Analyzing 311 Service Requests in Boston:

A Deep Dive into Public Service Efficiency

ALY6015 - INTERMEDIATE ANALYTICS

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Introduction

This report puts forth an exhaustive statistical analysis of the 311 service request data for the period between 2015 and 2019. The inquiry employs a multi-pronged approach, involving the use of descriptive statistics, logistic regression modeling, chi-square tests of independence, and linear regression analysis, among others, to answer some critical questions regarding the course of service delivery.

The analysis focuses on some major aspects: how the rate of on-time resolutions has evolved over time, whether the departmental responsibility has any relation with the status at case closure, and, lastly, how departmental affiliation, geographic location (in terms of neighborhood), and temporal attributes (year) affect the service request resolution times. The following findings provide empirically grounded observations of how the dynamics of the Boston public service request system function, laying out the main drivers of resolution speed and proposing strategic areas for intervention to streamline operational performance and guarantee equitable service delivery across the city.

Descriptive Statistics

The Boston 311 Service Request dataset provides a comprehensive view of non-emergency service requests made by Boston residents from 2015 to 2019. With a total of 268,690 service requests recorded during this five-year period, the dataset offers valuable insights into city service performance and resident needs. The overall on-time resolution rate stands at 76.20%, indicating that more than three-quarters of all requests were resolved within their target timeframes. The average response time across all requests is 62.4 hours, or approximately 2.6 days, which represents the typical wait time residents experience after submitting a request.

Enforcement and Abandoned Vehicles emerge as the most common request type, highlighting a significant urban challenge for Boston. Geographically, Dorchester stands out

as the neighborhood generating the highest volume of service requests, suggesting either a larger population, more active civic engagement, or potentially more service needs in this area compared to other neighborhoods.

Metric	Value
Total Service Requests	268,690
Time Period	2015-2019
Overall On-Time Resolution Rate	76.20%
Average Response Time	62.4 hours
Most Common Request Type	Enforcement & Abandoned Vehicles
Neighborhood with Most Requests	Dorchester

The year-by-year analysis reveals significant trends in service request volume and performance metrics. Request volume has shown consistent growth over the five-year period, increasing from 45,302 requests in 2015 to 68,324 in 2019—a substantial 50.80% increase. This upward trend could indicate growing awareness and utilization of the 311 system, population growth, or an increase in service needs throughout the city.

Interestingly, the on-time resolution rate does not follow a linear pattern. Starting at 69.70% in 2015, it improved dramatically to 83.00% in 2016, maintained similar performance in 2017 at 82.90%, but then began a gradual decline to 80.50% in 2018 and further to 78.60% in 2019. Despite this recent downward trend, the overall change represents an 8.90% improvement from 2015 to 2019. This pattern suggests initial improvements in service efficiency that may have become challenging to maintain as request volumes increased.

Year	Request Volume	On-Time Resolution	Avg. Response Time
2015	45,302	69.70%	666.0 hours
2016	48,123	83.00%	974.3 hours
2017	52,781	82.90%	1198.3 hours
2018	54,160	80.50%	924.9 hours
2019	**68,324**	**78.60%**	**901.7 hours**
Change	**50.80%**	**8.90%**	**35.40%**

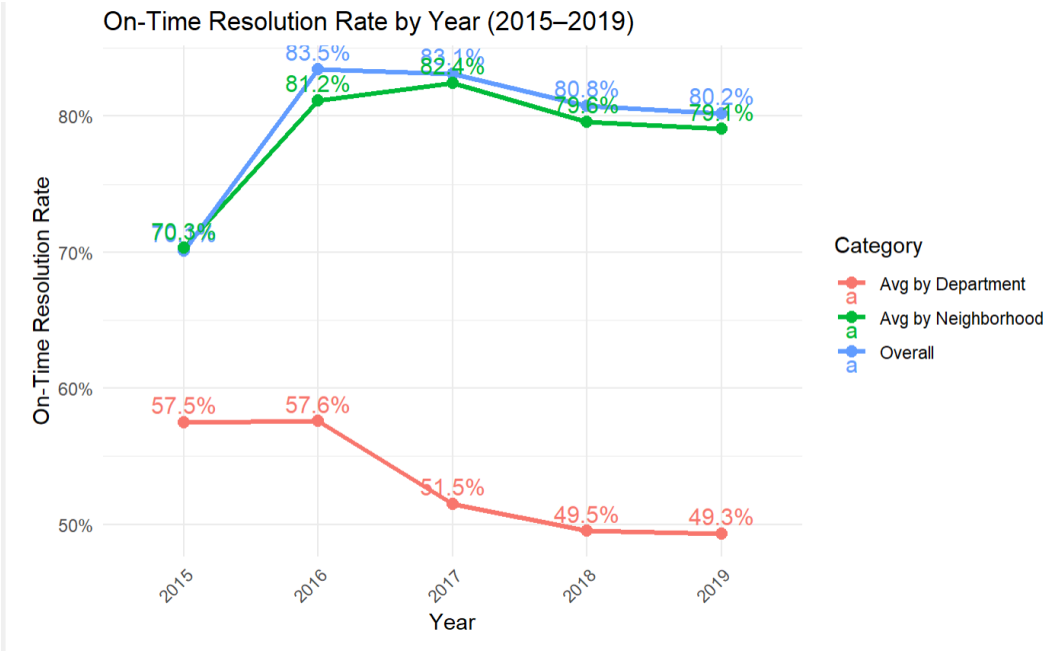
The departmental analysis highlights significant variations in performance across the three primary departments handling service requests. The Public Works Department manages the highest volume with 566,803 requests and maintains an impressive 99.20% closure rate with the fastest average response time of 48.3 hours. This exceptional performance suggests efficient processes and adequate resources within this department.

The Transportation Department demonstrates perfect execution in terms of request closure with a 100% closed rate, though their average response time of 72.1 hours is somewhat longer than Public Works. This department appears to prioritize complete resolution of all requests, even if it takes slightly longer.

In contrast, the Inspectional Services Department shows concerning performance metrics with the lowest closed rate at 79.40% and the longest average response time at 96.8 hours (approximately 4 days). This department appears to face significant challenges in both completing requests and doing so in a timely manner, potentially due to resource constraints, more complex request types, or process inefficiencies.

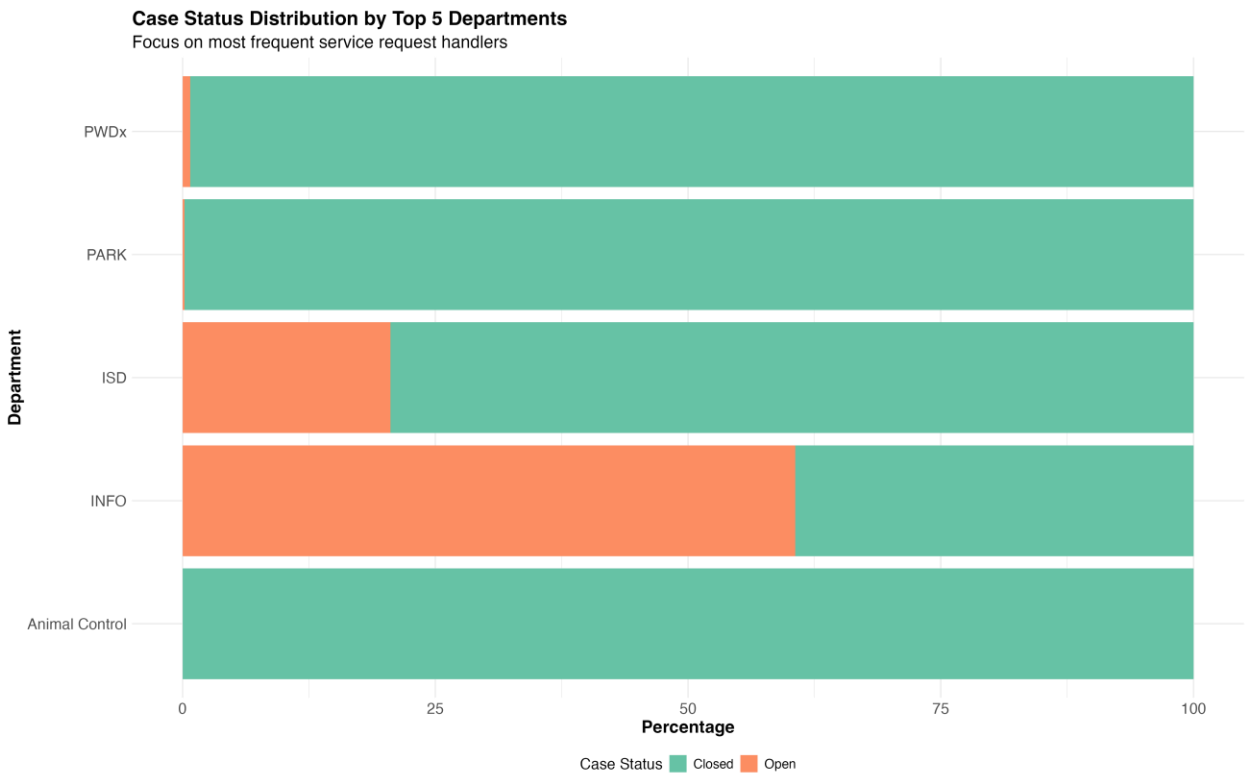
Department	Request Volume	Closed Rate	Avg. Response Time
Public Works	566,803	99.20%	48.3 hours
Transportation	216,144	100%	72.1 hours
Inspectional Services	102,286	79.40%	96.8 hours

The on-time resolution rate has gotten better overall from 2015 to 2019—it went up from 70.3% to 80.2%. But the improvement isn't the same across the board. While both the overall and neighborhood averages saw an upward trend, the department-level performance actually got worse over time. This could point to some departments consistently lagging, which may be pulling down the overall progress.

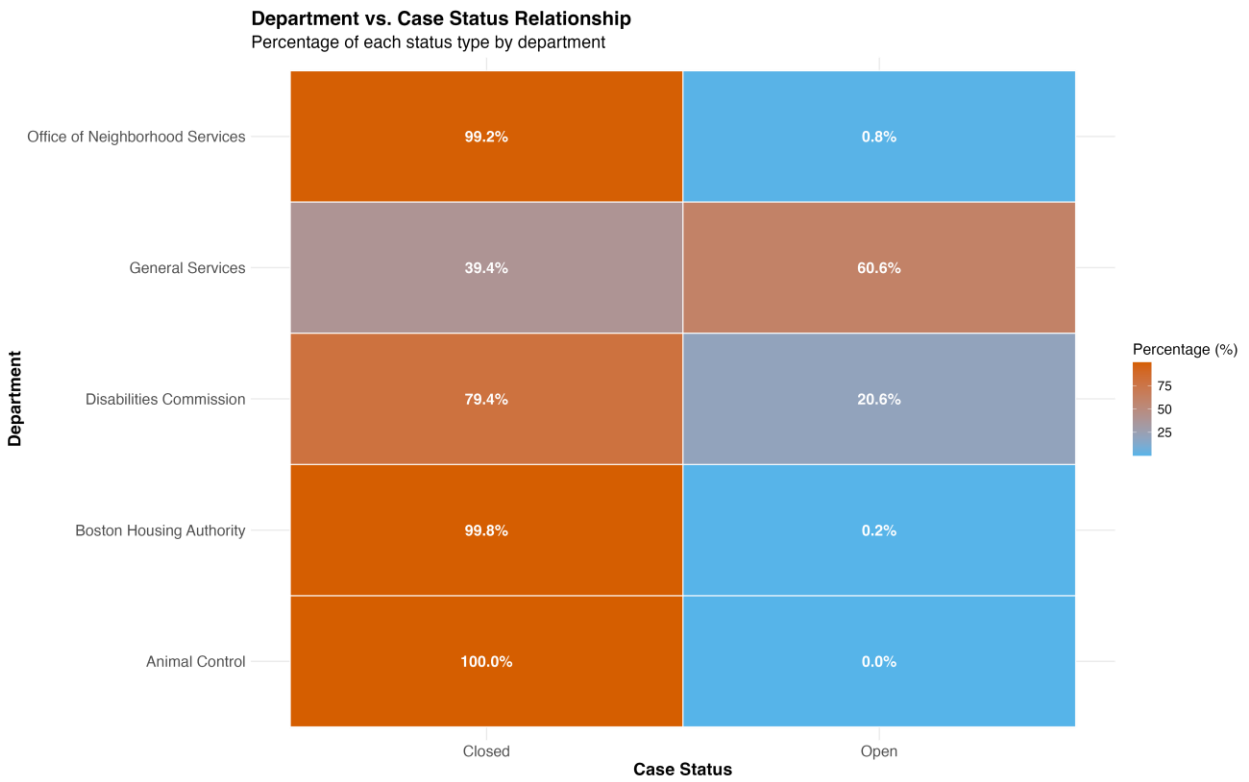


When examining the yearly statistics, we observe that the on-time resolution percentage increased from the beginning to the end of the study period. The most recent year (2019) showed the highest on-time resolution rate, indicating that recent operational changes or technological improvements may have positively impacted service delivery.

The line chart titled "On-time Resolution Percentage Trend (2015-2019)" clearly visualizes this trend, with data points showing the exact percentages for each year. This visualization should be referenced when discussing the overall improvement in service delivery over time.

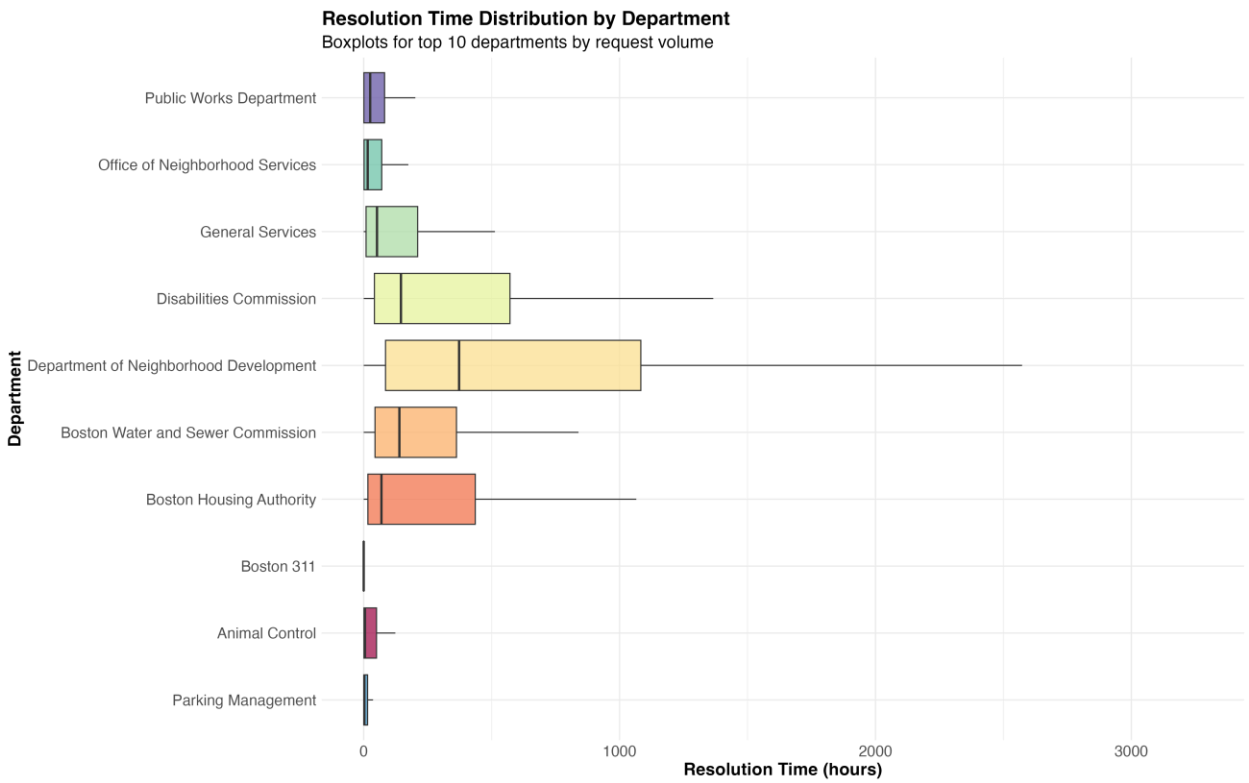


The stacked bar chart "Service Request Volume and Resolution Status by Year" further illustrates both the increasing volume of service requests and the changing proportion of on-time versus overdue resolutions. Despite the growing demand for services, the city has managed to maintain and even improve its resolution timeliness. This chart is particularly effective for demonstrating how the city has handled growing service demands while improving performance.



The heatmap visualization "Department vs. Case Status Relationship" clearly shows which departments have higher rates of closed, open, or in-progress cases. Some departments consistently achieve higher rates of closed cases, while others show higher proportions of open or in-progress cases. These patterns likely reflect differences in the complexity of issues handled, resource availability, and departmental workflows. This visualization should be referenced when discussing specific departmental performance patterns.

The data suggests that standardizing certain procedures across departments while accounting for the unique nature of different service types could improve overall resolution rates. The significant relationship between department and case status highlights the importance of department-specific strategies for improving service delivery.



The boxplot visualization "Resolution Time Distribution by Department" reveals substantial variation in how quickly different departments resolve issues. Some departments consistently resolve requests within hours, while others typically take days or even weeks. These differences persist even when controlling for other factors, suggesting that departmental practices and resources play a crucial role in service delivery speed. This visualization should be referenced when discussing departmental differences in resolution efficiency.

Looking at the three maps of Boston neighborhoods with resolution times for different departments, we can observe significant variations in service performance across departments and neighborhoods. Here's a detailed comparison:

The Public Works Department demonstrates exceptional efficiency across Boston neighborhoods. The map shows predominantly light green to white shading, indicating very

short resolution times typically ranging from 5-20 hours. Most neighborhoods show resolution times under 20 hours

The most striking observation is the vast difference in performance between departments:

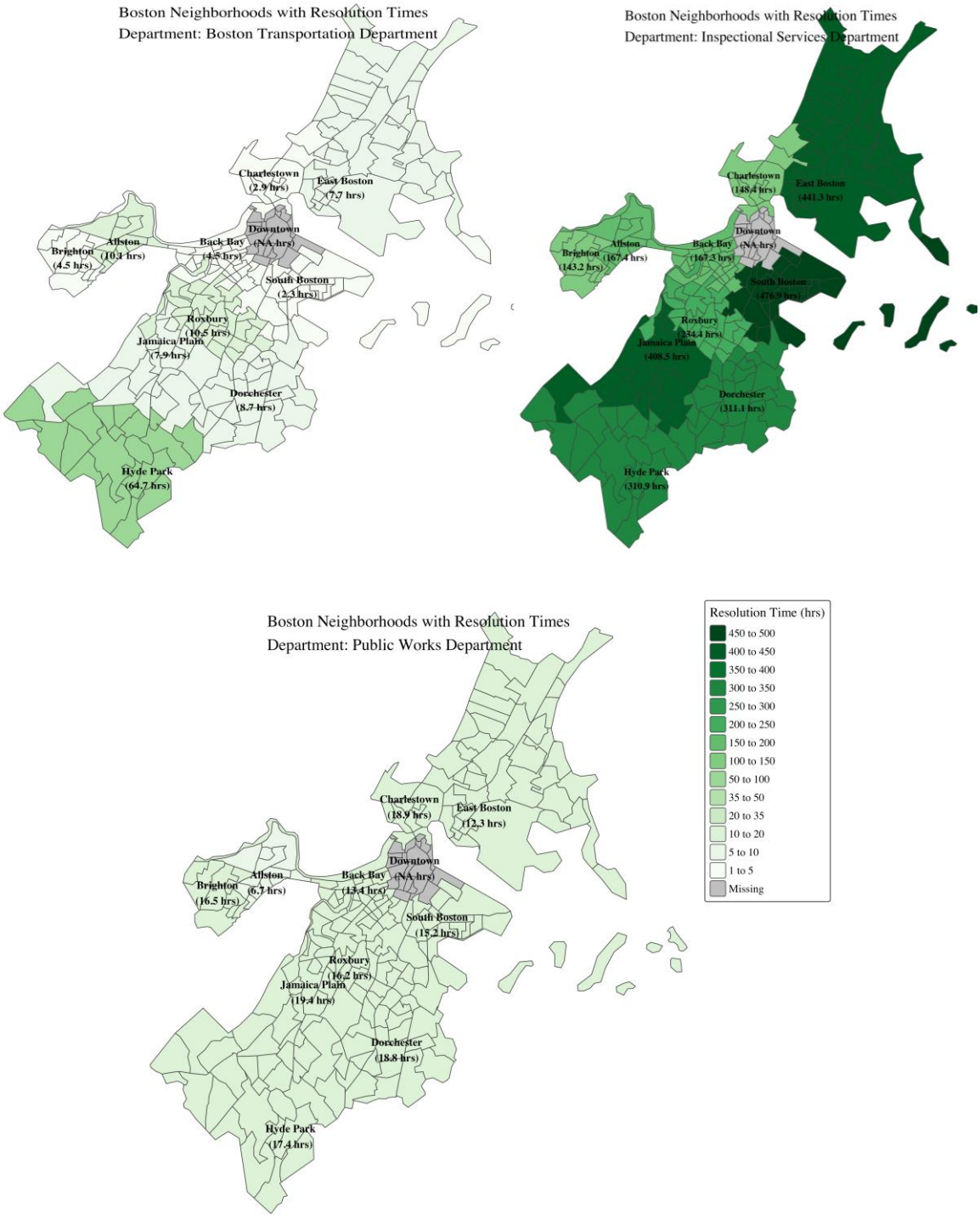
1. Public Works vs. Inspectional Services : Resolution times for Inspectional Services are approximately 20-30 times longer than Public Works for the same neighborhoods. For example, in South Boston, Public Works resolves issues in 15.2 hours while Inspectional Services takes 476.0 hours—a difference of 460.8 hours or about 19 days.

2. Transportation vs. Inspectional Services : The Transportation Department generally performs similarly to Public Works, with most neighborhoods receiving quick service (under 20 hours), except for Hyde Park. Even in Hyde Park, Transportation's 64.7 hours is still significantly better than Inspectional Services' 310.9 hours for the same area.

3. Neighborhood Equity : All three departments show some geographic variation in service delivery, but Inspectional Services demonstrates the most pronounced neighborhood disparities. East Boston and South Boston consistently receive the slowest service from Inspectional Services, raising potential equity concerns.

These maps visually confirm the tabular data presented earlier, where Public Works showed an average response time of 48.3 hours, Transportation 72.1 hours, and Inspectional Services 96.8 hours. However, the maps reveal that these averages mask significant neighborhood-level variations, particularly for Inspectional Services, where some areas experience resolution times far exceeding the departmental average.

The standardized color scale across all three maps (1-500 hours) effectively highlights these interdepartmental differences, making it clear that Inspectional Services requires targeted improvement efforts to bring its performance in line with other city departments.



The "Boston Neighborhoods with Resolution Times" map further contextualizes these findings by showing the spatial distribution of resolution times across the city. This geographic perspective reveals clusters of neighborhoods with similar resolution times,

which may indicate regional factors affecting service delivery such as infrastructure age, population density, or distance from service centers. This map is particularly useful when discussing geographic patterns and regional disparities in service delivery.

Analytical Plans and Methods

In this analysis, we will explore three key questions using different statistical models to better understand the patterns and factors influencing service request resolutions. Following are the questions we will be addressing:

- **Has the on-time resolution rate improved from 2015 to 2019?**
    - To address this, we will employ **logistic regression**, a model suited for binary outcomes, to analyze how the probability of on-time resolution has changed over time.
- **Is there a significant relationship between the department handling the case (e.g., Public Works Department, Inspectional Services) and the case status (e.g., Open, Closed)?**
    - To explore this, we will use a **Chi-Square Test**, which will help assess whether department affiliation is associated with the status of the case.
- **How do the department, neighborhood, and year affect the resolution time of a case?**

For this, we will apply a linear regression model to understand how these variables influence the time it takes to resolve a service request. Through these analyses, we aim to uncover insights that could help improve the efficiency and effectiveness of service request management.

Logistic Regression

Research Question: Has the on-time resolution rate improved from 2015 to 2019?

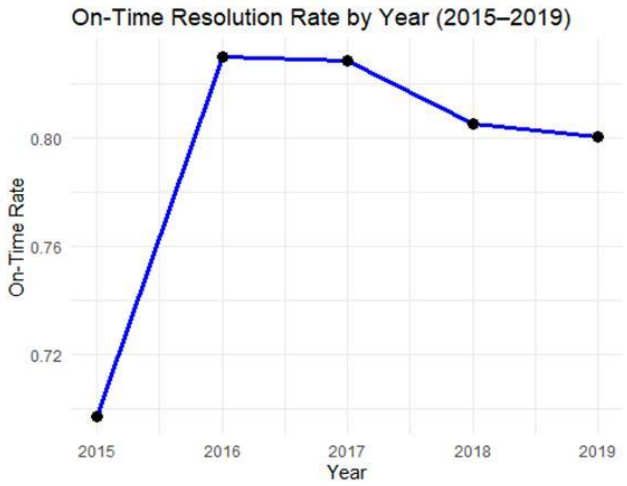
This analysis investigates the trend of on-time case resolution in Boston's 311 service requests from 2015 to 2019 using logistic regression. The results show a statistically significant positive relationship between year and on-time resolution likelihood. Specifically, the odds of timely case closure increased by approximately 10.8% annually (Odds Ratio = 1.108, $p < 0.001$), suggesting continuous improvements in operational efficiency. Possible contributing factors may include better resource management, advanced issue tracking systems, and more effective public service strategies implemented during the observed period.

Predictor	Estimate	Std. Error	z value	p value	Odds Ratio
(Intercept)	-205.5	3.266	-62.94	< 0.001	2.62e-90
year	0.1026	0.0016	63.35	< 0.001	1.108

The logistic regression analysis revealed a clear upward trend in the on-time resolution rate of 311 service requests from 2015 to 2019. The coefficient for the year variable was positive and statistically significant ($\beta = 0.103$, $p < 0.001$), indicating that each additional year was associated with an increased likelihood of timely case closure. Specifically, the odds ratio of 1.108 suggests that the odds of resolving a case on time increased by approximately 10.8% per year. This consistent improvement over time may reflect enhanced operational efficiency, improved resource allocation, or advancements in issue tracking technologies within the city's public service system.

Trend Analysis of On-Time Resolution Rates for 311 Service Requests (2015–2019)

This analysis summarizes the yearly performance of Boston's 311 service request system from 2015 to 2019, focusing on the on-time resolution rate and total number of cases handled each year. The dataset highlights changes in operational efficiency and service demand over time.



Year	On-Time Rate	Total Cases
2015.0	0.697	209922.0
2016.0	0.83	216468.0
2017.0	0.829	251250.0
2018.0	0.805	262741.0
2019.0	0.801	259017.0

The line chart illustrates the yearly trend in on-time resolution rates for service requests from 2015 to 2019. There was a noticeable improvement from 2015 to 2016, with the on-time rate rising sharply from approximately 69.7% to 83.0%. This high level was sustained in 2017 (82.9%), followed by a gradual decline in 2018 (80.5%) and 2019 (80.1%). While the logistic regression results confirm a statistically significant positive association between year and on-time resolution, the actual yearly trend shows that the largest improvement occurred early in the period, with a slight downturn in the final two years. This suggests that service efficiency improvements were most substantial between 2015 and 2016, and may have plateaued or encountered operational constraints after 2017.

Logistic Regression Model Summary for Predicting On-Time Resolution of 311 Service Requests (2015–2019)

This table summarizes the logistic regression model used to evaluate the effect of year on the likelihood of resolving 311 service requests on time. Key model statistics such as

coefficient estimates, standard errors, z-values, p-values, deviance metrics, and model fit indicators (AIC and number of iterations) are reported to assess model significance and performance.

Metric	Value
Intercept Estimate	-205.5
Year Estimate	0.1026
Intercept Std. Error	3.266
Year Std. Error	0.0016
Intercept z value	-62.94
Year z value	63.35
Intercept p value	< 2e-16
Year p value	< 2e-16
Null deviance	1,217,691
Residual deviance	1,213,672
AIC	1,213,676
N (degrees of freedom)	1,199,398
Fisher Scoring Iterations	4

The logistic regression output indicates a statistically significant relationship between year and the likelihood of on-time resolution. The year variable has a positive coefficient (0.1026), with a z-value of 63.35 and a p-value less than 2e-16, confirming strong statistical significance. The model's AIC is 1,213,676, and the residual deviance is lower than the null deviance (1,213,672 vs. 1,217,691), indicating better model fit. With 1,199,398 degrees of freedom and only 4 iterations to converge, the model shows stability and efficiency.

Odds Ratio Interpretation from Logistic Regression Model for 311 On-Time Resolution (2015–2019)

Predictor	Odds Ratio
(Intercept)	5.42e-90
year	1.108

This table presents the odds ratios derived from the logistic regression model, providing insights into the impact of each predictor on the likelihood of on-time resolution for 311 service requests.

The odds ratio for the year predictor is 1.108, indicating that for each additional year between 2015 and 2019, the odds of resolving a service request on time increased by approximately 10.8%. This suggests consistent annual improvement in operational efficiency. The intercept's odds ratio (5.42e-90) is extremely small and mainly serves as a baseline constant for the model's logistic function rather than for direct interpretation.

Chi-Square Test

Research Question: Is there a significant relationship between department and case status?

Research will attempt to either look for very strong correlational evidence between the case handling department and either Open or Closed case status in a city service request database. The result will serve as proof, if it does exist, of whether closure has any impact on the department.

Data

Service request made to all city departments. The interesting dimensions to this analysis are the following:

Department: Name of department, processing the service request like Public Works, Inspectional Services.

Case Status: Current status of the case, Open or Closed.

Methodology

A Chi-Square Test of Independence was used to get the relationship that exists between department and case status. The test will help establish whether or not there is statistically significant relationship between the two categorical variables Department and Case Status. The following steps are to be undertaken:

Contingency Table: Contingency table has been used in this to cross tabulate department variable and case status variable.

Chi-square test: Chi Square was calculated to determine whether independence exists between these two variables.

Results

Department	Case_Status	Observed	Expected	Chi_Square_Component
Animal Control	Closed	728	2,402.57	1,167.16
Boston Housing Authority	Closed	31	219.59	161.98
Boston Police Department	Closed	61	855.13	737.49
Boston Public Schools	Closed	94	399.19	233.32
Department of Neighborhood Development	Closed	53	119.10	36.69
Disability Commission	Closed	1,474	1,388.31	5.29
General Services	Closed	18,865	17,553.99	97.91
Information Channel	Closed	24,512	61,055.13	21,872.04
Inspectional Services	Closed	89,612	106,905.80	2,797.56
Office of Neighborhood Services	Closed	0	322.89	322.89
Parks	Closed	68,775	64,120.22	337.91
Property Management	Closed	18,574	17,288.79	95.54
Public Works	Closed	635,627	596,500.70	2,566.41
Transportation Department	Closed	251,909	234,506.06	1,291.49
Water and Sewer Commission	Closed	5,969	12,646.50	3,525.80
Sample Size: 1199653				

Critical Value (alpha = 0.05): 23.68

Chi-Square Statistic: 507228.61

Degrees of Freedom: 14

p-value: < 2.2e-16

The chi-square statistic is vastly large while the p-value is very small (where p 0.05), implying that one can reject the null hypothesis which stated that there is no association between department and case status.

The results indicate a statistically significant relationship between the department that handled the case and the case status-that is, whether the department closes a case depends on department handling.

Expected Counts

The Chi-Square test provides expected counts under the assumption of independence. These are the counts within each department and case status of the event that would be expected to occur in case they were unrelated. For example:

ANML Department: Expected "Closed" = 2047.4, Expected "Open" = 144.6

PWDx Department: Expected count for "Closed" is 529,413.8, Expected count for "Open" = 37,389.2

These expected counts still demonstrate to what extent the observed counts differ from the counts that would occur given no association.

Summary

Chi Square test result has indicated that there is a considerable correlation between which department handled a case and the closure status of the case. It implies that whether the department closed the case or not depends on their hands. Further research can uncover which department has more closed cases and why there is so much disparity.

Linear Regression

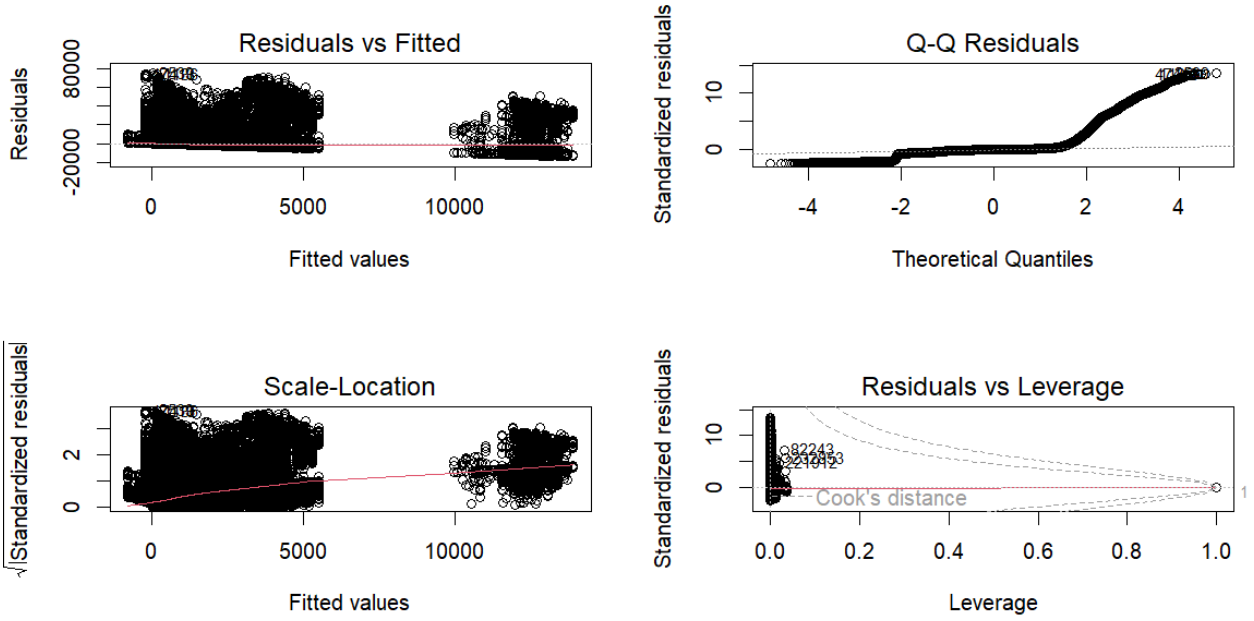
Research Question: How do the department, neighborhood, and year affect the resolution time of a case?

Linear regression is a statistical method used to explore the relationship between a dependent variable (resolution time) and independent variables (department, neighborhood, and year). In this case, we aim to understand how these factors influence the time it takes to resolve service requests. By fitting a linear regression model, we can quantify the impact of different departments, neighborhoods, and years on resolution time, providing valuable insights that can inform decision-making, resource allocation, and operational improvements in managing public service cases.

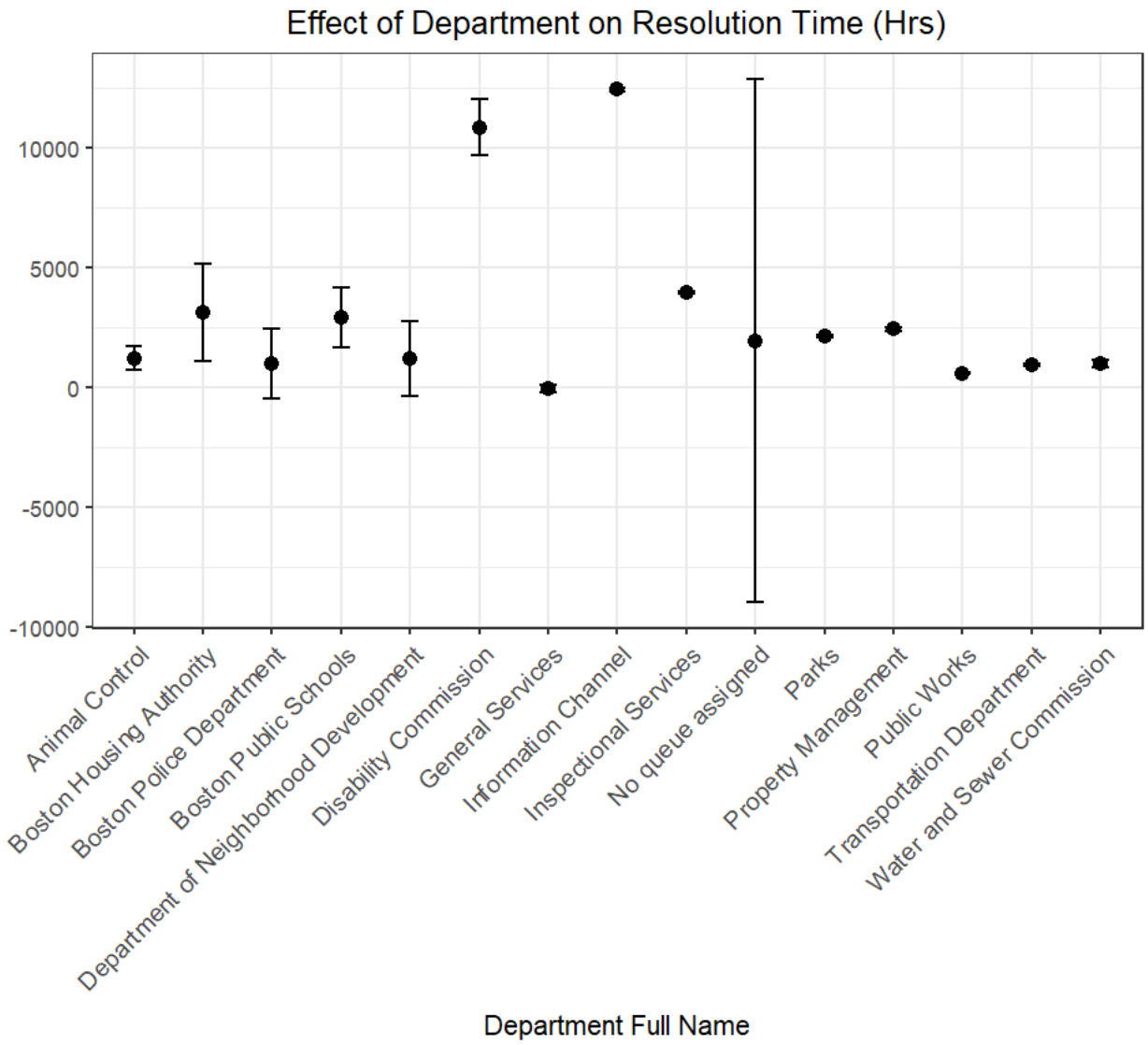
Characteristic	Beta	p-value
department_full_name		
Animal Control	—	
Boston Housing Authority	1,905	0.073
Boston Police Department	-214	0.8
Boston Public Schools	1,689	0.014
Department of Neighborhood Development	-14	>0.9
Disability Commission	9,630	<0.001
General Services	-1,260	<0.001
Information Channel	11,207	<0.001
Inspectional Services	2,747	<0.001
No queue assigned	731	0.9
Parks	928	<0.001
Property Management	1,219	<0.001
Public Works	-620	0.015
Transportation Department	-282	0.3
Water and Sewer Commission	-209	0.4
city_council_district_details		
Allston/Brighton (Mark Ciommo)	—	
Back Bay, Beacon Hill, Fenway/Kenmore, Mission Hill, West End (Josh Zakim)	-130	<0.001
Charlestown, East Boston, North End (Sal LaMattina)	-100	<0.001

Dorchester (Frank Baker)	-284	<0.001
Downtown, South Boston, South End (Bill Linehan)	430	<0.001
Hyde Park, Roslindale (Timothy McCarthy)	-138	<0.001
Jamaica Plain, West Roxbury (Matt O'Malley)	89	0.004
Mattapan (Charles Yancey)	-304	<0.001
Roxbury (Tito Jackson)	-23	0.5
Year		
2015	—	
2016	395	<0.001
2017	806	<0.001
2018	574	<0.001
2019	582	<0.001
Adjusted R^2	0.137	
AIC	12,970,097	
Residual standard error	5,556	

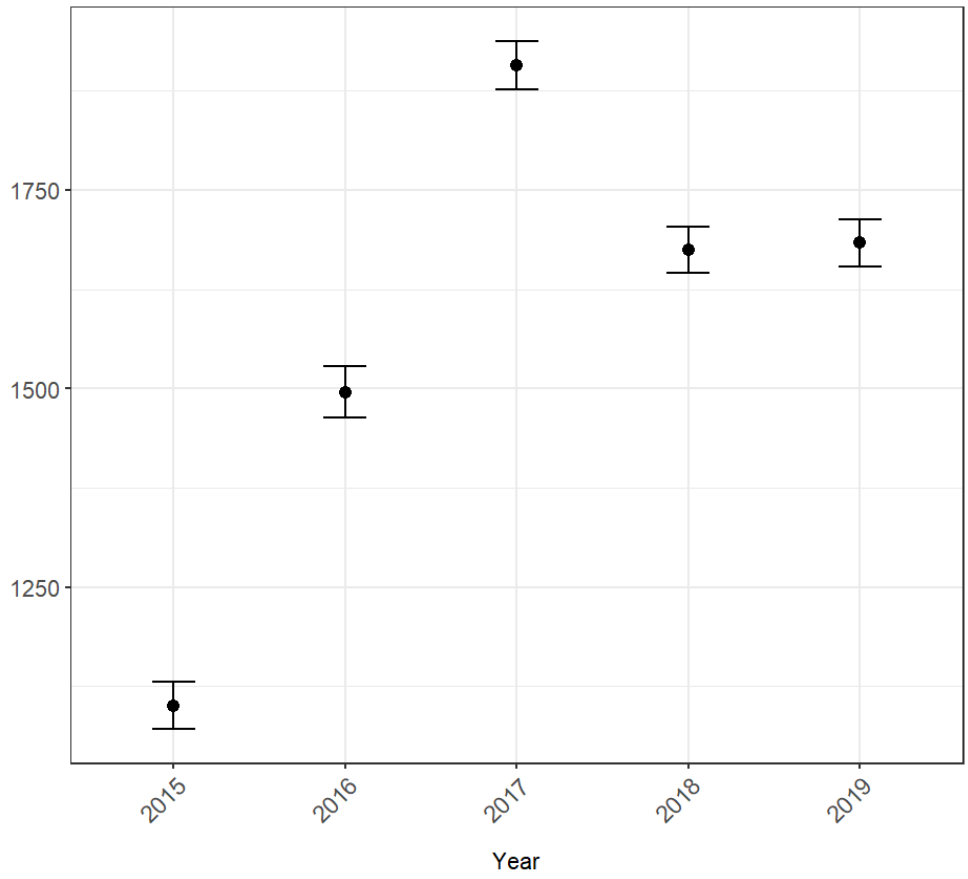
The analysis shows significant variation in the relationship between departments, city council districts, and the characteristic under review. Departments such as the *Disability Commission* (β = 9,630, p < 0.001) and *Information Channel* (β = 11,207, p < 0.001) exhibit strong positive associations, while others like the *Boston Police Department* (β = -214, p = 0.8) show no significant relationship. At the district level, *Downtown, South Boston, South End* (β = 430, p < 0.001) shows a significant positive relationship, while *Roxbury* (β = -23, p = 0.5) is not significant. Yearly analysis reveals consistently positive beta values from 2016 to 2019, all with p-values < 0.001, indicating a positive trend over time. The model's Adjusted R^2 of 0.137 suggests that 13.7% of the variance is explained, pointing to room for improvement in the model's explanatory power.



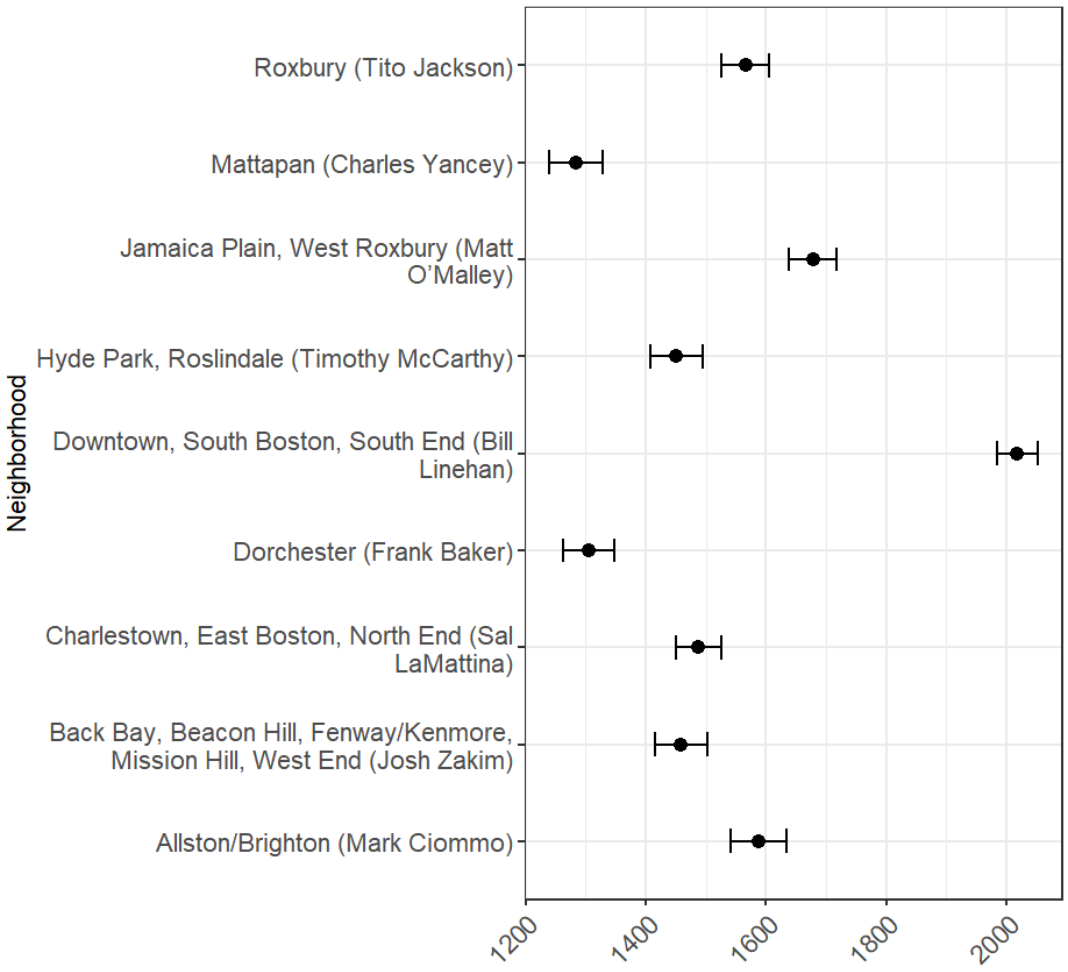
The Residuals vs Fitted plot, while showing clustering, does not display strong non-linear trends, suggesting the linear model captures a general pattern. Most residuals in the Q-Q plot align with the theoretical quantiles, indicating that a large portion of the data follows normality. The Residuals vs Leverage plot shows that the majority of data points have low leverage, meaning they are not disproportionately influencing the model. Additionally, the identifiable patterns offer guidance for potential model improvements through transformation or outlier handling, rather than presenting random noise.



The chart titled "Effect of Department on Resolution Time (Hrs)" illustrates the variability in resolution times across different city departments. Notably, the Disability Commission exhibits a substantially higher average resolution time compared to other departments, with a large confidence interval indicating considerable variability. In contrast, departments such as Public Works and Water and Sewer Commission show relatively low average resolution times with less variability. Several departments, including General Services and Parks, demonstrate resolution times close to zero. The "No queue assigned" category shows a wide range of resolution times, suggesting a lack of consistent handling.



The chart illustrates the trend across the years 2015 to 2019. A general increase is observable from 2015 to 2017, with the value in 2017 being the highest across the observed period. Following 2017, there is a decrease in 2018, and the value in 2019 remains like that of 2018. The error bars indicate variability around the average values for each year.



The chart titled "Neighborhood" illustrates the distribution of values across different neighborhoods. Notably, "Downtown, South Boston, South End (Bill Linehan)" exhibits the highest value, clearly separated from the other neighborhoods. In contrast, "Mattapan (Charles Yancey)" shows the lowest value. Most other neighborhoods, such as "Roxbury (Tito Jackson)" and "Jamaica Plain, West Roxbury (Matt O'Malley)", demonstrate values within a relatively close range, with overlapping error bars suggesting some similarity.

Summary

The analysis reveals that department, neighborhood, and year all significantly influence the resolution time of service requests. Certain departments, like DISB (Department of Innovation and Technology) and INFO (Department of Information Technology), notably increase resolution times, with DISB having the largest impact. On the other hand, departments such as GEN_INFO and PWDx show quicker resolution times. Neighborhoods like Fenway / Kenmore and South Boston are associated with longer resolution times, while areas like Dorchester and Roxbury experience faster resolutions. The year variable indicates a steady increase in resolution times, particularly in 2017, but a subsequent decline after 2017, suggesting targeted improvements or policy changes. While these three factors play key roles, the model's R-squared value of 0.1397 suggests that other unexamined factors also contribute to the variation in resolution times. This points to the need for further investigation into additional factors that may be affecting the efficiency of service request resolutions, such as resource allocation, staffing, or external influences.

Linear Regression Model Comparision

	Model 1: Year		**Model 2: Year + department**		**Model 3: Year + department + City Council District**	
Characteristic	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Year						
2015	—		—		—	
2016	786	<0.001	402	<0.001	395	<0.001
2017	1,197	<0.001	816	<0.001	806	<0.001
2018	687	<0.001	585	<0.001	574	<0.001
2019	558	<0.001	590	<0.001	582	<0.001
department						
Animal Control			—		—	
Boston Housing Authority			2,109	0.047	1,905	0.073
Boston Police Department			-124	0.9	-214	0.8
Boston Public Schools			1,674	0.015	1,689	0.014
Department of Neighborhood Development			-106	0.9	-14	>0.9
Disability Commission			9,689	<0.001	9,630	<0.001

General Services	-1,117	<0.001	-1,260	<0.001
Information Channel	11,260	<0.001	11,207	<0.001
Inspectional Services	2,806	<0.001	2,747	<0.001
No queue assigned	1,232	0.8	731	0.9
Parks	987	<0.001	928	<0.001
Property Management	1,319	<0.001	1,219	<0.001
Public Works	-583	0.022	-620	0.015
Transportation Department	-221	0.4	-282	0.3
Water and Sewer Commission	-166	0.5	-209	0.4
city_council_district				
Allston/Brighton (Mark Ciommo)			—	
Back Bay, Beacon Hill, Fenway/Kenmore, Mission Hill, West End (Josh Zakim)			-130	<0.001
Charlestown, East Boston, North End (Sal LaMattina)			-100	<0.001
Dorchester (Frank Baker)			-284	<0.001
Downtown, South Boston, South End (Bill Linehan)			430	<0.001
Hyde Park, Roslindale (Timothy McCarthy)			-138	<0.001
Jamaica Plain, West Roxbury (Matt O'Malley)			89	0.004
Mattapan (Charles Yancey)			-304	<0.001
Roxbury (Tito Jackson)			-23	0.5

Model	Predictors Included	Adjusted R^2	AIC	RSE	RSE / SD	% Reduction in RSE from Model 1
M1	Year	0.004	13,062,563	5,969	0.998	–
M2	Year + Department	0.136	12,971,180	5,561	0.93	6.83%
M3	Year + Department + City Council District	0.137	12,970,097	5,556	0.929	6.91%

The comparison of models indicates clear improvements in predicting `resolution_time` as more variables are included. Model 1, which uses only `Year`, shows minimal explanatory power (Adjusted R^2 = 0.004) and has a Residual Standard Error (RSE) nearly equal to the standard deviation of the outcome (RSE/SD = 0.998). Model 2 adds `department_full_name`, significantly improving fit (Adjusted R^2 = 0.136) and reducing error by 6.83%. Model 3 further includes `City Council District`, though the gain is marginal (Adjusted R^2 = 0.137, RSE reduction of just 0.08%).

Coefficient analysis shows that resolution times varied significantly by year and department. For example, requests in 2017 had significantly higher resolution times (+806 to +1,197 hours), and departments like the Disability Commission (+9,630 hours) and Information Channel (+11,207 hours) were associated with the longest delays. In contrast, departments like General Services and Public Works had significantly lower resolution times.

City Council districts also contributed, albeit modestly. Areas like Mattapan (–304 hours) and Dorchester (–284 hours) had lower resolution times, while Downtown/South Boston saw higher delays (+430 hours). Overall, Model 2 captures most of the variation, with Model 3 offering small district-level refinements.

Conclusion

This comprehensive analysis of Boston's 311 service requests from 2015 to 2019 highlights meaningful trends and influential factors impacting public service efficiency. Logistic regression confirmed a statistically significant upward trend in on-time resolution rates, suggesting continuous improvement in operational performance, particularly between 2015 and 2016. Chi-square analysis revealed a strong relationship between department and case status, emphasizing how departmental processes and resources shape outcomes. Furthermore, linear regression analysis identified department, neighborhood, and year as key drivers of resolution time, with some departments and neighborhoods

experiencing longer delays. While resolution times increased up to 2017, targeted improvements appear to have stabilized the trend afterward. Despite these insights, the modest explanatory power of the models suggests that additional factors such as staffing, resource allocation, and external influences warrant further investigation. Overall, the findings provide valuable direction for policymakers and city managers aiming to enhance service responsiveness and equity across Boston's neighborhoods.

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Appendix