



Bridging the Gap: Exploring New York City's Transit Deserts



Problem Statement:

As the largest city in the United States with a population of over 8 and a half million residents, New York City is home to one of the most extensive public transportation systems in the world. However, despite serving 15.3 million passengers daily, an alarming almost two million residents live in what have been described as “Transit Deserts”. Many argue that these grey areas in the subway system disproportionately affects low-income New Yorkers and neighbourhoods with predominantly people of color, and that these affected residents face increased barriers to travel, such as having to walk for sometimes several miles to reach the nearest train station.

Research Question:

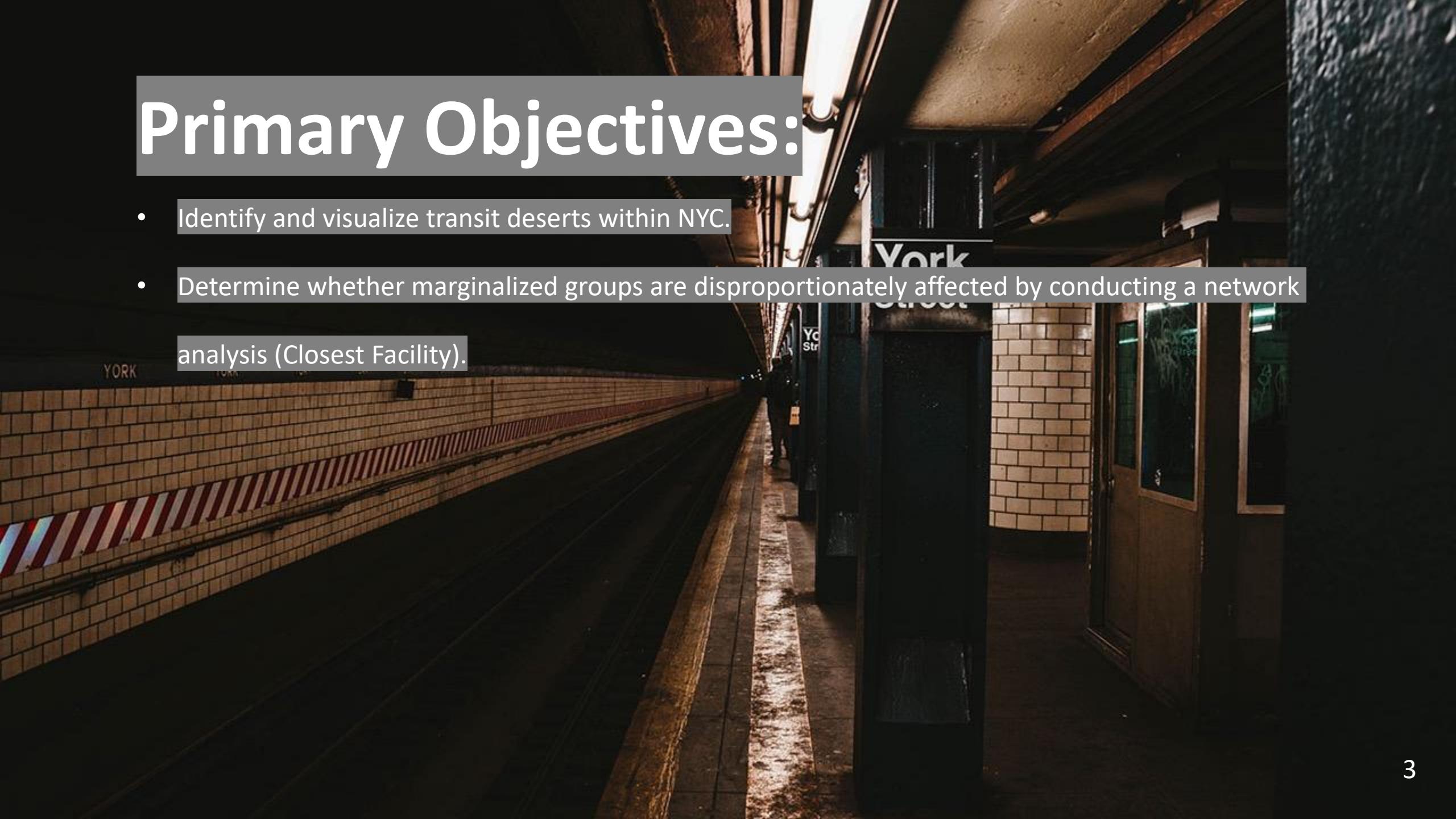
Where are the transit deserts in New York City located, and how do they affect low income and marginalized communities?

Scope:

- Focusing on train stations
- The backbone of the city’s mass transit infrastructure (bulk of transit volume)
- Data consistency (less variation)

Primary Objectives:

- Identify and visualize transit deserts within NYC.
- Determine whether marginalized groups are disproportionately affected by conducting a network analysis (Closest Facility).

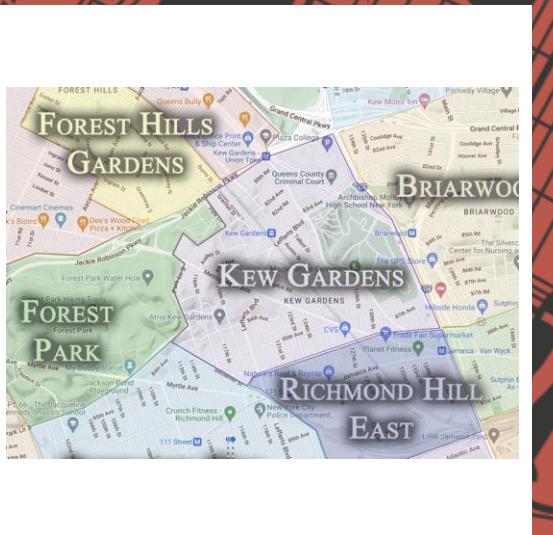


What Is a Transit Desert?

- The term “transit desert” refers to areas where disadvantaged and transit-dependent populations are provided with inadequate amounts of transit supply. (Jomehpour Chahar Aman, 2020)
- Usually form where there's lengthy walking distances to public transportation, transportation inaccessible for people with disabilities, or a lack of transportation facilities in the area
- While there is not a fixed threshold on what walking distance (without reaching a station) constitutes a transit desert, most studies use 0.5/0.75 mile buffers

My Personal Connection

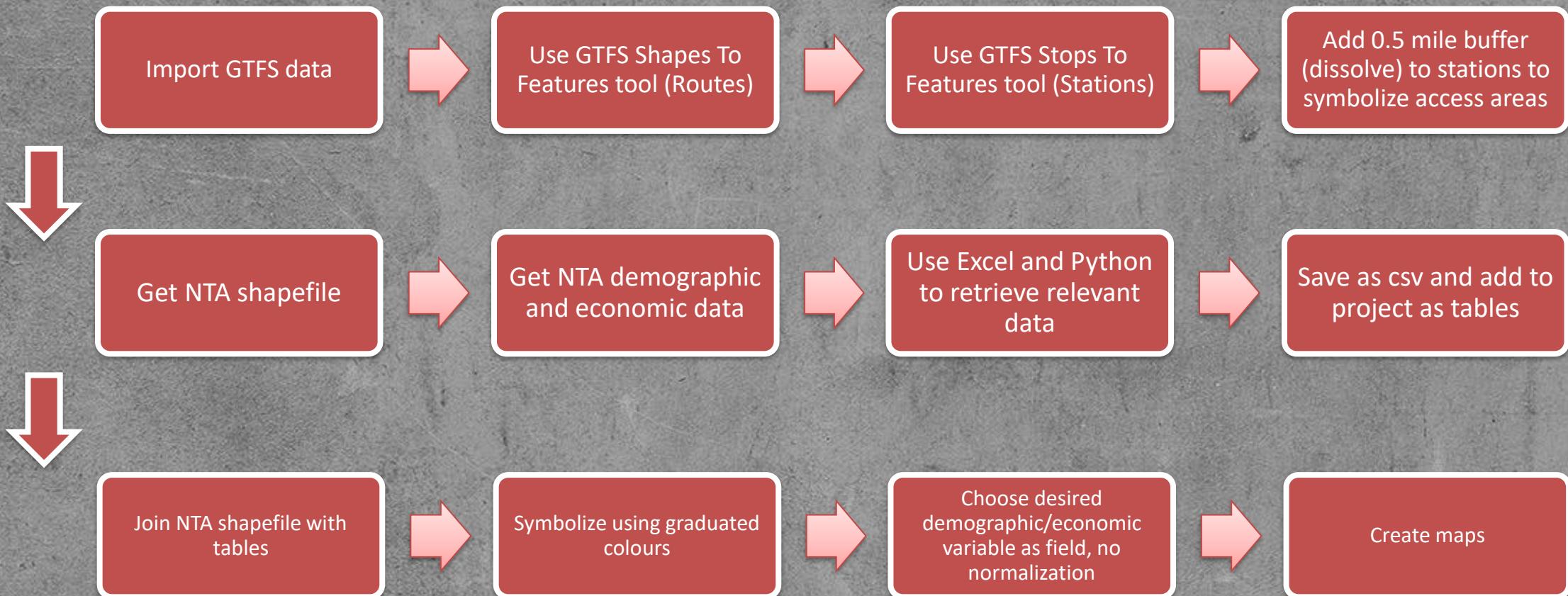
The reality of living in a transit desert.



Data Sources

Data	Type	Source
New York City 2010 Neighbourhood Tabulation Areas (NTA)	Polygon	Neighborhood Tabulation Areas (NTAs) - Department of City Planning - DCP
Demographic Profiles of ACS 5 Year Estimates at the Neighborhood Tabulation Area (NTA) level	.csv file	Demographic Profiles of ACS 5 Year Estimates at the Neighborhood Tabulation Area (NTA) level - Catalog
Economic Profiles of ACS 5 Year Estimates at the Neighborhood Tabulation Area (NTA) level	.csv file	Demographic Profiles of ACS 5 Year Estimates at the Neighborhood Tabulation Area (NTA) level - Catalog
Subway Routes	Static General Transit Feed Specification (GTFS) data	Developer Resources
Subway Stops	Static General Transit Feed Specification (GTFS) data	Developer Resources

Methodology



Methodology

jupyter EconDataCleaing Last Checkpoint: 6 days ago

File Edit View Run Kernel Settings Help Trusted JupyterLab Python 3 (ipykernel)

```
[5]: import pandas as pd  
  
df=pd.read_csv('EconDataNTA.csv')  
df  
  
columns_to_keep = [  
    "GeogName": "NTA_Name",  
    "GeoID": "NTA_Code",  
    "Borough": "Borough",  
    "MdHHIncE": "Median_HH_Income",  
    "MnHHIncE": "Mean_HH_Income",  
    "DU": "Mean_Travel_Time",  
    "CW_PbTrnsP": "Pct_Use_Public_Transit"  
}  
  
existing_cols = [col for col in columns_to_keep if col in df.columns]  
cleaned_df=df[existing_cols].rename(columns=columns_to_keep)  
  
cleaned_df.to_csv("nta_income_cleaned.csv", index=False)  
  
cleaned_df.head()
```

	NTA_Name	NTA_Code	Borough	Median_HH_Income	Mean_HH_Income	Pct_Use_Public_Transit
0	Bath Beach	BK27	Brooklyn	58,243	75,950	57.7
1	Bay Ridge	BK31	Brooklyn	63,539	86,319	57.0
2	Bedford	BK75	Brooklyn	39,970	62,616	63.7
3	Bensonhurst East	BK29	Brooklyn	48,097	65,715	61.4
4	Bensonhurst West	BK28	Brooklyn	51,035	70,198	60.9

Contents Search

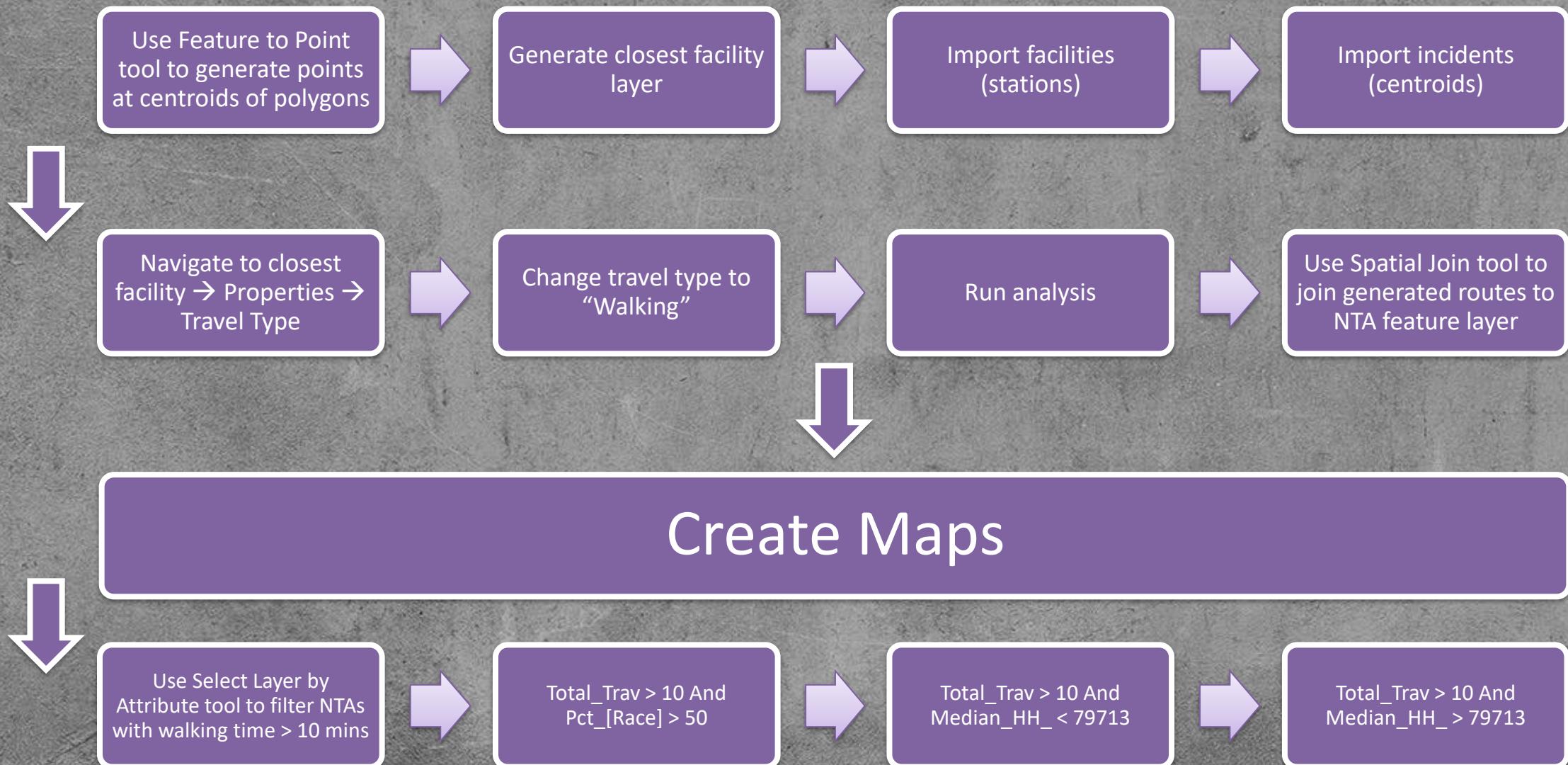
HH_Income
Stops
Routes
Access Zone
HHI_Layer
nynta2010
Light Gray Reference
Light Gray Base

Drawing Order

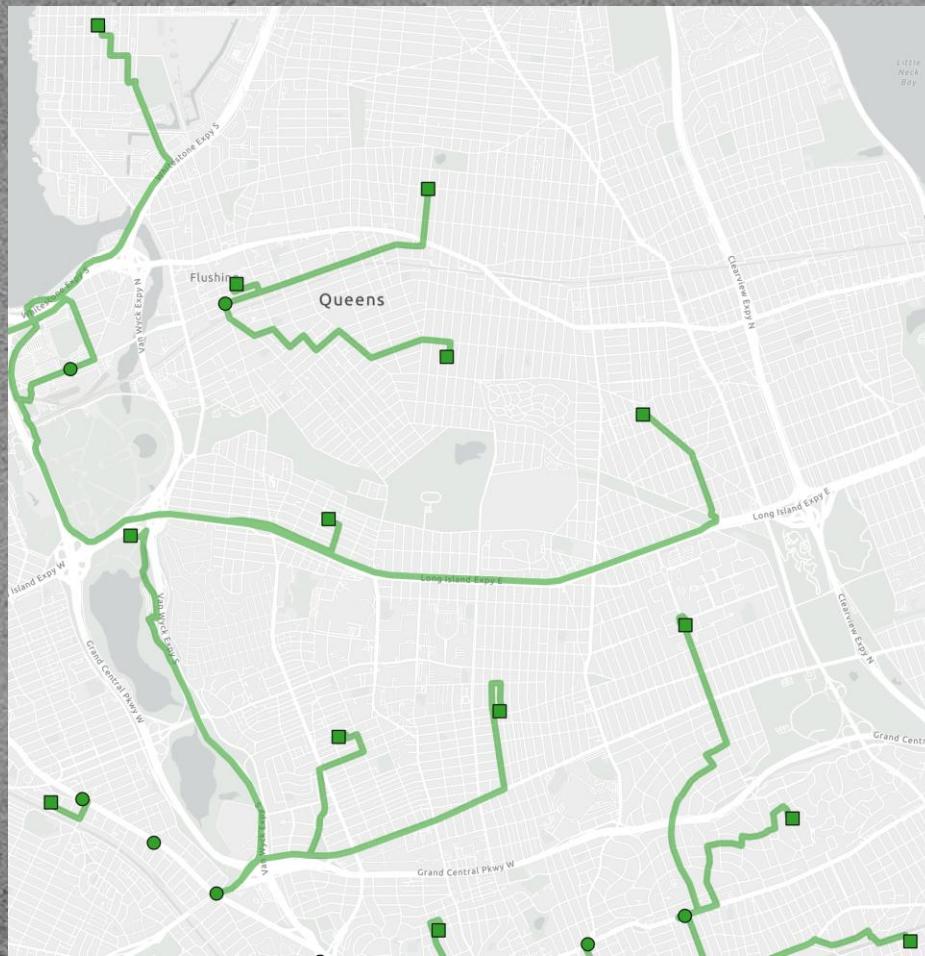
Standalone Tables

- Cleaned_NTA_Demographics.csv
- nta_income_cleaned.csv

Methodology (Network Analysis)



Methodology (Network Analysis)



Total_TravelTime ▾
14.61633
11.544751
11.44049
10.699498
10.562359
10.480779
10.171238
9.965867
9.686072
9.669451
8.985308
8.877595
8.801773
8.751465
8.421762
8.184132
8.09484
7.993314
7.754642
7.633321

Parameters Environments

Input Rows: AllNeighbourhoods_SpatialJoin

Selection Type: New selection

Expression: Total_Trav > 10 And Median_HH_ > 79713

Invert Where Clause

Load Save Remove

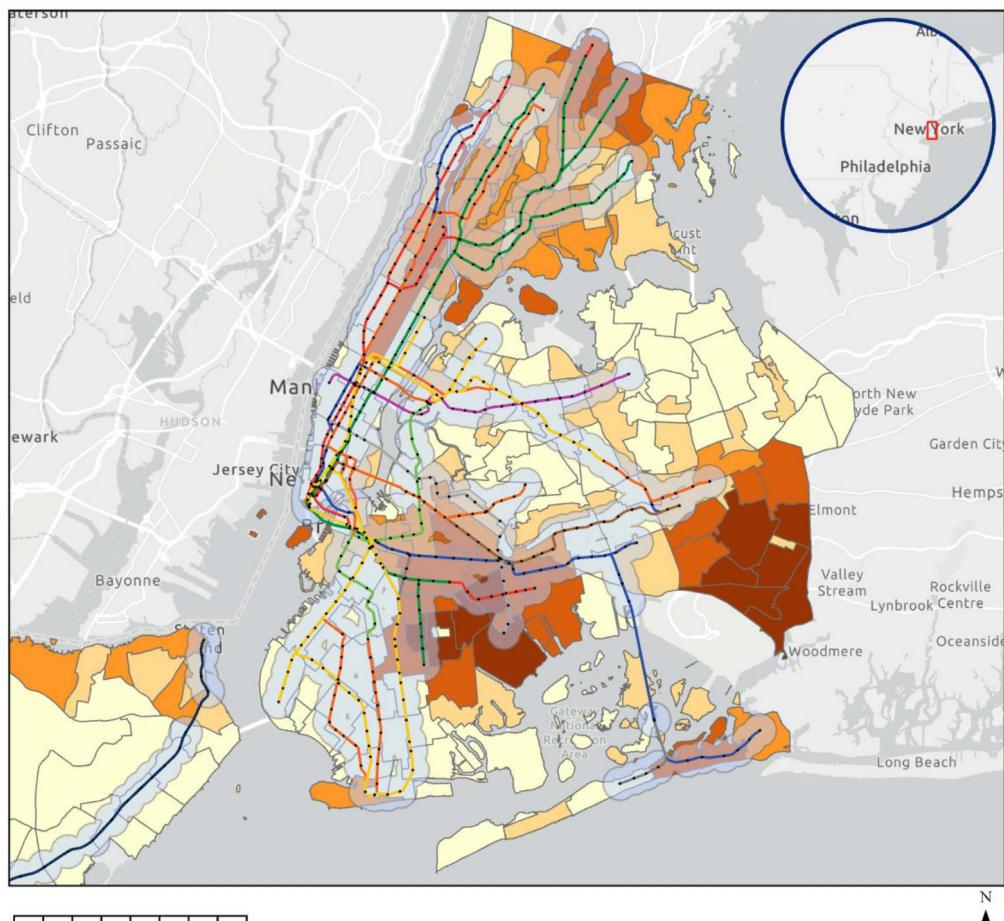
SQL ?

Results



Transit Deserts and Black Population Distribution in NYC

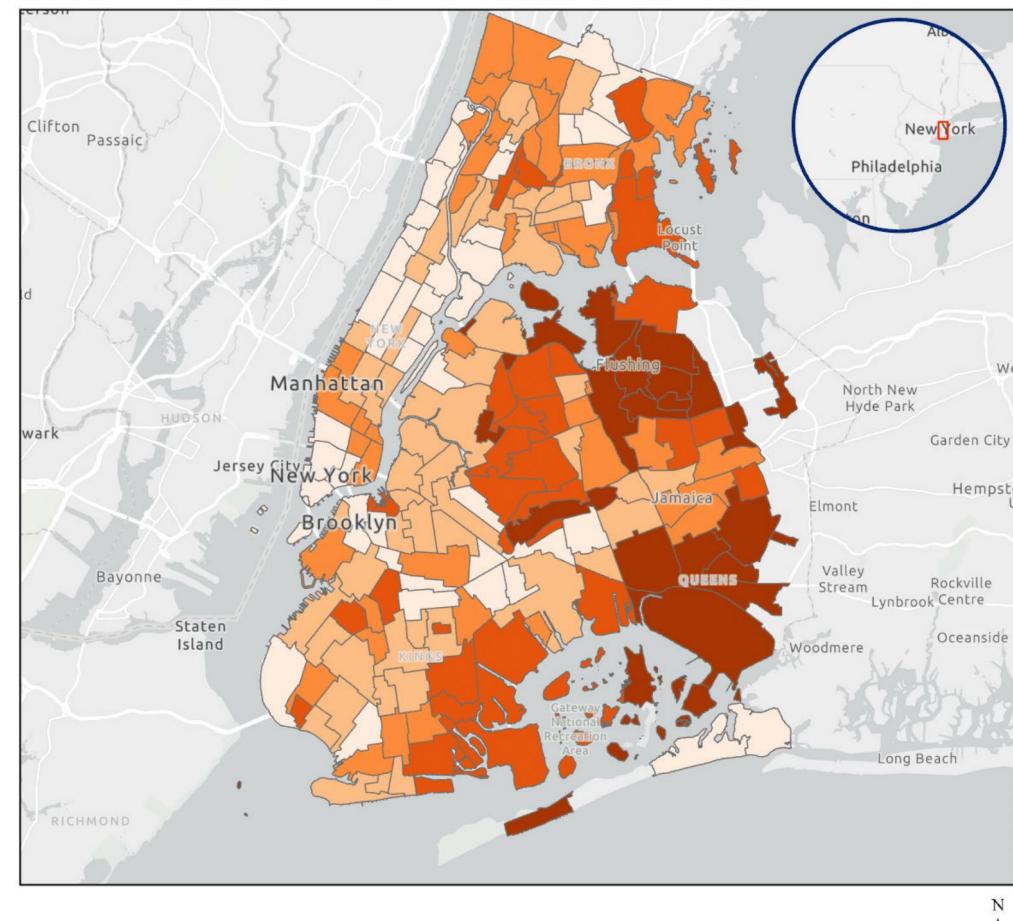
Transit Access and Black Population Across NYC NTAs



Map authored by: Jonathan Solomon
Credits: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, NYC OpenData, New Jersey Office of GIS, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, USFWS
Projection: NAD 1983 StatePlane New York Long Isl FIPS 3104 (US Feet)

Total Walking Time (To Nearest Subway Station) in NYC

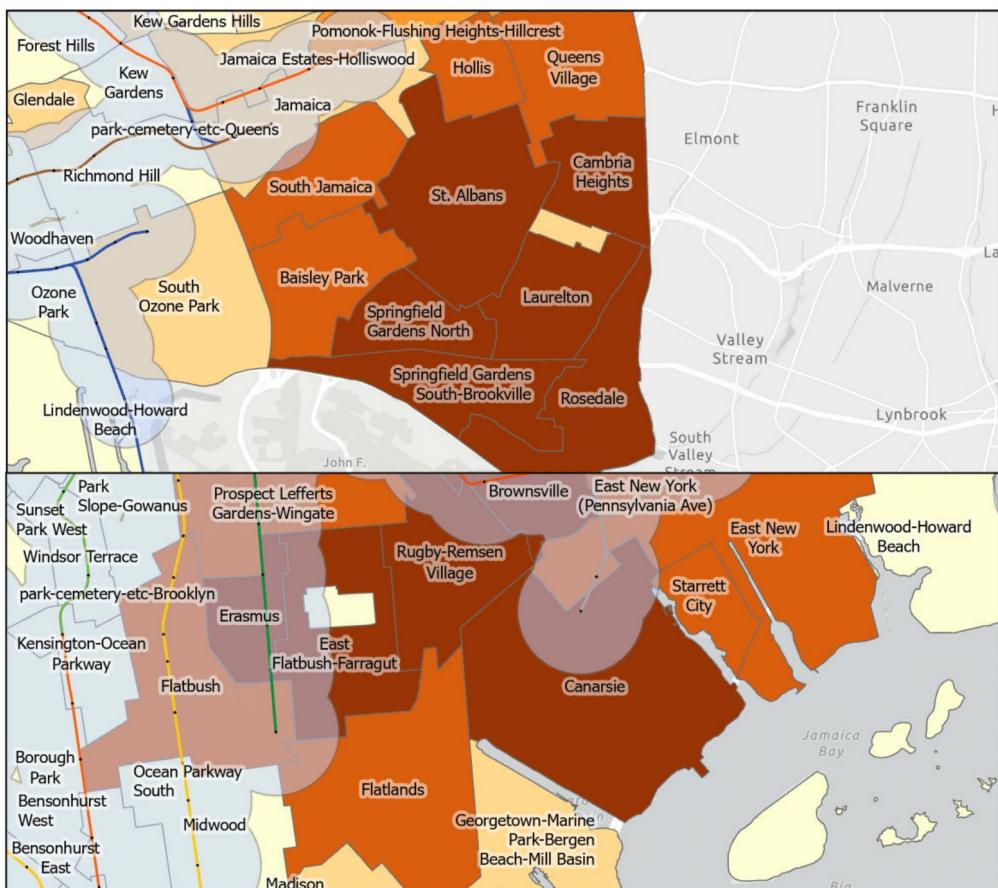
Total Walking Time (Minutes) Across NYC NTAs



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Transit Deserts and Black Population Distribution in NYC

Specific Areas of Concern



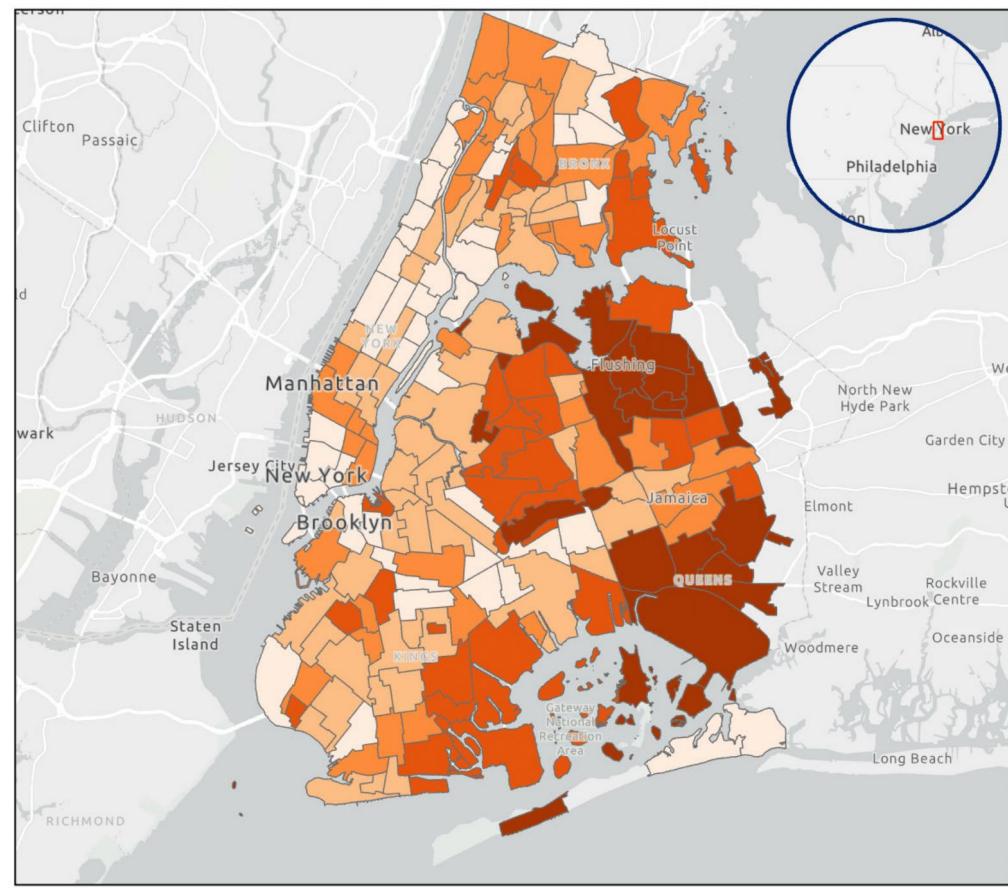
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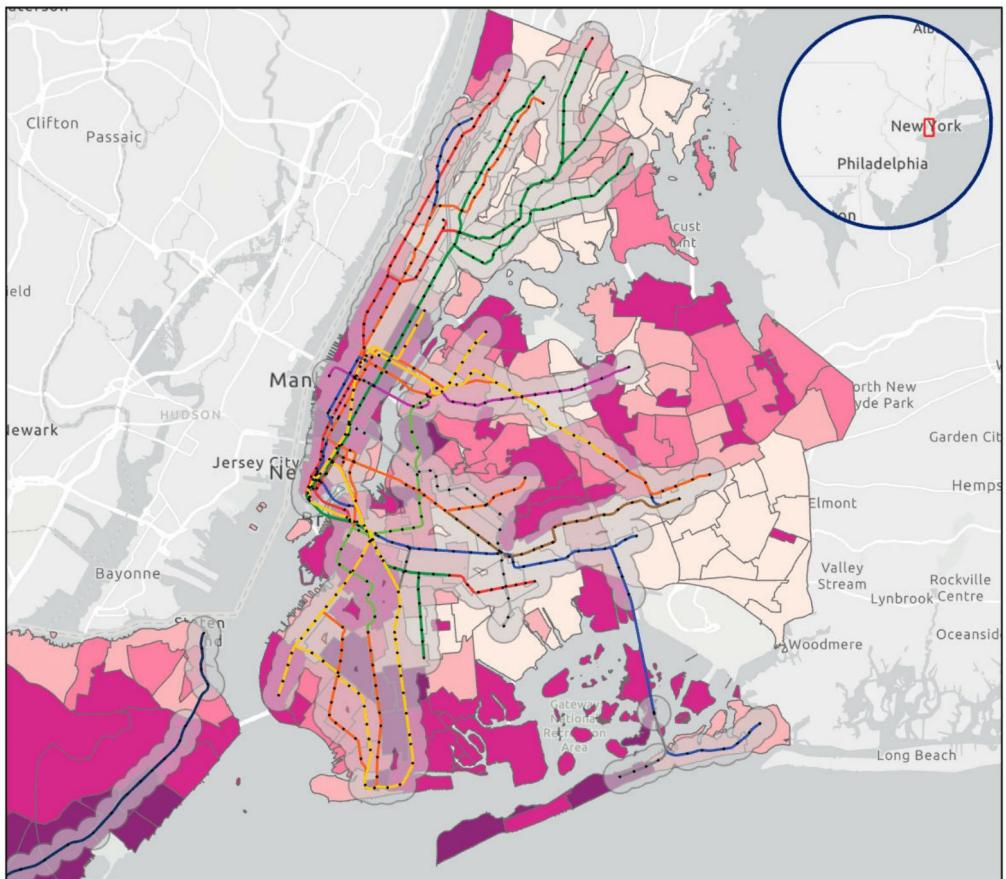
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Transit Deserts and White Population Distribution in NYC

Transit Access and White Population Across NYC NTAs



White (%)
Per Neighbourhood

7 Miles

Stops
• Stop
Access Zone

Routes
7
ACE
BDFM
G
JZ
L

Stops
NQRW
S
SIR

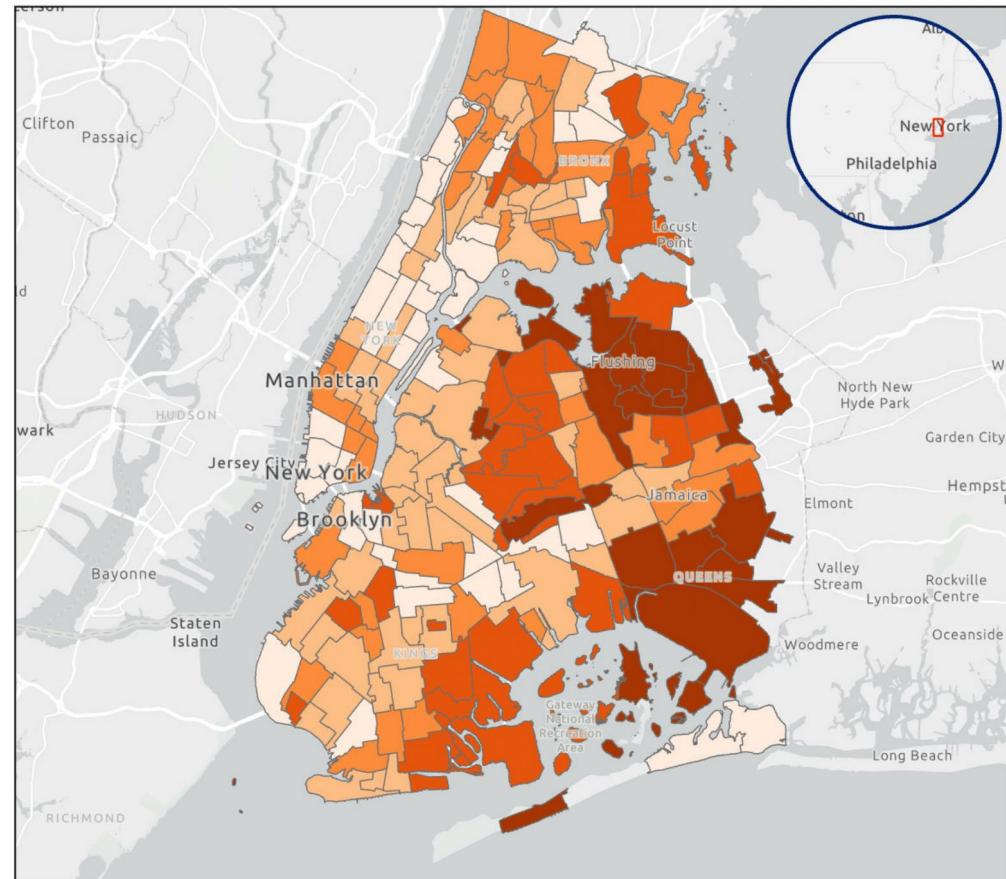


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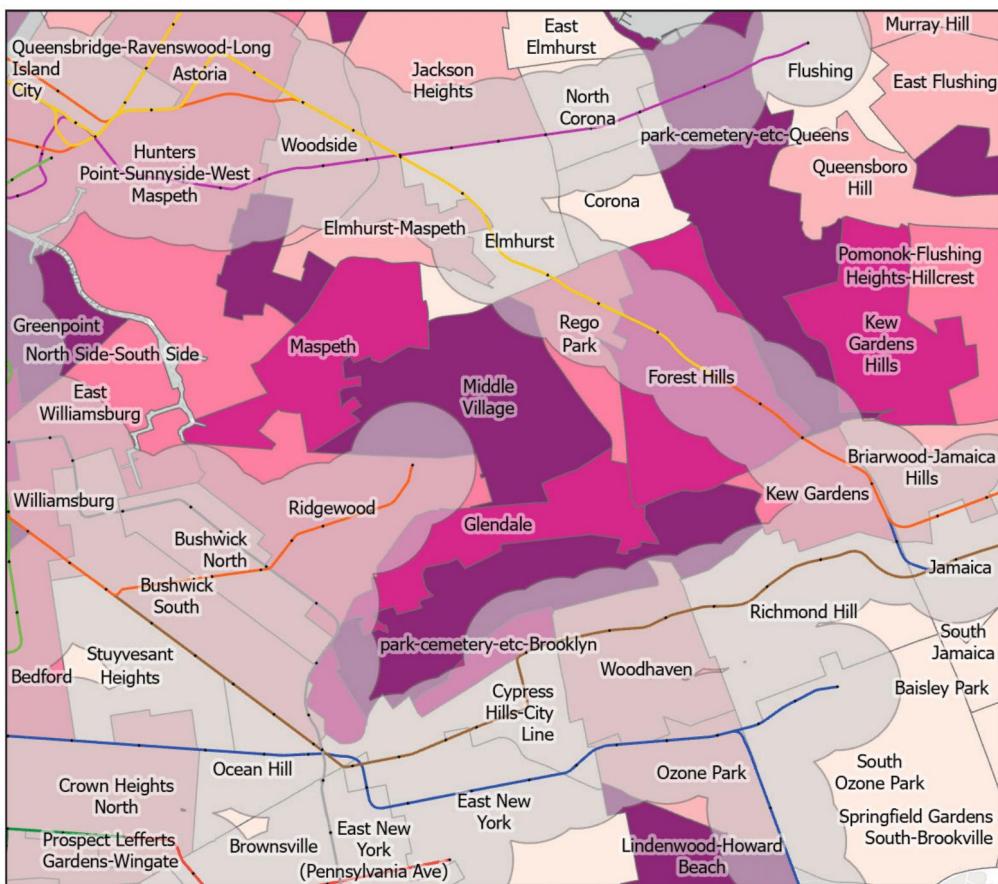


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Transit Deserts and White Population Distribution in NYC

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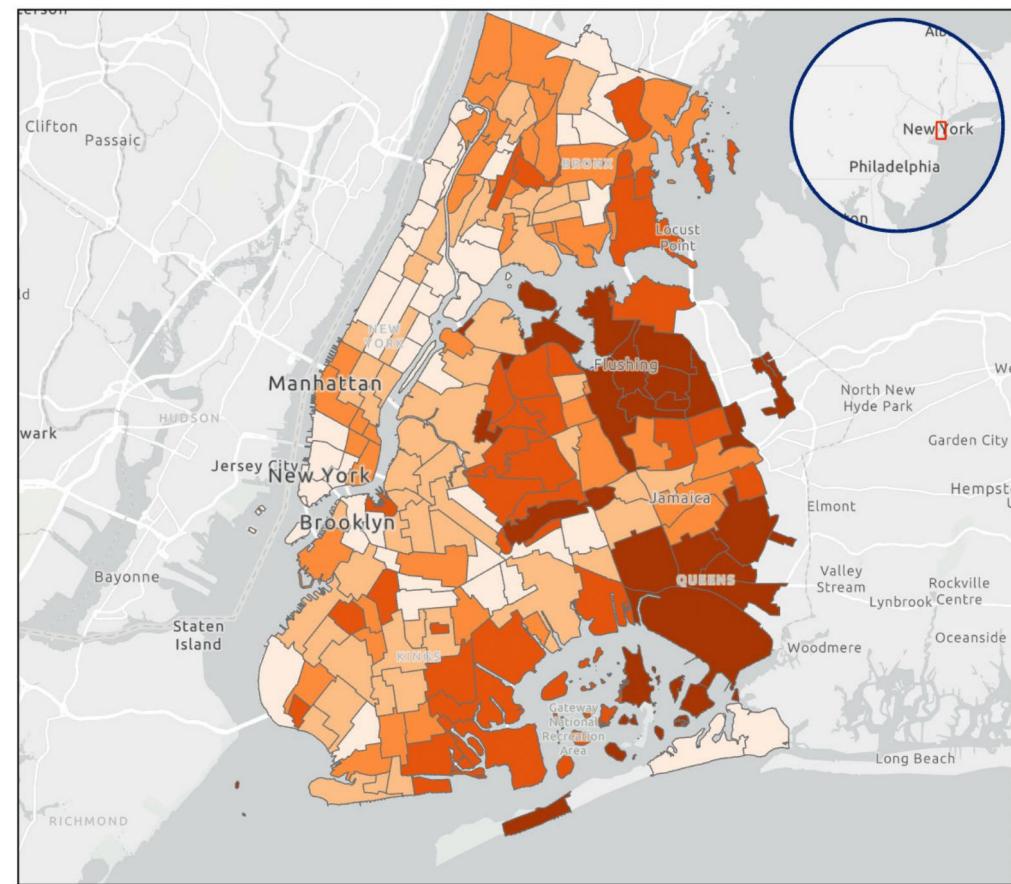
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Total Walking Time (Minutes) Across NYC NTAs



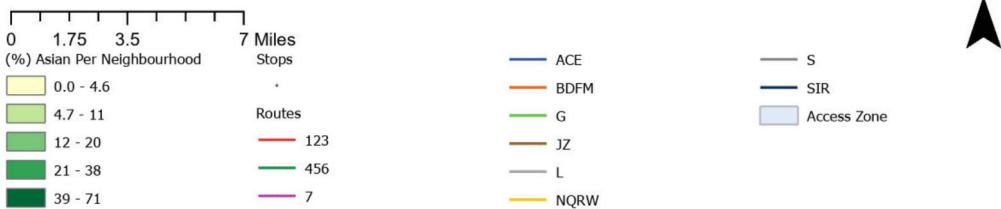
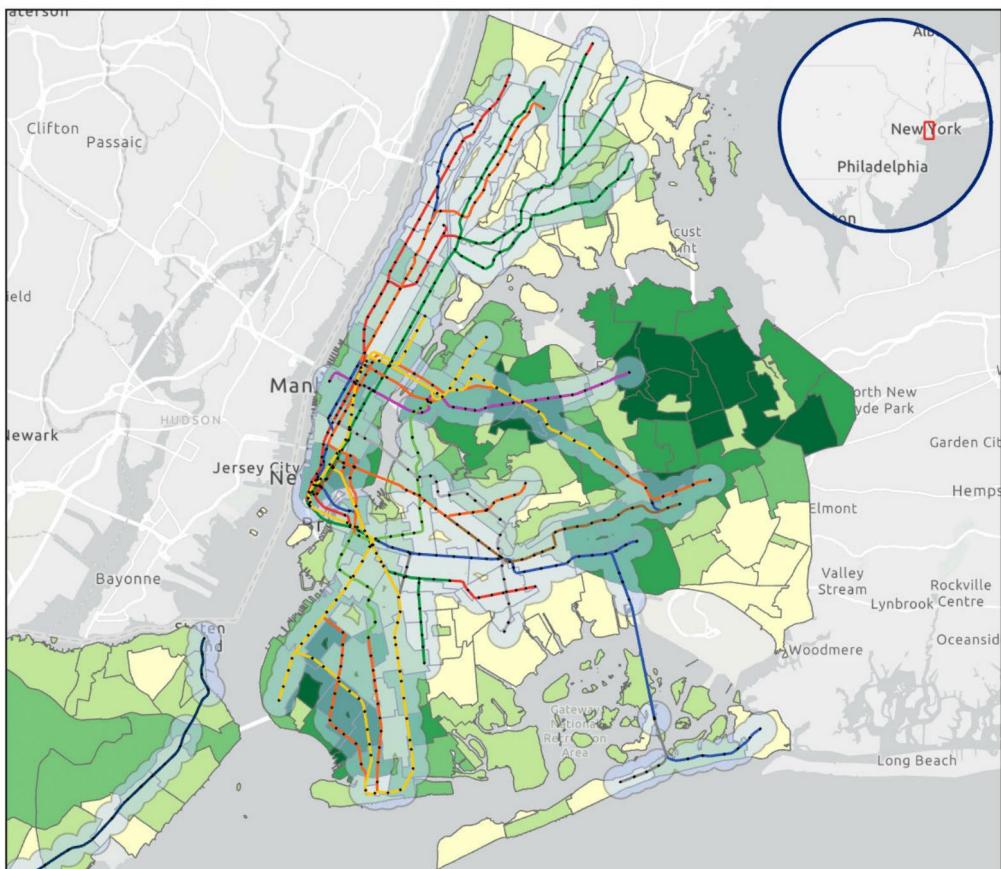
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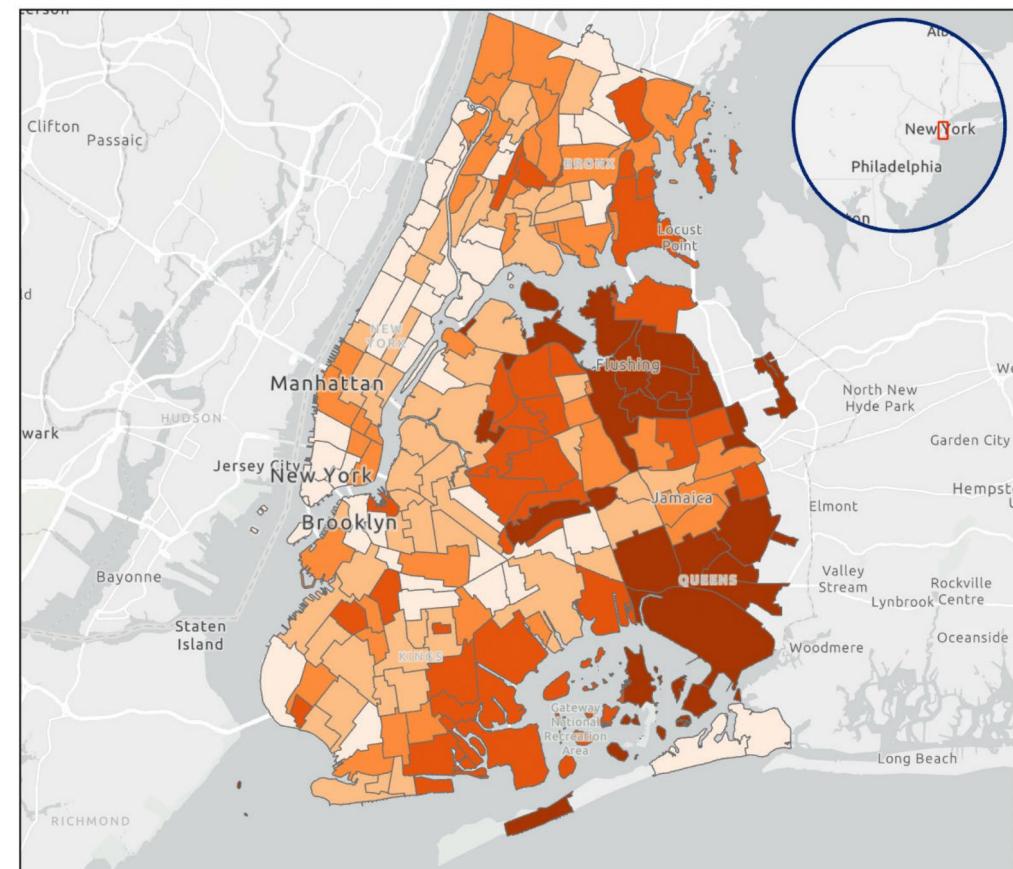
Transit Deserts and Asian Population Distribution in NYC

Transit Access and Asian Population Across NYC NTAs



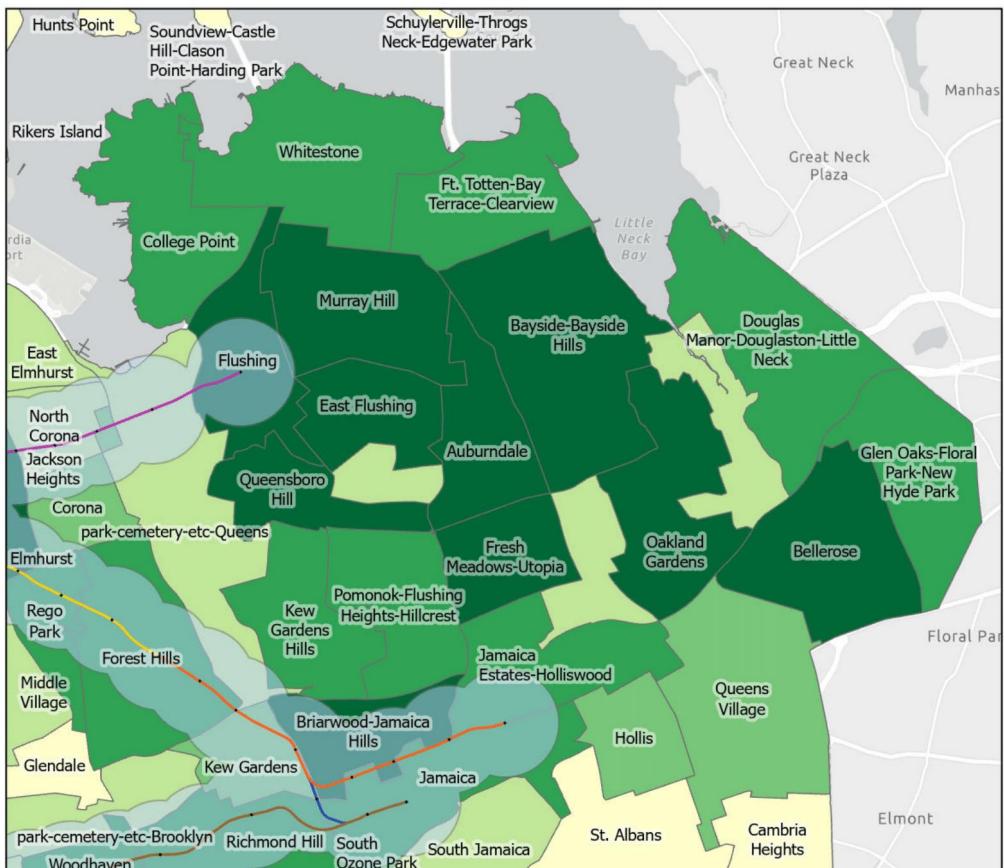
Total Walking Time (To Nearest Subway Station) in NYC

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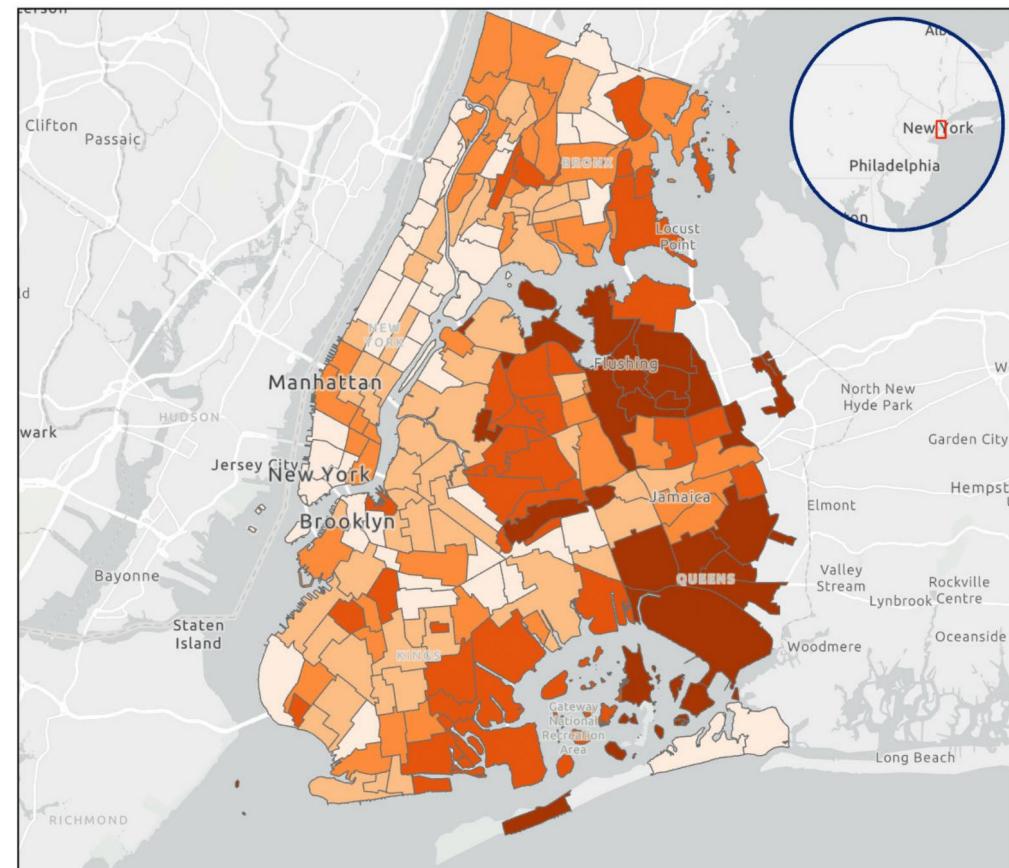
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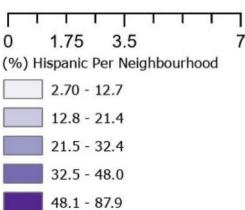
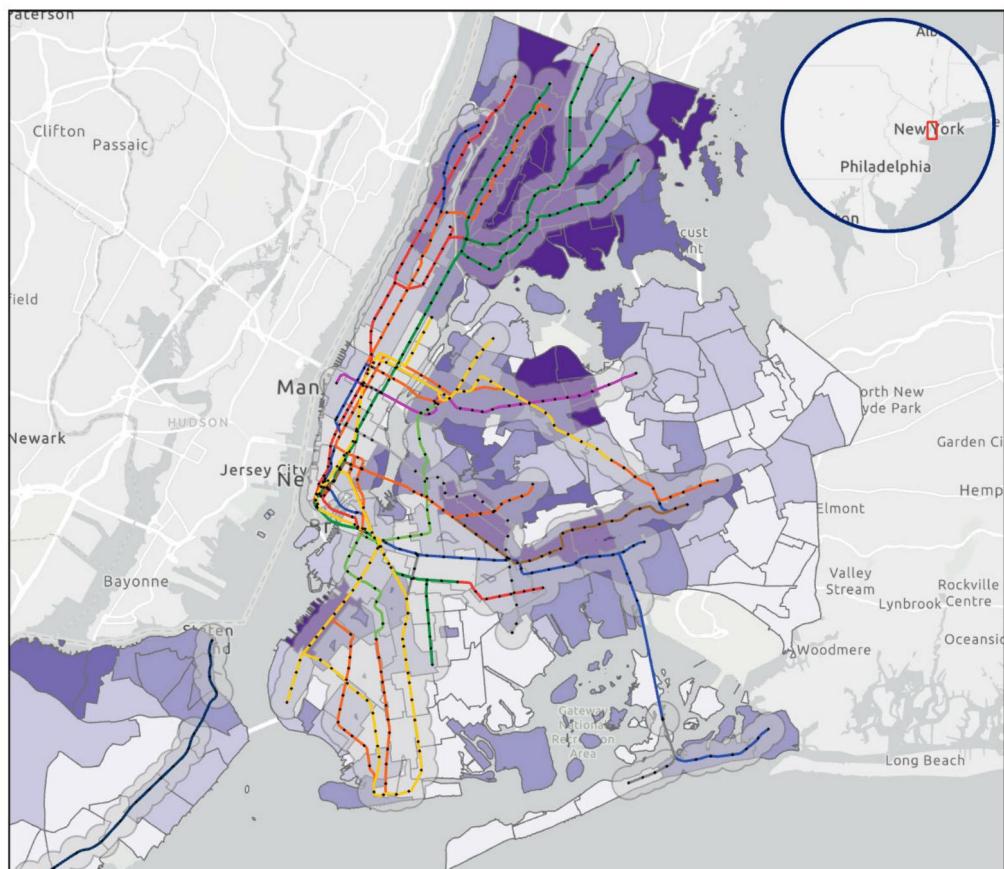
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Transit Deserts and Hispanic Population Distribution in NYC

Transit Access and Hispanic Population Across NYC NTAs

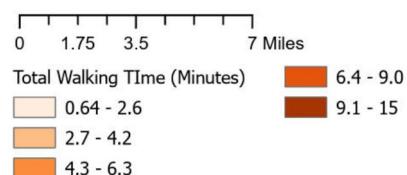
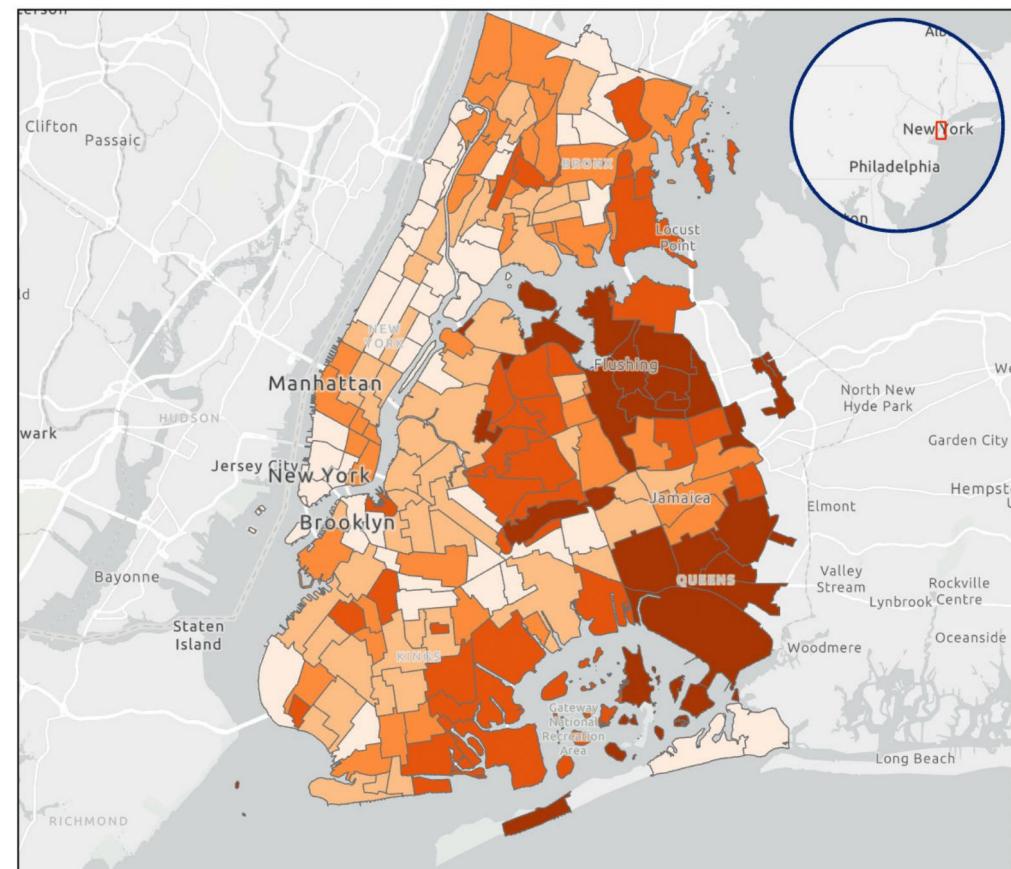


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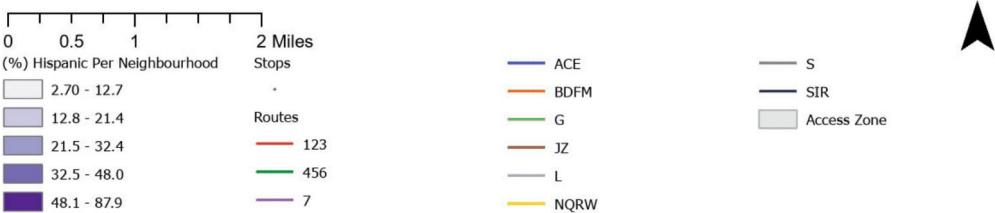
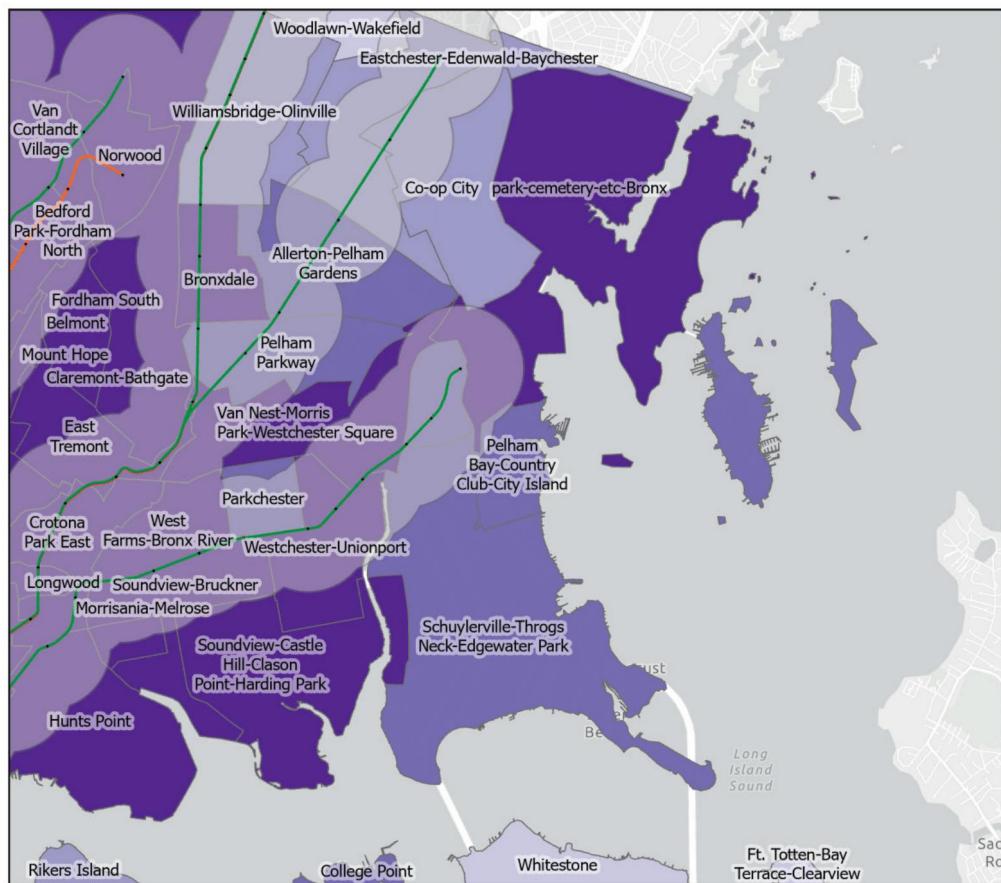
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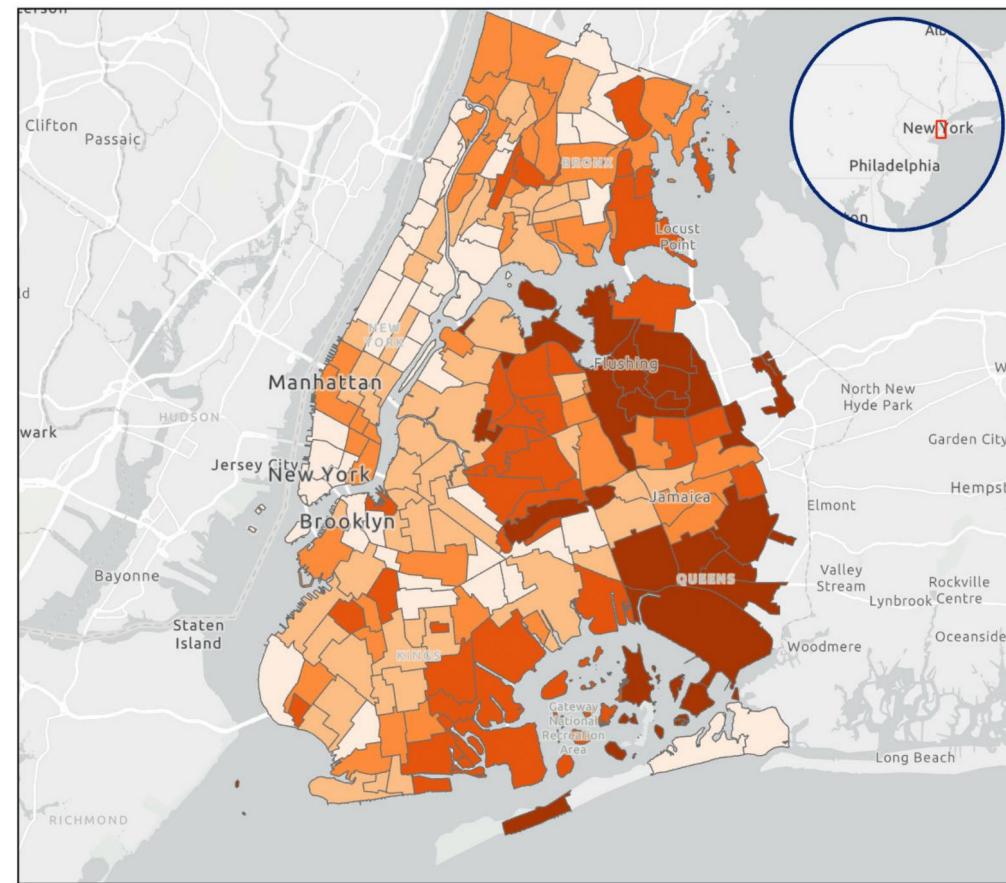
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Transit Deserts and Hispanic Population Distribution in NYC Specific Areas of Concern



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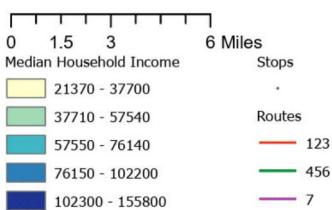
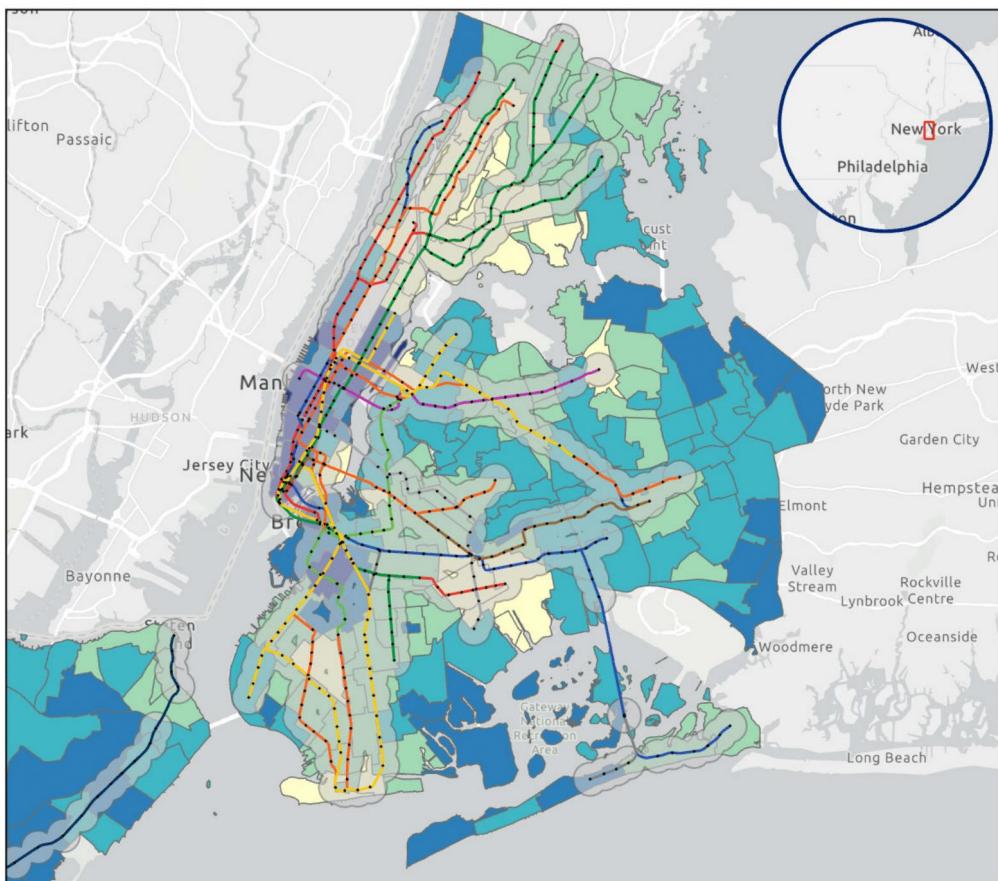
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Transit Deserts and Median Household Income in NYC

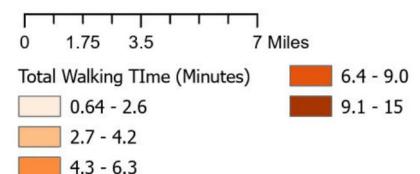
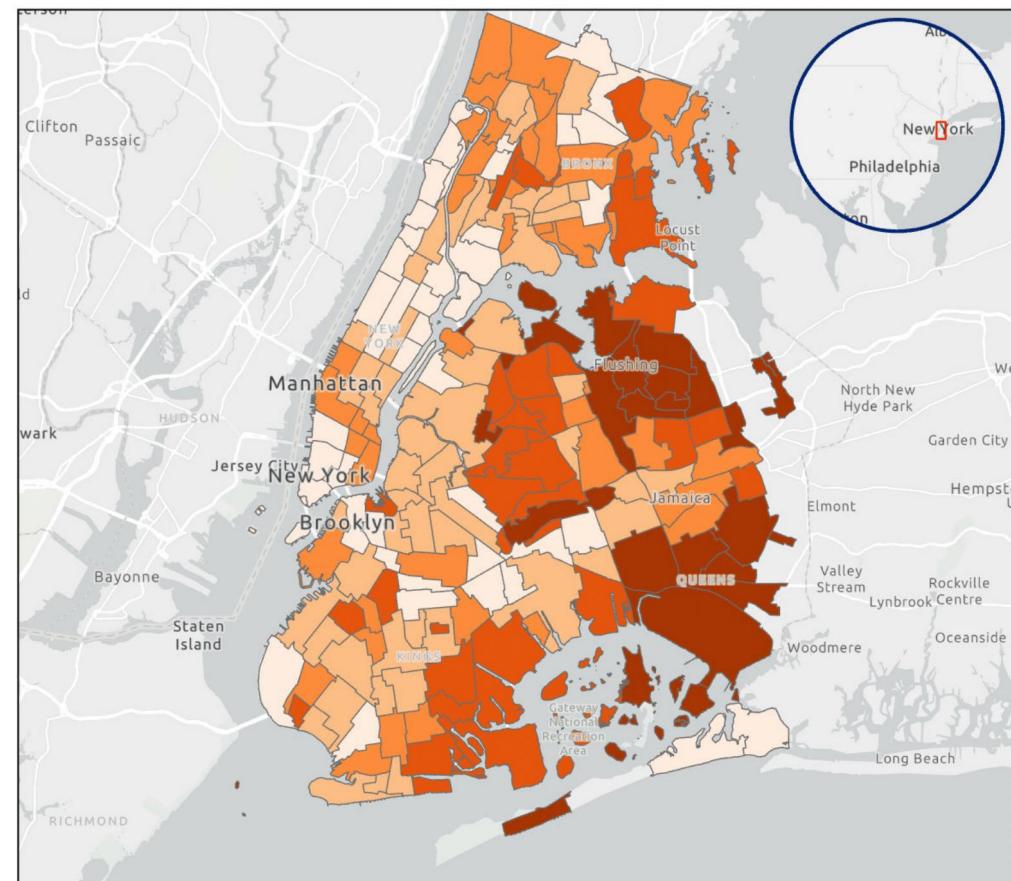
Transit Access and Median Household Income Across NYC NTAs



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Total Walking Time (To Nearest Subway Station) in NYC

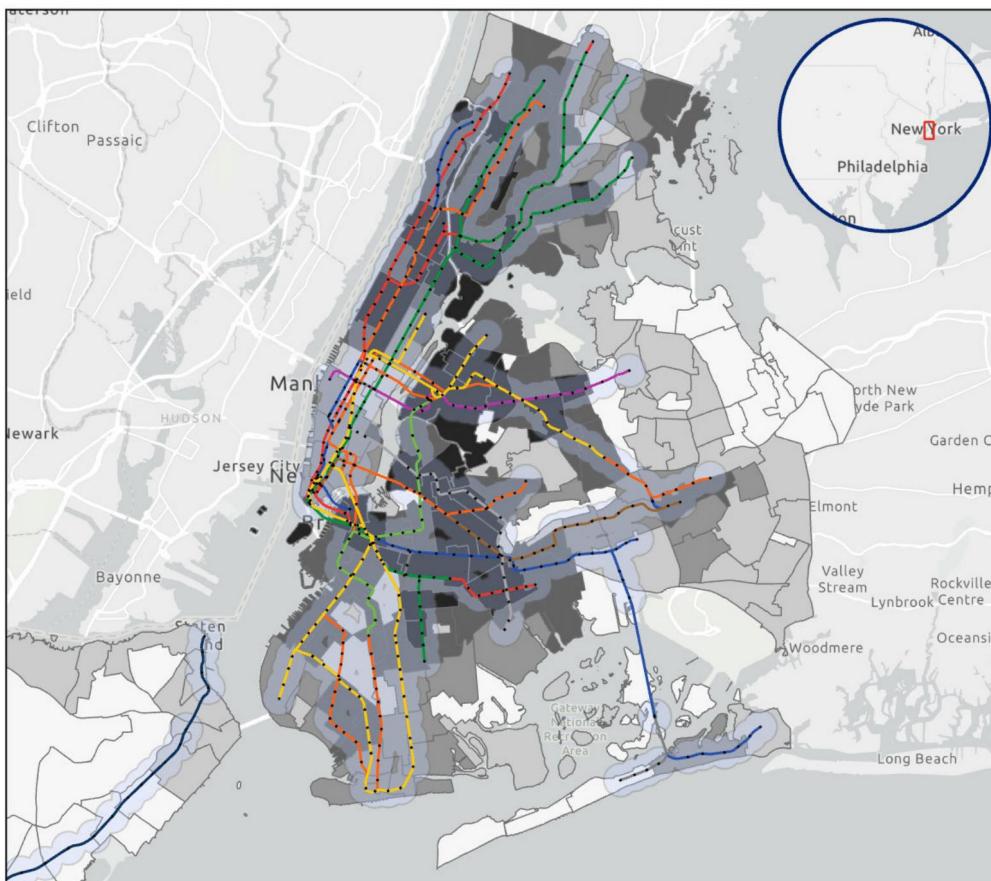
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Transit Deserts and Percentage Use of Public Transport in NYC

Transit Access and Percentage Use of Public Transport Across NYC NTAs



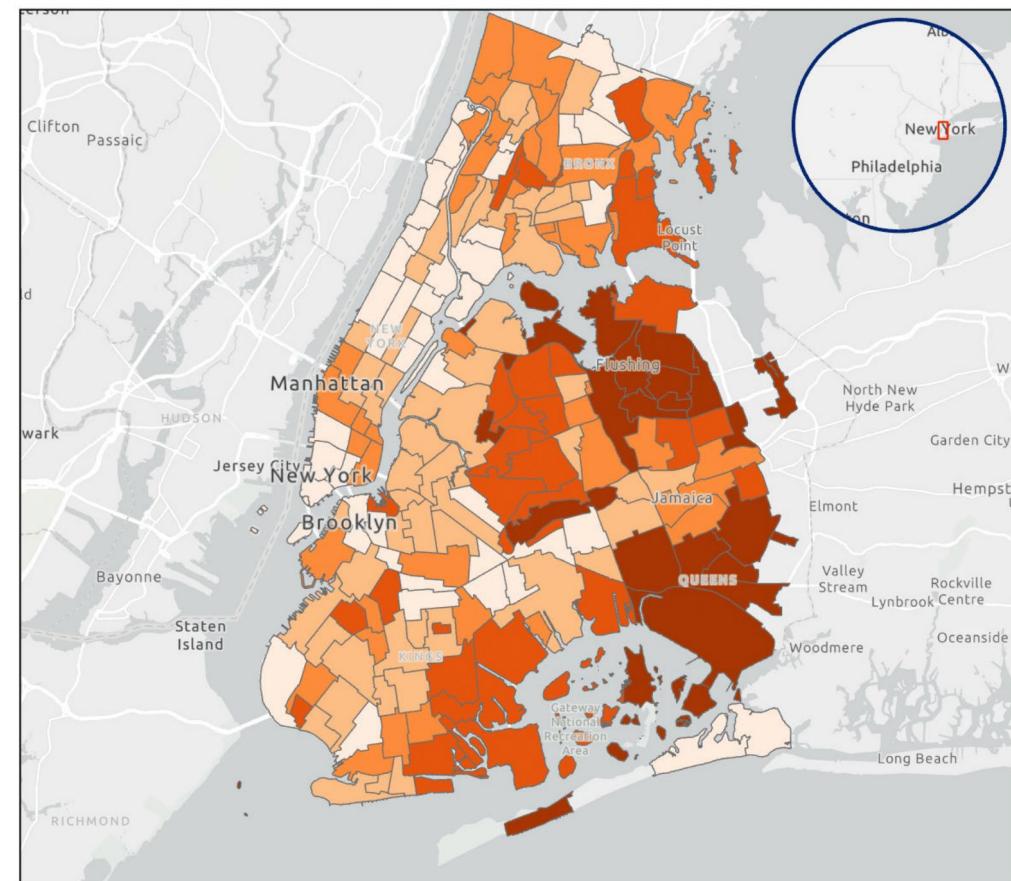
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Projection: NAD 1983 StatePlane New York Long Isl FIPS 3104 (US Feet)

Racial Disparities?

> 10 Minute Walking Time and > 50% of Specified Demographic

Black	White	Asian	Hispanic
South Jamaica	Steinway	Queensboro Hill	N/A
Baisley Park			
Springfield Gardens North			
Springfield Gardens South - Brookville			

Economic Disparities?

> 10 Minute Walking Time and below/above Median Yearly Household Income (\$79,713) – [US Census Bureau](#), (2023).

Below Median Household Income	Above Median Household Income
Auburndale	N/A
College Point	
Steinway	
South Ozone Park	
South Jamaica	
Jamaica	
Baisley Park	
Springfield Gardens North	
Springfield Gardens South – Brookville	

Conclusions

Transit Deserts Disproportionately Affect Majority-Black Neighbourhoods

Four NTAs have a majority black population and greater than 10 minutes walking time to the closest subway, much higher than any other observed racial group.

Lower-Income Neighbourhoods Are Significantly More Likely to Experience Poor Subway Access

With all 9 neighbourhoods with high walking times falling below the city's median household income (compared to 0 higher-income neighbourhoods), one can conclude that there is a clear economic disparity in transit accessibility.

Negative Economic Feedback Loop

"People need access to high-quality transportation in order to find and retain better jobs." (Jiao, 2018)

- Link between transit access, upward mobility and income inequality

Possible Solutions and Future Work

- Investing in infrastructure in transit deserts
- Increasing Citi Bike presence (at a discounted rate)
- Resurgence of the Dollar Van?
- Incorporating bus networks
- Including real-time travel data → assessing accessibility during peak hours
- Exploring access for New Yorkers with accessibility needs (e.g., elevator access)

Challenges

Finding Census Data

- Mismatch in corresponding years between datasets
 - Demographic and economic data often reflected different census estimates (2016, 2020, 2023)
 - Kept searching until I found a dataset that contained both demographic and economic data from the same year

Identifying and Excluding Non-Residential NTAs

- While Rikers Island, airports, and large parks or cemeteries do not have/have very low residential populations, they still appear in generated maps
- Make sure to exclude these NTAs in any analyses

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Thank You!