



Impacts of Public Transportation Reliability on Food Accessibility & Health Outcomes

Applied Data Science Capstone Project

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PROJECT BACKGROUND

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**In 2022, USDA
reported that
1 in 8 U.S. households
struggled with food
insecurity.**

(Nova, 2023)



PUBLIC TRANSIT & HEALTH

In New York City, when so many residents rely on public transportation, how does service quality impact the health outcomes associated with food accessibility?

How does public transportation quality (service levels, reliability, travel times) impact food accessibility and health outcomes for NYC residents?

When service is improved, do purchasing patterns and health outcomes improve?

RESEARCH

03



STATE OF FOOD INSECURITY

In 2022, In New York City, an estimated **1.2 million residents (14.6%)** were food insecure.

The Bronx: 19.7%

Brooklyn: 15.5%

Manhattan: 13.6%

Queens: 12.1%

Staten Island: 10.1%



PUBLIC TRANSPORTATION

- Crucial to access urban amenities including food sources
- For low-income residents, this is **not a convenience but a necessity**
- **Better on-time performance** enhances service availability, contributing to a **more robust local economy and better service delivery**



INTERSECTIONS OF TRANSPORTATION, FOOD ACCESSIBILITY, & HEALTH

- **Limited access** to grocery stores due to distance or poor transportation options and performance **can lead to food insecurity**, which is **directly related to adverse health outcomes**
- **Improved access** is vital for maintaining good health and preventing diet-related illnesses

TRANSPORTATIO N ANALYSIS

03

SUBWAY PERFORMANCE

The line with the lowest on time performance was the F train, with only 70.2% of trains running on time in 2023, a reduction of 1.6% since the previous year. Despite serving many of the same stations, on time performance for the M train was 85.9% in 2023, increasing 8.3% compared to 2022.

Year	2022	2023	change
line			
F	71.34%	70.17%	-1.64%
A	69.06%	72.09%	4.38%
C	68.82%	72.64%	5.54%
D	72.62%	73.38%	1.05%
N	76.33%	73.64%	-3.54%
E	71.75%	74.31%	3.57%
B	68.27%	75.91%	11.19%
2	74.79%	76.05%	1.68%
Q	74.46%	78.35%	5.23%
R	77.43%	79.63%	2.84%
6	79.35%	79.69%	0.43%
1	82.30%	82.34%	0.05%
5	81.07%	82.52%	1.78%
Systemwide	81.57%	82.88%	1.61%
4	81.05%	83.20%	2.65%
M	79.38%	85.93%	8.25%
G	88.50%	86.26%	-2.53%
3	84.76%	86.41%	1.94%
JZ	84.84%	88.12%	3.88%
7	90.59%	91.04%	0.50%
L	91.12%	92.38%	1.38%
S Rock	95.79%	96.66%	0.91%
S Fkln	99.13%	99.11%	-0.02%
S 42nd	99.34%	99.68%	0.35%

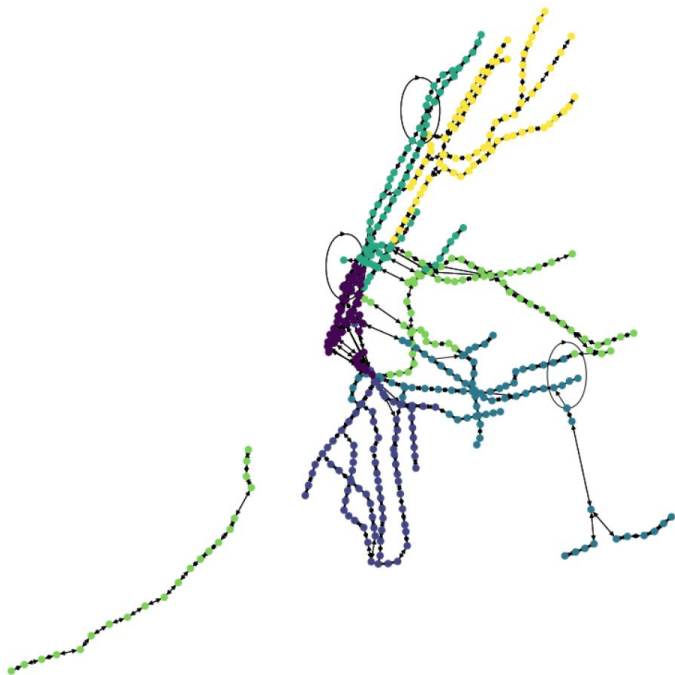
COMMUNITY DETECTION



Analyzing node link data for all subway stations in New York City confirmed that the unshared portions of these lines are part of unique communities when at least six communities are being detected. As expected, the communities detected were similar to the five boroughs, with some additional division due to subway lines.

COMMUNITIE

Despite including F line service, the community with the highest on-time performance was community four. This community is located in Brooklyn and is represented by the color indigo.

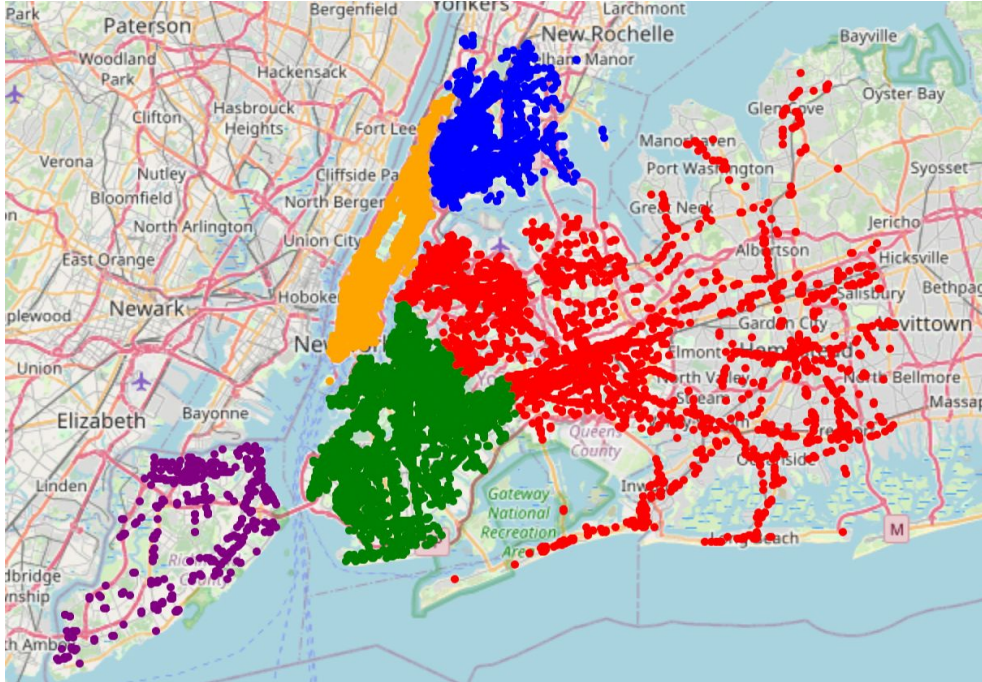


	aOTP	2022	2023	change	community
community					
0	77.19%	76.61%	77.77%	1.16%	Purple
1	74.54%	73.83%	75.25%	1.42%	Green
2	77.40%	75.93%	78.87%	2.94%	Blue
3	76.97%	76.47%	77.47%	1.00%	Turquoise
4	84.29%	83.61%	84.98%	1.36%	Indigo
5	78.23%	77.29%	79.16%	1.87%	Yellow

FOOD RESOURCE ANALYSIS

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FOOD RESOURCE

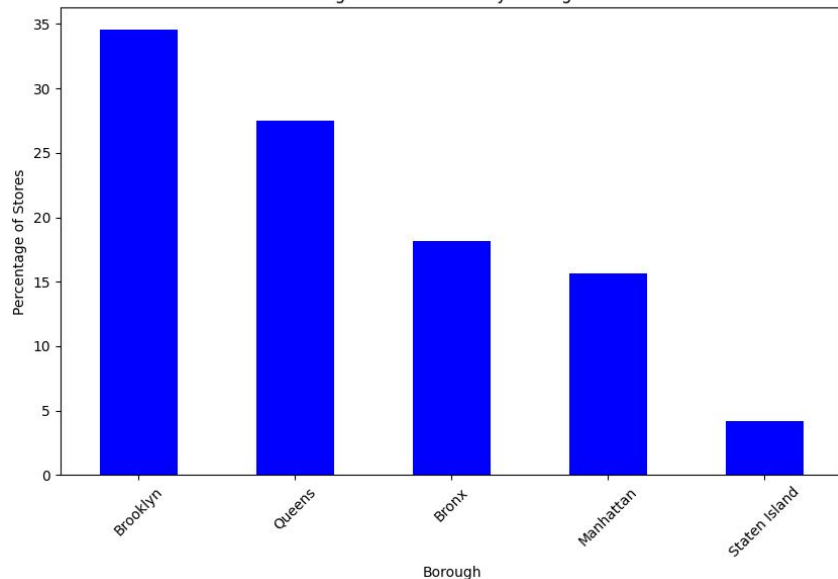


At the borough level, the concentration of food retail stores are relatively well-distributed as determined by a **Gini coefficient score of 0.29**.

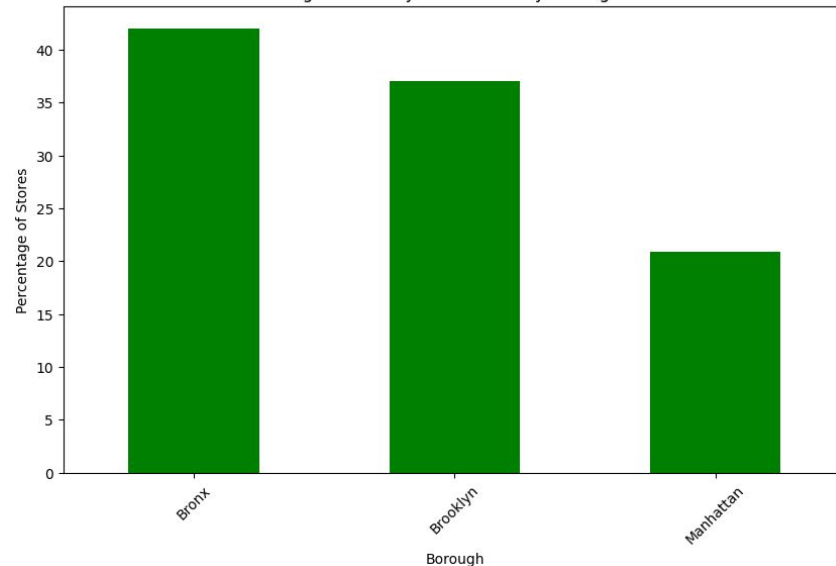
The score almost doubled when it was taken down to the zip code level. The **Gini coefficient score was 0.49** suggesting significant variation in the distribution of food retail stores.

FOOD RESOURCE

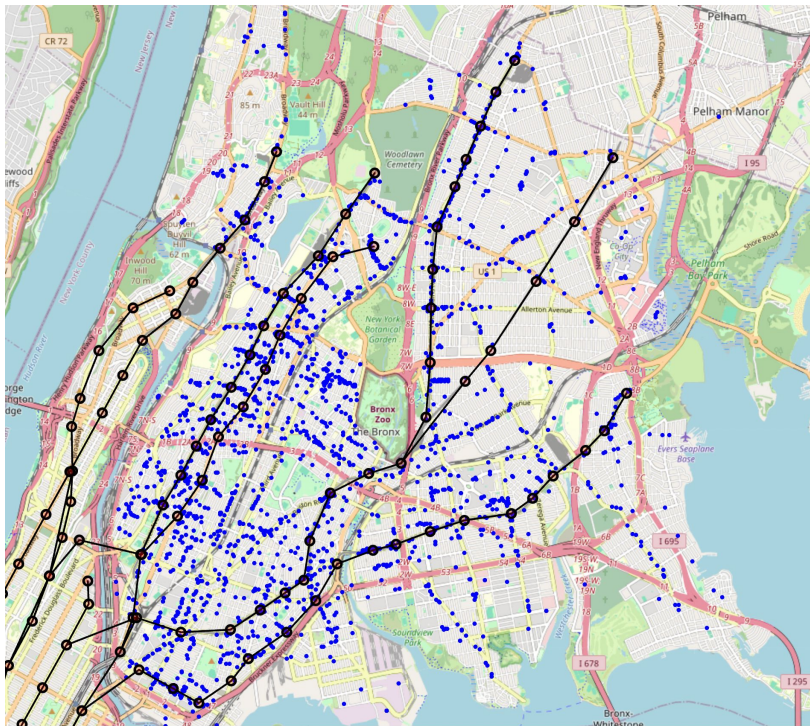
Percentage of Food Stores by Borough in NYC



Percentage of Healthy Food Stores by Borough in NYC



FOOD RESOURCE



Average Distance of using food retail stores and subway station data *ONLY*:

1. Staten Island
2. Queens
3. Bronx
4. Brooklyn
5. Manhattan

CONCLUSION

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HEALTH FACTORS

Although quality food and proper nutrition play a major role in health outcomes, having health-food stores in the neighborhood is not correlated with better health outcomes. This may be attributed to what we label as “health-food”, but can also be linked to income levels, neighborhood walkability, and housing affordability.

