Analyzing Service Accessibility and Response Patterns in NYC 311

Author: Sagorika Ghosh
Course: DATA 512: Human-Centered Data Science

University of Washington

12-01-2025

This presentation delves into the comprehensive dataset of NYC 311 service requests, examining key trends, operational efficiencies, and the effectiveness of urban service delivery.

311
645·3111

Service Request Portal

Summary of Deck Contents

What's 311 & Why it Matters?
Understanding NYC 311 and its **critical role**.

Who This Is For?
Key stakeholders and audiences for this analysis.

Research Questions
Key questions guiding the 311 investigation.

Data & Methods
Overview of the **dataset** and **analytical approaches**.

Borough & ZIP Gaps
Response time **disparities** by **boroughs** and **ZIP codes**.

Channel Effects
Reporting channel impact (digital vs. phone).

Workload vs. Structure
Demand vs. **systemic issues** in delays.

Prediction & Use
Predicting slow cases and **operational improvements**.

Impact & Implications
Practical & **Scientific** impact of the analyses

What's 311 and why this analysis matters?

NYC 311 Access Channels
Who Gets Faster Help?

City Agency

- 311 is the entry point for basic city help (like heat, noise, water issues)
- My experience in NYC this summer showed big differences in how people experienced it
- Unequal response speeds raise real access and fairness concerns

Question: Do some neighborhoods or channels consistently wait longer for help?

Goal: Understand whether these patterns are random or systematic and identify the primary cause

Who This Is For?

This analysis offers insights valuable to several key stakeholders and interested parties.

Primary Audience

City Operations & 311 Teams

Guiding service improvements and strategic resource allocation.

Borough Managers & Schedulers

Optimizing local workflows and staffing based on demand patterns.

Digital Service Designers

Informing enhancements for 311's digital communication channels.

Secondary Audience

Engaged Residents

Understanding neighborhood service experiences and responsiveness.

Community Advocates

Assessing fairness and equity in 311 service delivery across NYC.

Interested 311 Users

Gaining insight into factors influencing service delays and patterns.

Research Questions

1

Borough Differences

How do average 311 response times vary across boroughs in 2024?

2

ZIP-Level Clustering

Which ZIP codes have significant response time issues, and do complaint types cluster in slow neighborhoods?

3

Channel Differences

Are digital channels faster than phone reports? Which complaint types rely most on phone?

4

Workload vs. Structural Delays

Does complaint volume or seasonal workload amplify delays, or are some areas always slow?

5

Early Prediction

Can we predict slow cases early and identify structural risk factors?

Data and Methods

Data Source

NYC 311 Service Requests (2010-present), with 2024 data filtered (~3-4M rows).

Data Cleaning

Timestamp fixes, removed invalid rows, and **computed response times**.

Analysis Methods

Group comparisons (boroughs, ZIPs, channels), **Kruskal-Wallis tests**, and median-based summaries.

Predictive Modeling

A **Random Forest** model flags "likely slow" cases.
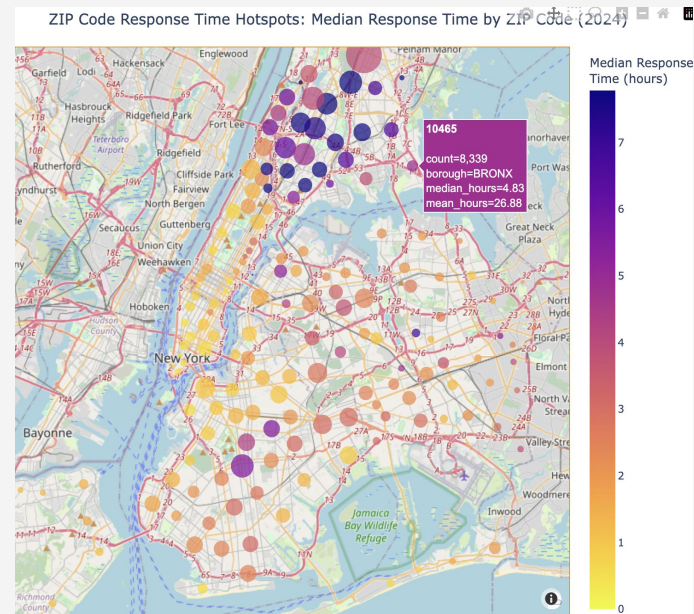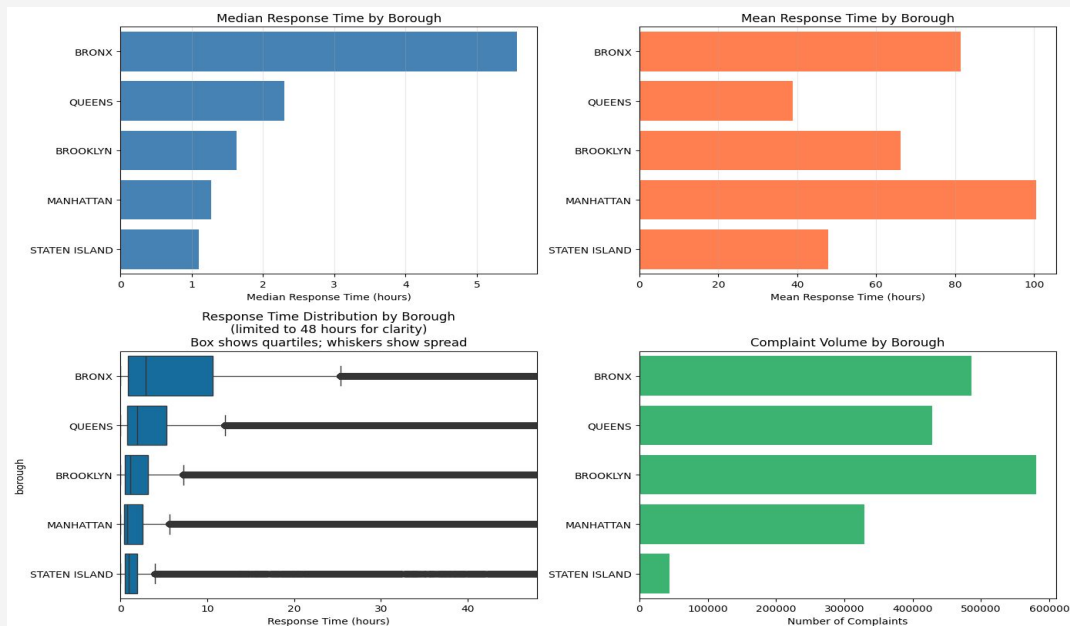
Key Focus

Analysis centered on **top complaint categories** for stable comparisons.

RQ1 and RQ2: Borough and ZIP

- Clear borough-level gaps in typical response time
- Bronx consistently the slowest; Manhattan + Staten Island the fastest
- ZIP-level patterns sharpen the story
- Slow ZIPs cluster in parts of Bronx and Brooklyn: suggests structural, not random, delays

Within borough ZIP gaps

→ **Neighborhood Differences**
   Borough averages mask significant variations at the ZIP level.
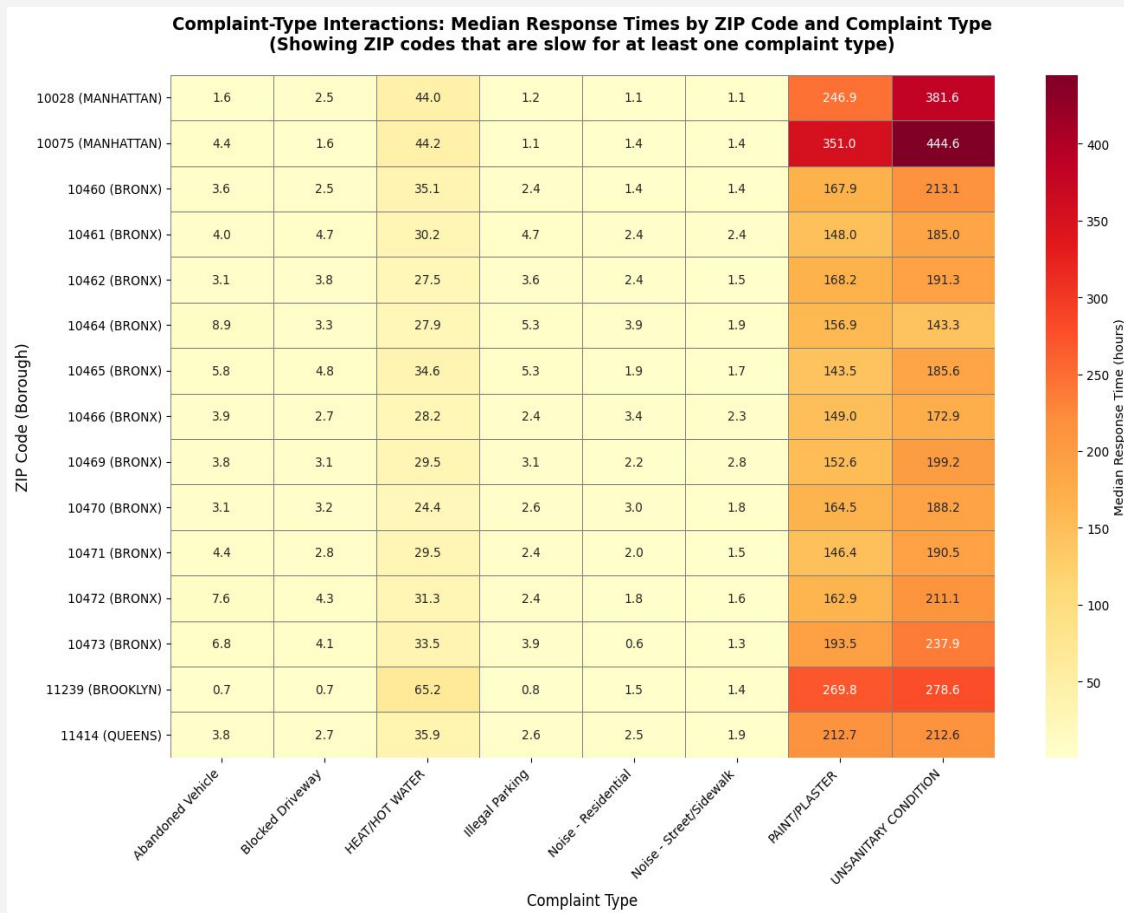
→ **Consistent Delays**
   Specific ZIPs consistently experience longer wait times for similar issues.

→ **Real, Not Random**
   These disparities are statistically significant, not mere chance.

→ **Structural Focus**
   Analysis highlights systemic patterns, not individual areas.

Complaint-Type Interactions: Median Response Times by ZIP Code and Complaint Type
(Showing ZIP codes that are slow for at least one complaint type)

ZIP Code (Borough)	Abandoned Vehicle	Blocked Driveway	HEAT/HOT WATER	Illegal Parking	Noise - Residential	Noise - Street/Sidewalk	PAINT/PLASTER	UNSANITARY CONDITION
10028 (MANHATTAN)	1.6	2.5	44.0	1.2	1.1	1.1	246.9	381.6
10075 (MANHATTAN)	4.4	1.6	44.2	1.1	1.4	1.4	351.0	444.6
10460 (BRONX)	3.6	2.5	35.1	2.4	1.4	1.4	167.9	213.1
10461 (BRONX)	4.0	4.7	30.2	4.7	2.4	2.4	148.0	185.0
10462 (BRONX)	3.1	3.8	27.5	3.6	2.4	1.5	168.2	191.3
10464 (BRONX)	8.9	3.3	27.9	5.3	3.9	1.9	156.9	143.3
10465 (BRONX)	5.8	4.8	34.6	5.3	1.9	1.7	143.5	185.6
10466 (BRONX)	3.9	2.7	28.2	2.4	3.4	2.3	149.0	172.9
10469 (BRONX)	3.8	3.1	29.5	3.1	2.2	2.8	152.6	199.2
10470 (BRONX)	3.1	3.2	24.4	2.6	3.0	1.8	164.5	188.2
10471 (BRONX)	4.4	2.8	29.5	2.4	2.0	1.5	146.4	190.5
10472 (BRONX)	7.6	4.3	31.3	2.4	1.8	1.6	162.9	211.1
10473 (BRONX)	6.8	4.1	33.5	3.9	0.6	1.3	193.5	237.9
11239 (BROOKLYN)	0.7	0.7	65.2	0.8	1.5	1.4	269.8	278.6
11414 (QUEENS)	3.8	2.7	35.9	2.6	2.5	1.9	212.7	212.6

Median Response Time (hours)

RQ3: Channel Effects

Digital Speed

Digital reports (web/app) close faster than phone reports.

Phone Dominance

Key complaints like **Heating/Hot Water** and **Housing** are still phone-heavy.
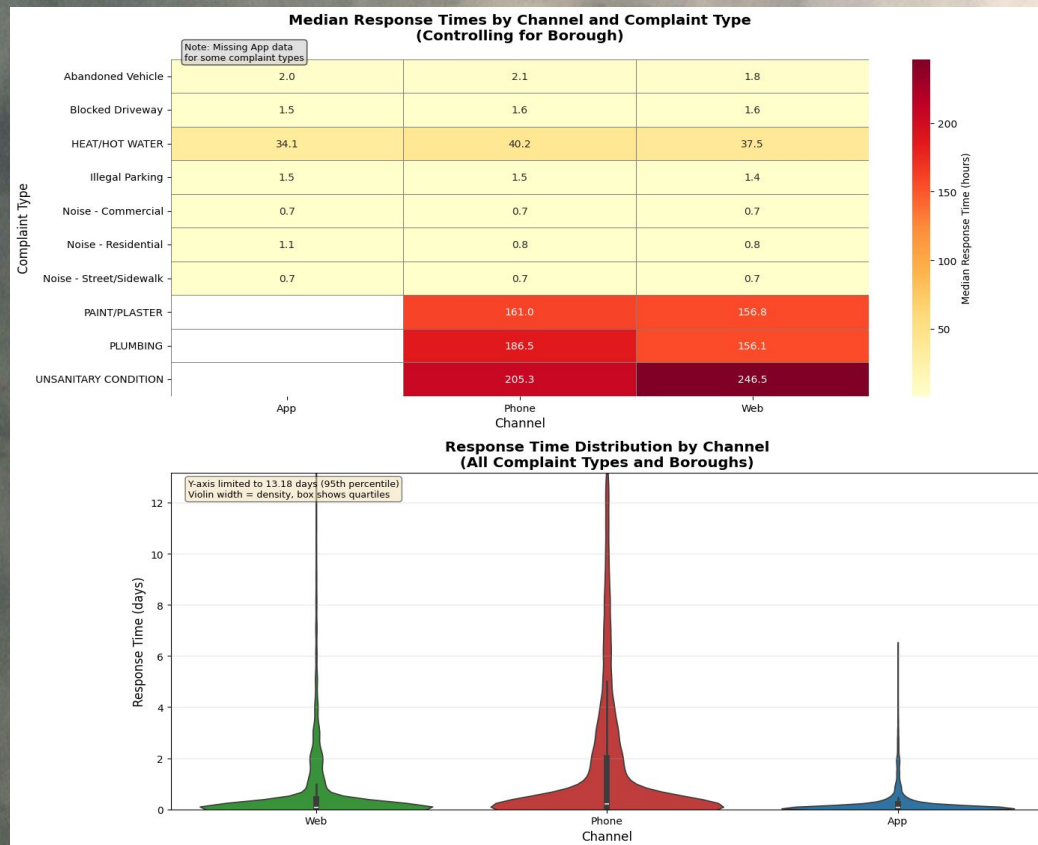
Slower Response

Phone-heavy categories typically have slower response times.

Access Concerns

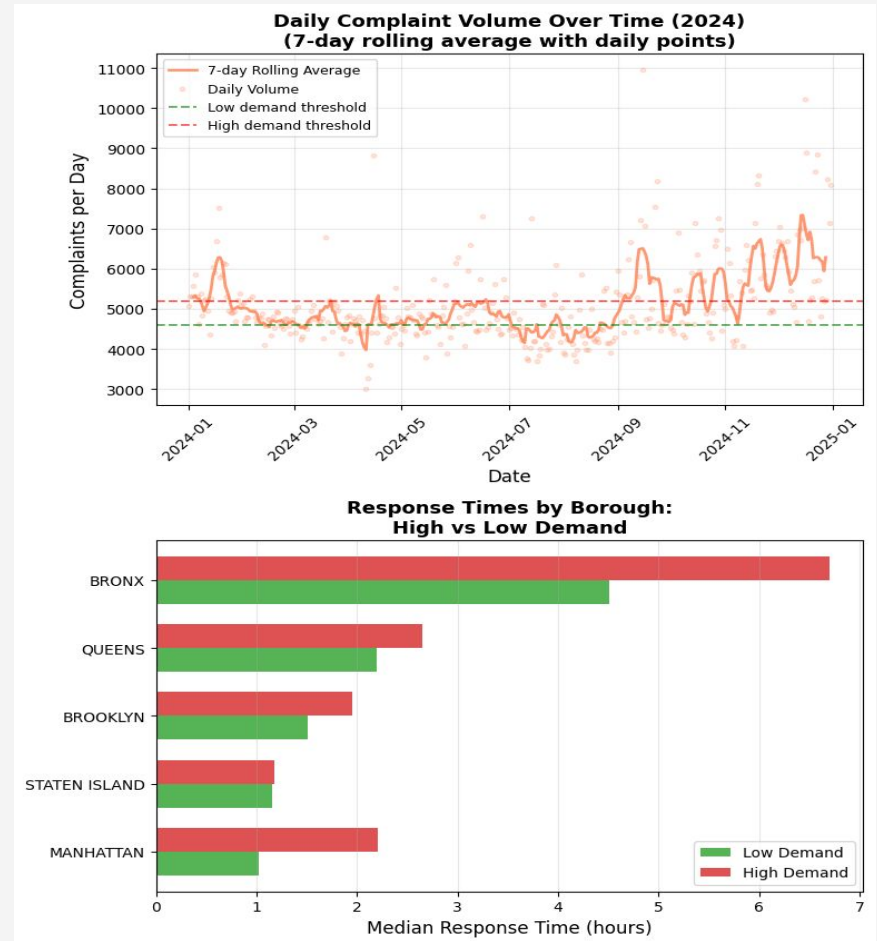This raises **equity issues** for residents reliant on phone communication.

Choice Factors

Channel preference could be driven by **usability, language access**, and tech comfort.

Median Response Times by Channel and Complaint Type
(Controlling for Borough)

Note: Missing App data for some complaint types

Complaint Type	App	Phone	Web
Abandoned Vehicle	2.0	2.1	1.8
Blocked Driveway	1.5	1.6	1.6
HEAT/HOT WATER	34.1	40.2	37.5
Illegal Parking	1.5	1.5	1.4
Noise - Commercial	0.7	0.7	0.7
Noise - Residential	1.1	0.8	0.8
Noise - Street/Sidewalk	0.7	0.7	0.7
PAINT/PLASTER		161.0	156.8
PLUMBING		186.5	156.1
UNSANITARY CONDITION		205.3	246.5

Response Time Distribution by Channel
(All Complaint Types and Boroughs)

Y-axis limited to 13.18 days (95th percentile)
Violin width = density, box shows quartiles

RQ4: Workload Versus Structure

Demand fluctuations impact response times. Demand is categorized by daily complaint counts (low: bottom 33%, high: top 33%).
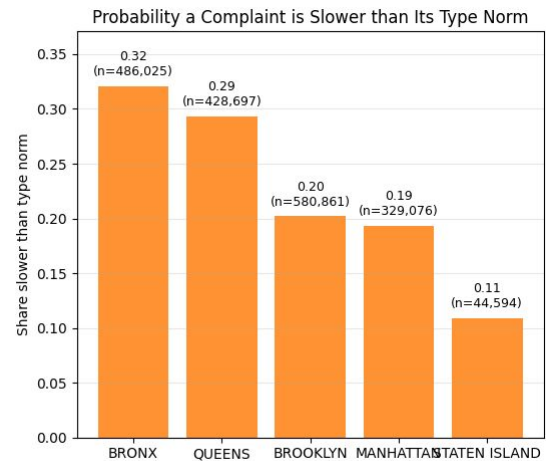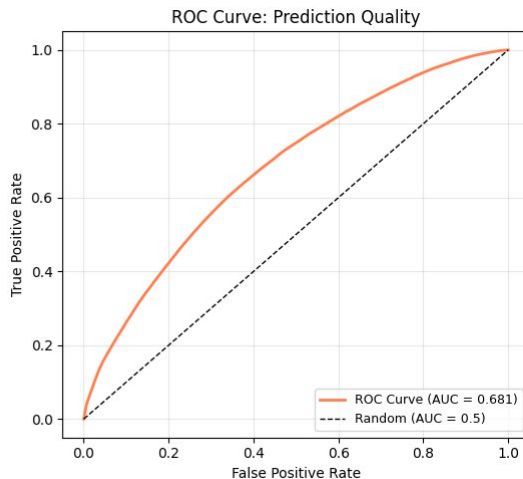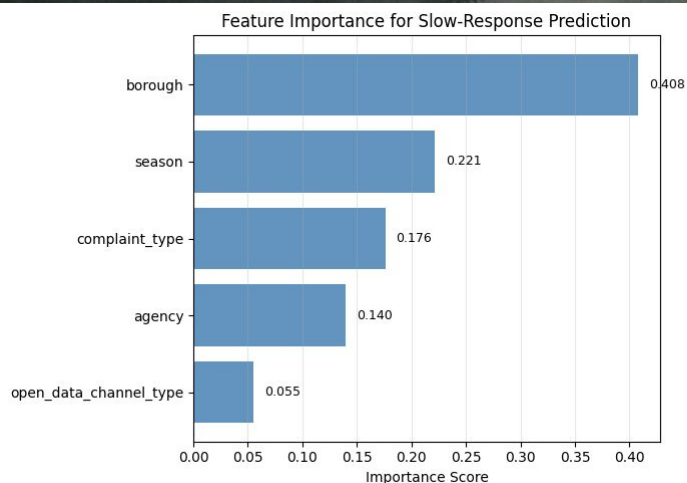
- **High-demand days** have universally slow responses.

- Staten island **absorb surges better.**

- Bronx experiences **significant slowdowns**.

- Key complaint types like Housing, Plumbing, and Paint/Plaster remain slow even on low-demand days, indicating **structural workflow issues**.

Daily Complaint Volume Over Time (2024)
(7-day rolling average with daily points)

Response Times by Borough:
High vs Low Demand

RQ5: Prediction and Queue Health

- Built a small Random Forest model
- **Goal:** flag complaints likely to be slower than typical for their own complaint type (above that complaint type's 75th percentile response time)
- Strongest predictors:
  - Borough
  - Season
  - Channel
- Helps identify structural slowdowns early
- Useful for monitoring queue slowdowns and routing decisions

Feature Importance for Slow-Response Prediction

ROC Curve: Prediction Quality

Probability a Complaint is Slower than Its Type Norm

Impact and Implications of Our Findings

Practical Impact

Identify slow borough and ZIP clusters. Improve routing for phone-heavy complaint types. Monitor queue health with prediction models.

Ethical & Human-Centered

Highlights inequities in community help. Emphasizes support for phone users. Encourages accessible digital pathways without disadvantaging callers.

Scientific Impact

Strong borough-level and spatial effects persist. Channel differences are smaller than borough/season effects. Supports future models with neighborhood context.

Further Research

Extend to multiple years and compare cities. Pair quantitative patterns with resident interviews or surveys.

Thank You!

Questions?

sagorika@uw.edu