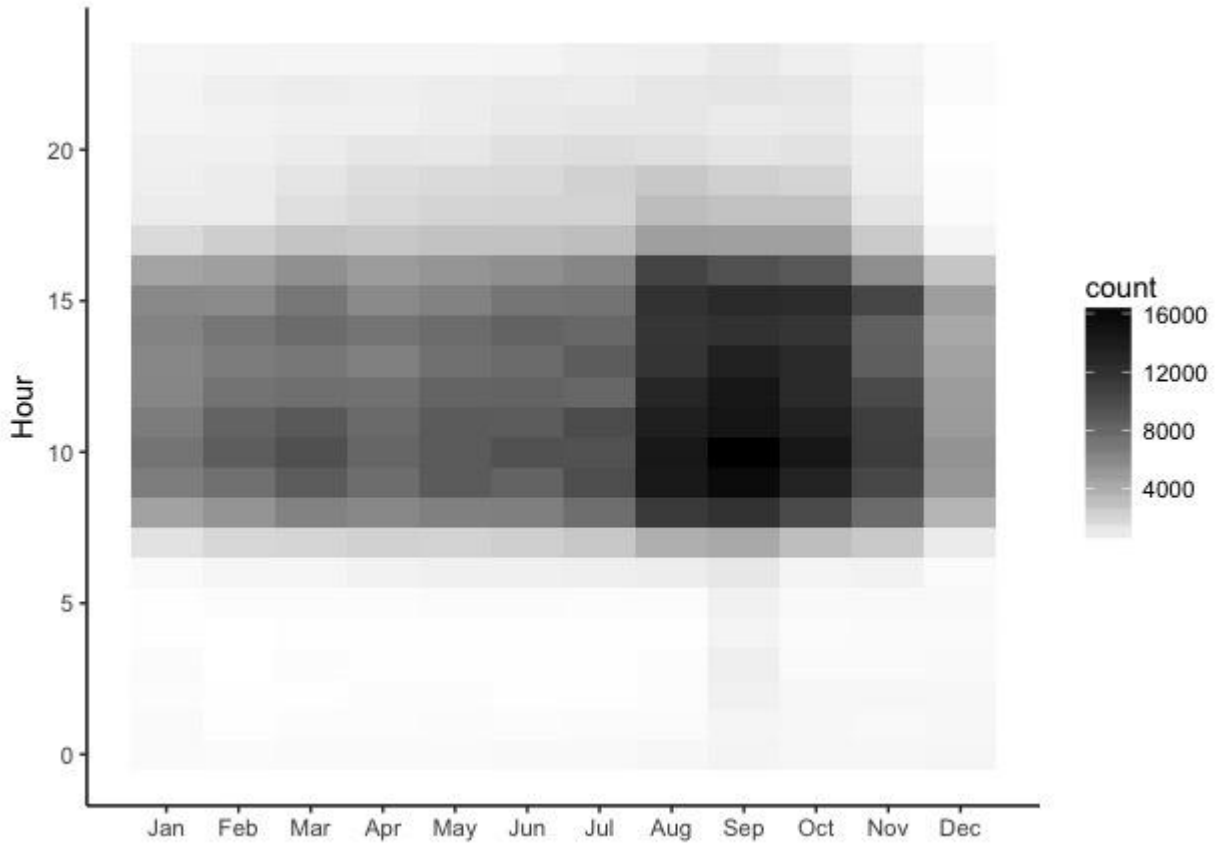
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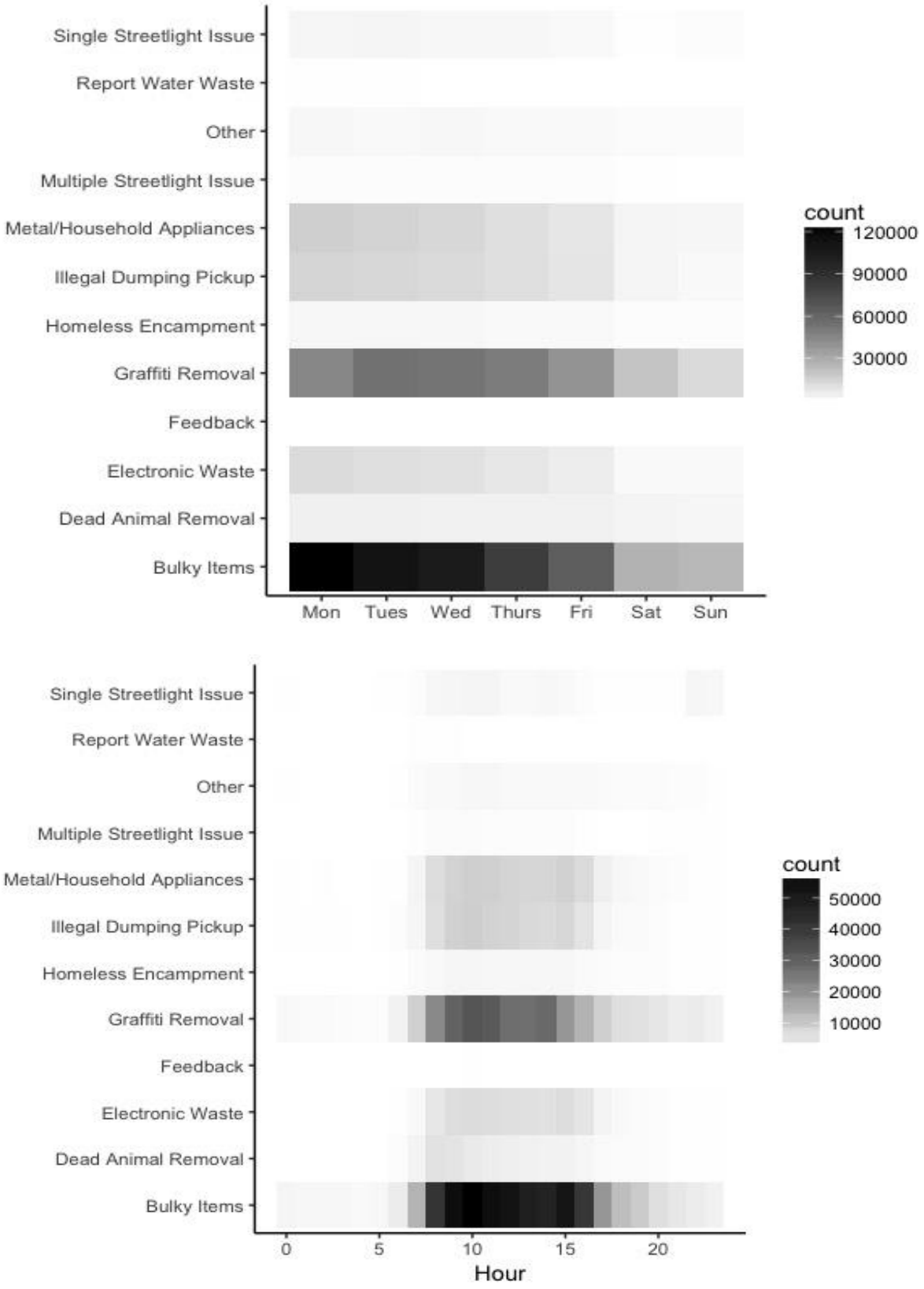


To analyze the patterns of overall request volumes across different time frames such as hours of the day, weekday, and seasonal effect. We have successfully recognized that higher request

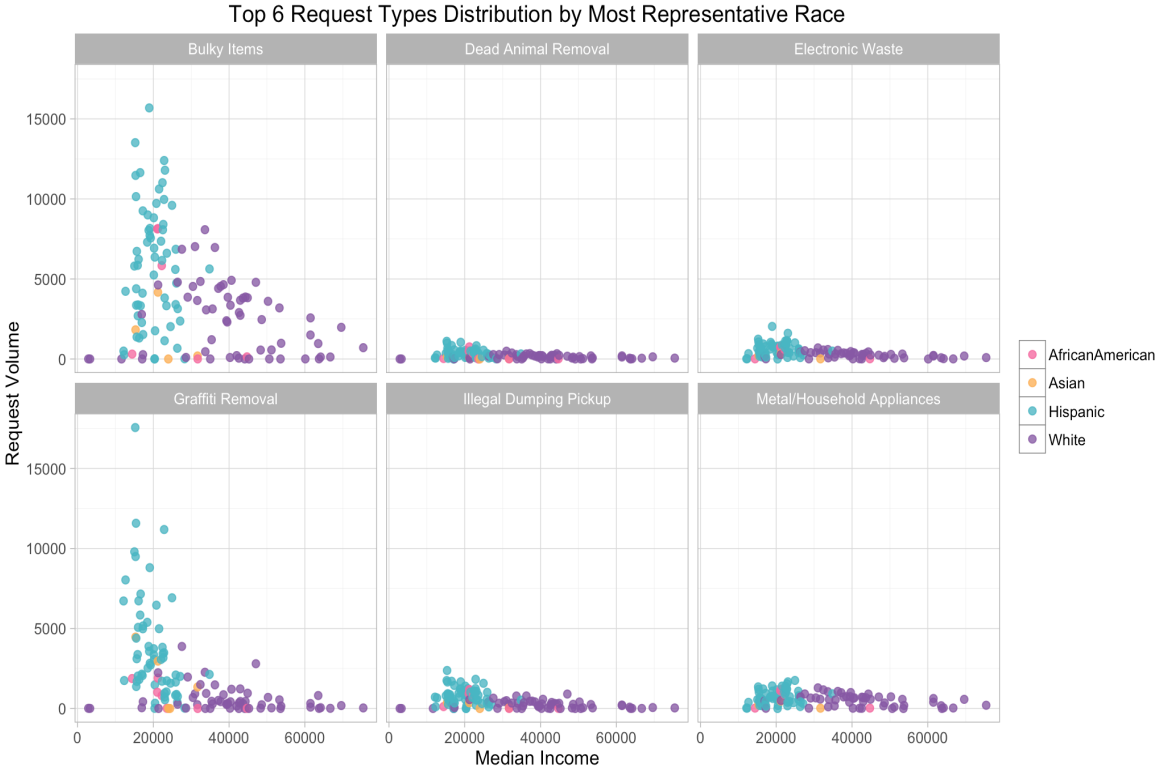
volumes were reported from August to November. Additionally, we found that more requests were submitted during the weekdays, especially early in the week (Monday and Tuesday), compared to requests on weekends. To be even more specific, we found that Mondays of August and Tuesdays and Wednesday of September had the highest request volume among the time.

- Request Type Seasonal Distribution

Looking deeper into the seasonality of volume by request type, we again used heatmaps to visualize the patterns. From the graphs we can tell that the volume of Bulky Items variates the most from time to time – the volume reaches the peak during the fall season (August to October) and gradually decline into the winter. Also the volume of Bulky Items is significantly higher on Mondays and slowly declines and reaches its lowest volume on Sundays. We suspect the reason behind this trend might be that because less people go out over the weekends, bulky items not found and reported would accumulate into Mondays and create a spike in volume. In order to avoid this situation and smooth out the volume, the department might consider having more service tech people working over the weekends and clean the items before people request services on Mondays.

<u>Demographic/economic indications</u>

- Request Type Distribution and income

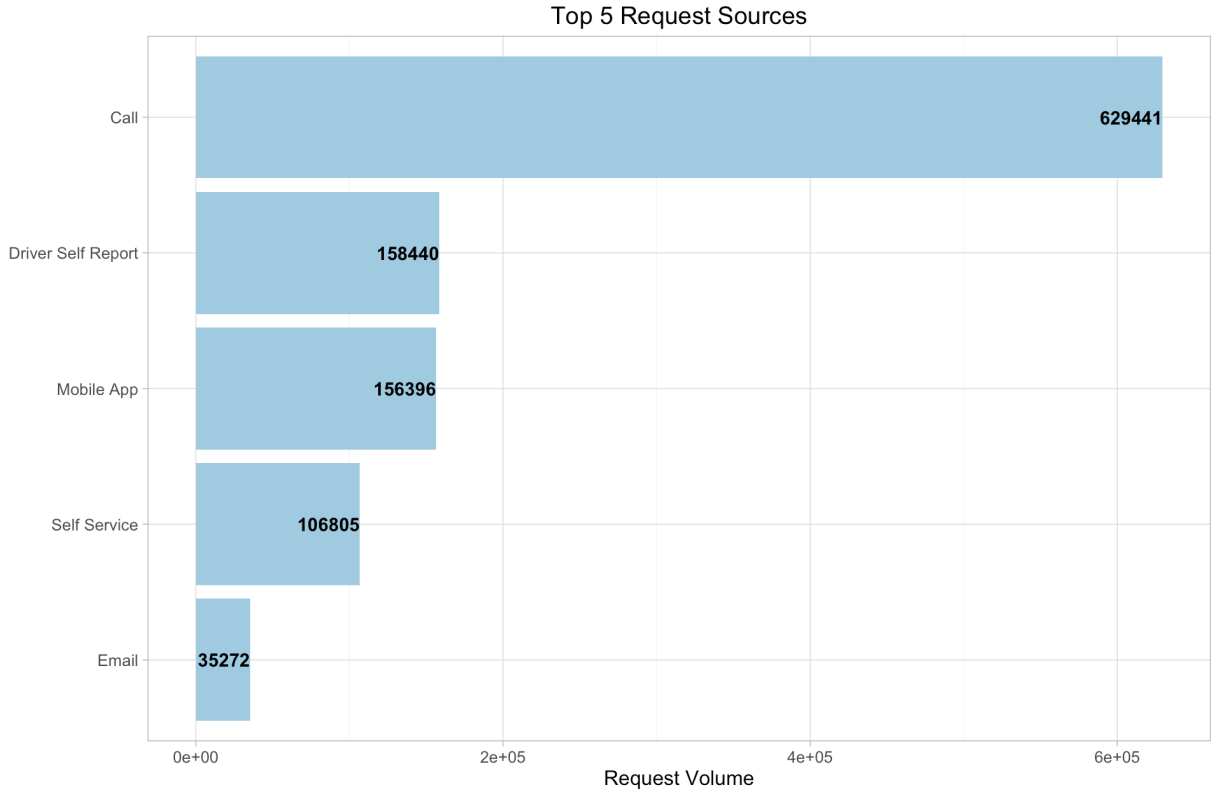


By considering demographical factors, we investigated on how request type distribution was related to the race and median income level in the neighborhoods. We managed to recognize

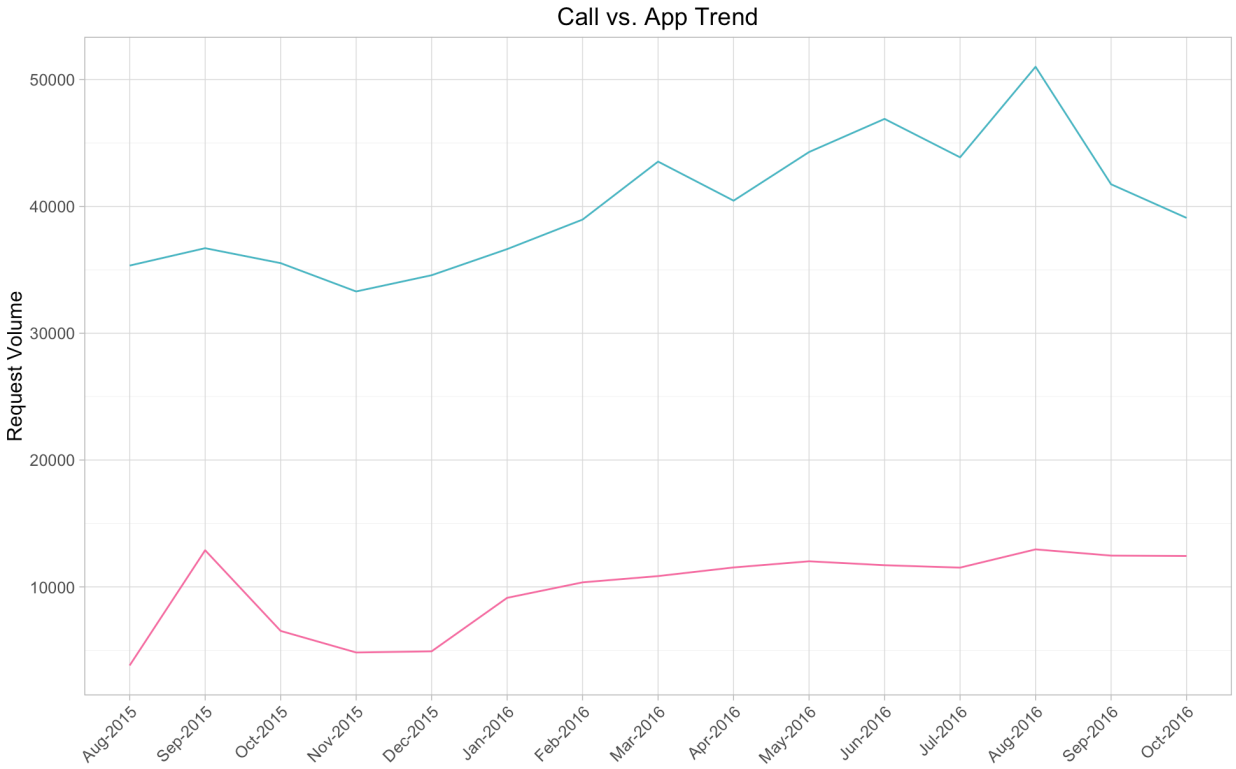
that the income level and the most representative race in each districts showed strong correlation with the service request volumes. The graph showed that in areas that are populated with lower income households, there tend to be more service requests of both Bulky Items and Graffiti Removal. Similar pattern is found in areas with higher concentration of Hispanic residences. In order to address these concerns, 311 call center could put more effort into the lower-income areas (e.g. sending more service tech people) and add more bilingual customer representatives in English and Spanish to better serve customers.

Call and Mobile App Performance

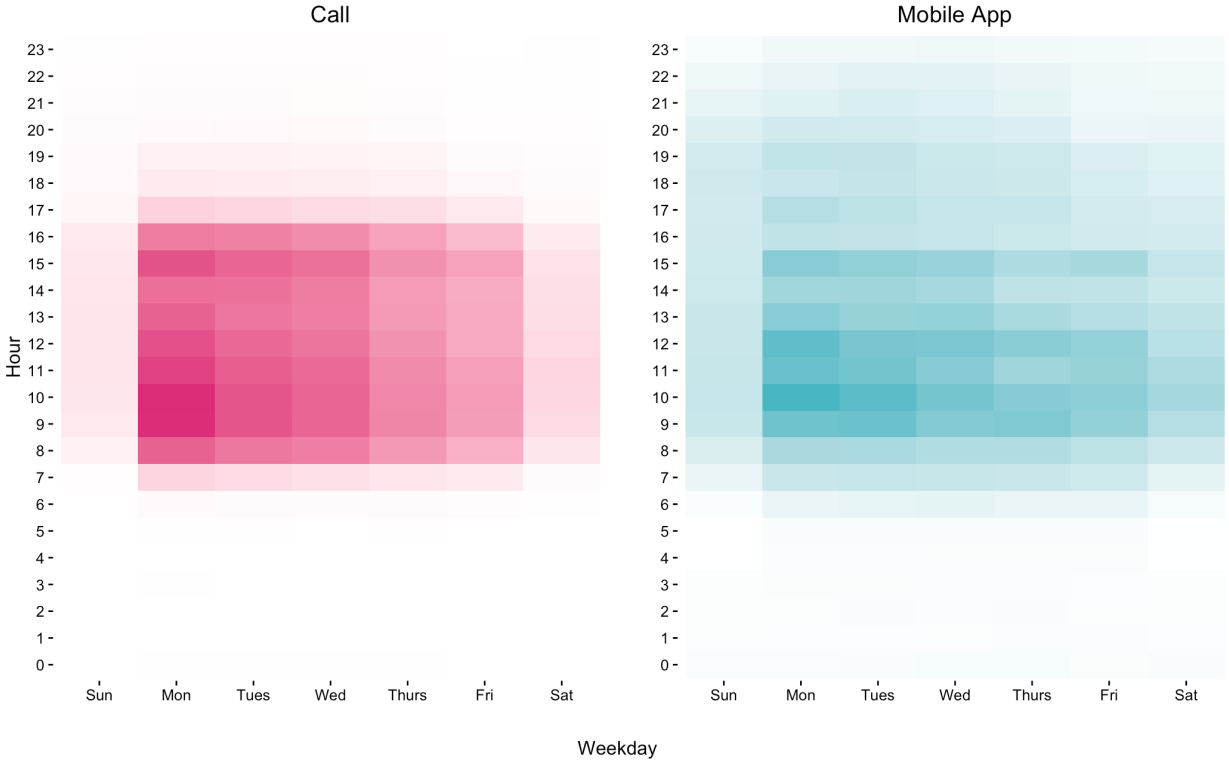
- Top 5 Request Sources



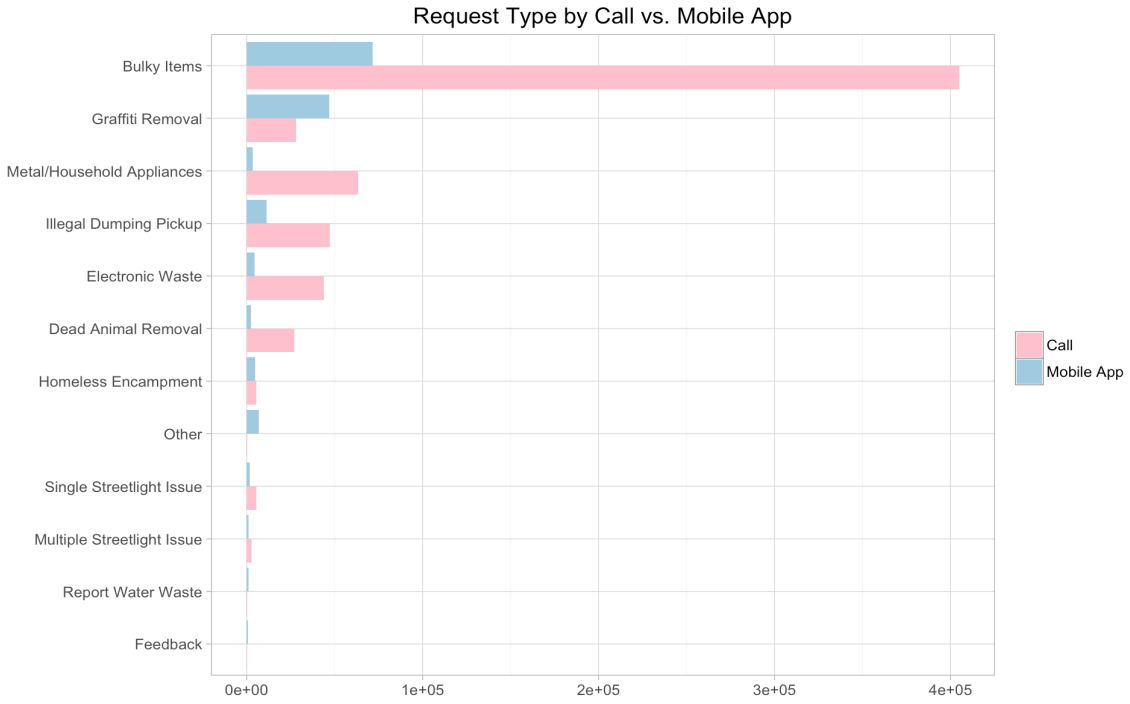
- Customer Usage on Call vs. Mobile App Trend



- Request Volumes Distribution by Weekday vs. Hour of the Day



- Request Volumes of Different Service Types by Call and Mobile App

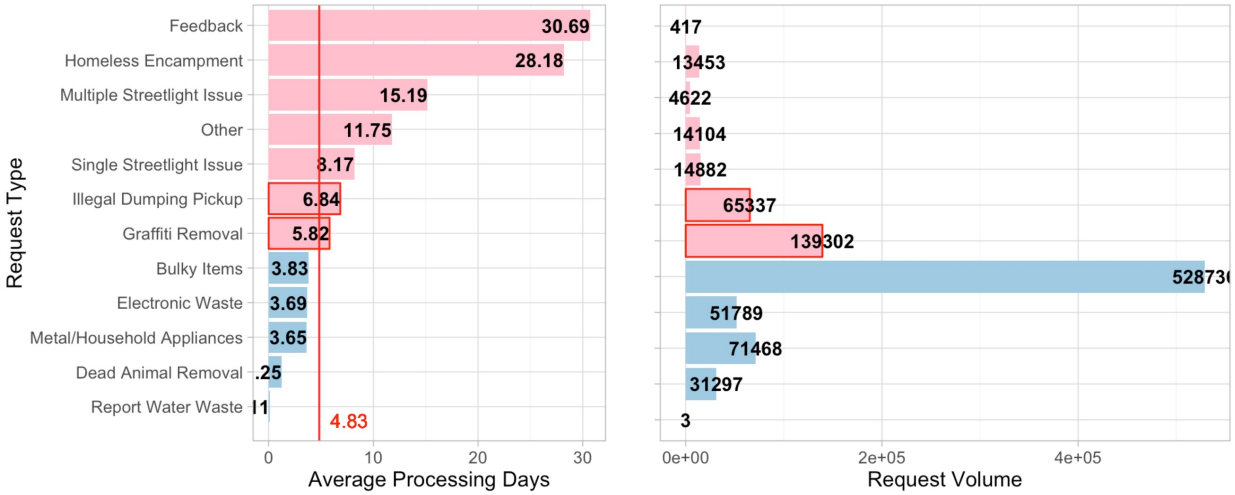


To conduct an overview of request source distribution by request volumes, we created a bar chart of the top 5 request sources as Call, Driver Self Report, Mobile App, Self Service, and Email. Then we decided to mainly focus on Call and Mobile App to analyze how customers utilized these two sources to request services. We developed a line graph from August 2015 to October 2016 for Call and Mobile App respectively. In general, the total request volumes by call were much larger than those by mobile app. It's worth mentioning that there was great potential to enhance more use with mobile app in the future because after August 2016 the volumes by call demonstrated a sharp decrease while the volumes by mobile app approximately levelled off.

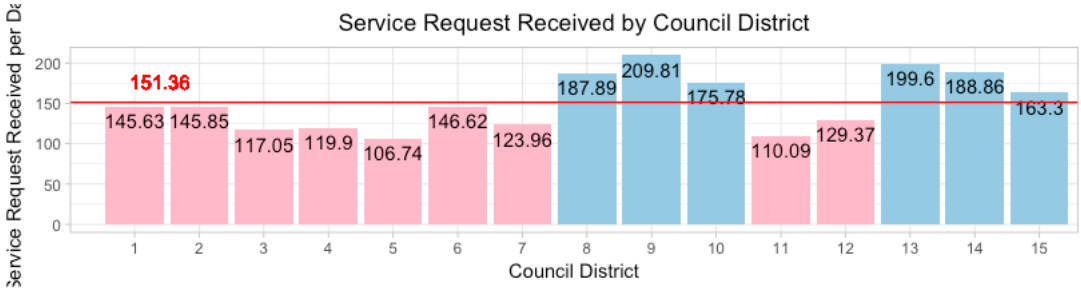
In addition, we made two heatmaps to illustrate the distribution of request volumes by call and mobile app during weekdays. Specifically, customers were more likely to request services on Monday morning around 10am and on Monday afternoon around 3pm for both sources. With no limitation on office hours, the request volumes by mobile app were widely distributed comparing to call. Furthermore, we intended to take another perspective on the relationship between request types and request sources by creating a bar chart to display the distribution of the two channels (call and mobile app) for different service types. Obviously, the request type of bulky items occupied the most proportion of total volumes by call and mobile app. While the volumes by call were more than five times than those by mobile app in terms of bulking items, the requests for graffiti removal were submitted more frequently by mobile app. This implied that it was potential to extensively promote mobile app channel for reporting service requests in order to share the burden of call service and enhance the overall efficiency in processing requests.

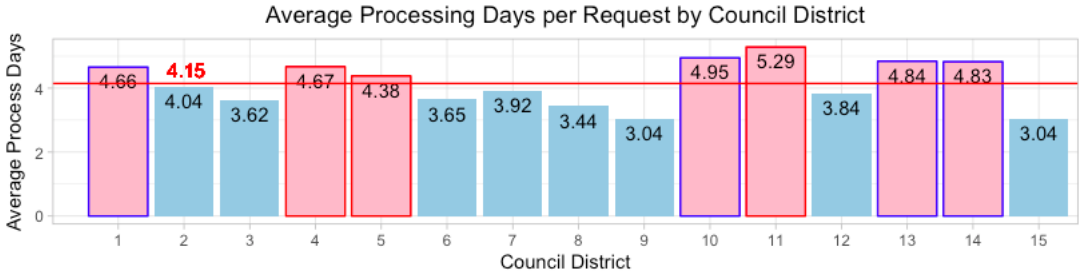
Processing Efficiency Analysis

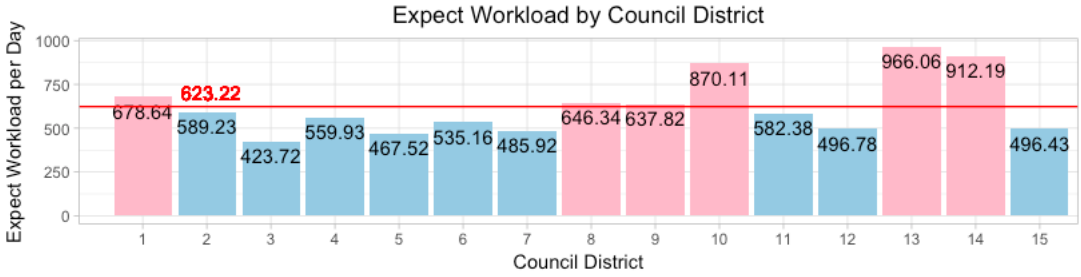
- Request Volume and Average Processing Time by Activities



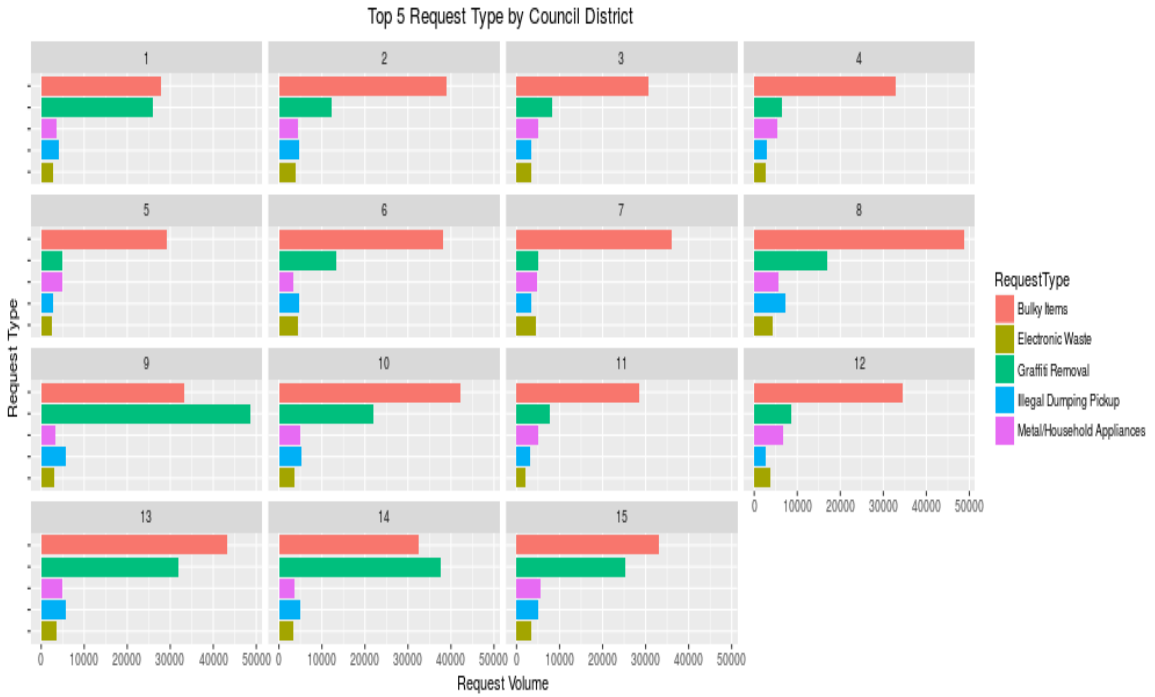
- Efficiency by Council District

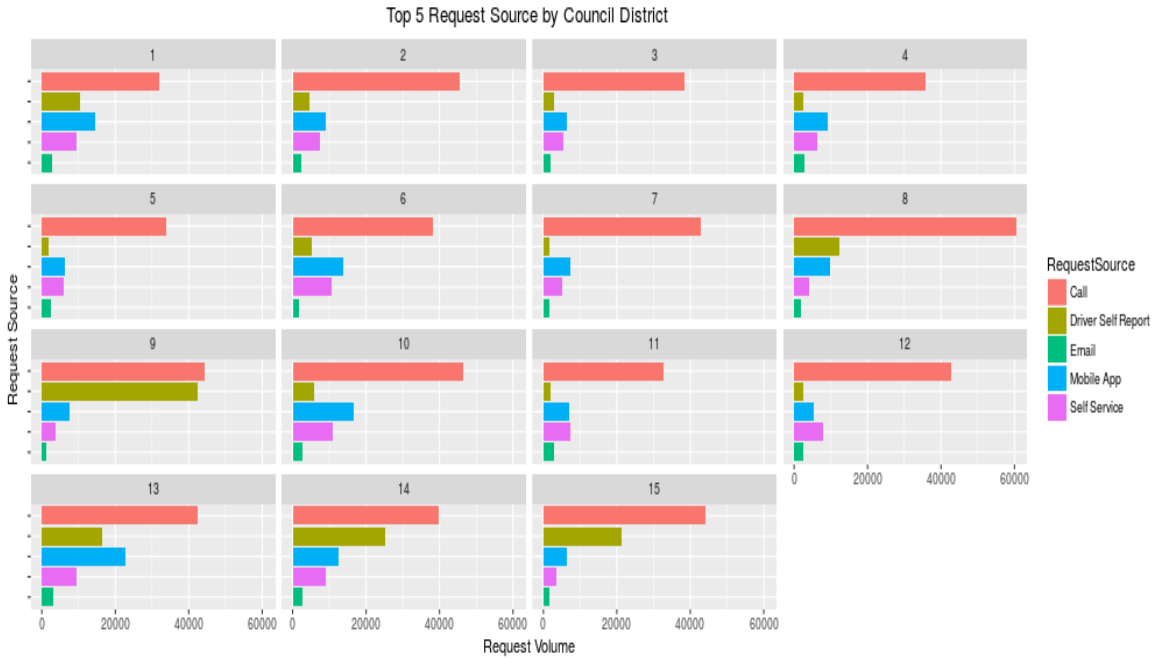






- Top Request Type/Source by Council District





To thoroughly understand the current operation efficiency of 311 call center service, we utilized bar charts to represent the average processing time for each activity with descending order. We decided to focus on the services whose processing time was above average of 4.83 days and combine the bar chart of service request volume with processing time. As a result, we were able to select two activities that require attention: illegal dumping pickup and Graffiti Removal, which ranked high in both processing time and request volumes.

We took another perspective to evaluate the service efficiency by different council districts with bar charts of both daily service request volumes and average processing time, which gave us a close look into each council district's performance of processing services. We spotted that the pattern in daily request volumes was not aligned with average processing time for different council districts. Therefore, we calculated the index for expected daily workload per Council District by multiplying daily service request volume by average processing time. Then we focused on the council districts whose average processing time was above the average of 4.15 days and divided them into two groups according to the workload index. We found that the council district 1, 10, 13, and 14 had both higher than average expected workload and average process time. Council district 4,5, and 11 had lower than average expected workload, but relatively higher average process time. Moreover, although council district 8 and 9 had a higher than average expected workload, their average process time was shorter than other council districts. Overall, council district 9 performed better than council district 8 because with similar workload index, council district 9 took 0.4 days less than council district 8 in average process time. Consequently,we regarded council district 8 as the most efficient, and council district 4,5, and 11 as the most inefficient in terms of average processing time and the workload index.

To dig further, we looked into top request types and request sources by council district. We observed that the major request activities for council district 4, 5, and 11 were Bulky Items and for council 9 were both Graffiti Removal and Bucky Items. From previous average process time by activity analysis, we learned that Graffiti removal actually took an average of 2 more days than Bucky Items to resolve. This finding controversed the top request types by council district and could not explain the underperformance of council district 4, 5, and 11. However, we indeed had some meaningful findings on the analysis of request sources by council district. We discovered that council district 9 had significantly larger volumes of service request from Driver Self Report, while council district 4, 5, 11 had very low volumes of service request from Driver Self Report. According to this result, we could interpret that the council districts would perform more efficiently when having more service tech people who took initiatives in the field rather than waiting for the service request to be submitted by the public.

❖ Business Insights

- Service volume demonstrated strong volatility, based on different day of the week and seasonal effect. The government should be able to leverage this information to effectively allocate current resources that matches with volume and service demand.
- Neighbourhood characteristics, including social, demographic and economic factors, have strong correlation with request type pattern. Based on our exploratory analysis, we conclude that high volume environmental issues related requests are more common across low income and education or high minority population neighbourhood
- Mobile app usage has demonstrated strong growth trend. This will be a great opportunity for the government to enhance its operational efficiency, if the technology platform is more efficiently leveraged and lower number of call center staff is required.

- The request resolution capability varies across different service requests. For services that require longer processing time, the government should pay more attention and keep monitored closely. We have identified two key activities, illegal dumping pickup and Graffiti Removal, which have high volume and low handling capability.
- The operational efficiency is largely driven by the initiatives of service tech people in the field rather than the general public

❖ Recommendations

- We recommend 311 service to clearly brand and define the 311 service categories, ensure request align with service provided. For services not able to resolve internally, ensure requests being transferred or referred to the appropriate service agency within timely manner, and follow up to ensure requests being properly handled.
- Based on the trend and pattern identified from service requests and social economical factors, we recommend the 311 service agency to pay close attention to low income and developing neighbourhood. With the information provided, 311 service agency can implement proactive instead of reactive actions.
- Incorporate volume seasonality effect into resource planning and allocating process, ensure sufficient staff member to process and resolve customer requests during peak volume periods. With efficient resource allocation, 311 service is able to improve service quality and expedite the service processing time.
- According to the trend of increasing smartphone app usage, we recommend 311 service agency to invest into app technology development, ensure app interface user friendly, and easy to navigate and submit requests.
- Based on the operational efficiency analysis, we have identified council district with different volume and service operational efficiency. We recommend 311 to pay close attention to CD 4, 5 and 11 to allocate more resource to improve its current operating level.