The 15-Minute-City Assessment in Queens, NYC

Kania Ulfa (kau2102@columbia.edu) | GIS Fall 24 – Final Project Memo

All images, diagrams, tables, and maps are by author, unless stated otherwise.

The Concept of 15-Minute-City

The 15-minute-city concept is an urban planning model which promote the idea that people should be able to access their daily necessities by foot or by bike within 15 minutes, as a solution to car dependency and improving quality of life in dense metropolitan areas (Crook, 2021). C40 Cities Climate Leadership Group (2021) describe the concept as "a 'human-scale' city composed of vibrant, people-friendly, 'complete' neighborhoods, connected by quality public transport and cycling infrastructure for the longer trips that residents want or need to make." The concept was popularized by Paris mayor Anne Hidalgo and Carlos Moreno through the Paris city plan. The same set of principles have dominated urban-planning paradigms for the past century and known as different terms such as 'complete neighbourhoods' (Portland, Oregon), 'Barrios Vitales' ('vital neighbourhoods',

Bogotá), '20-minute neighbourhoods' (Melbourne), and 'superblock' (Barcelona).

The key principles of the 15-minute-city concept are proximity, chrono-urbanism, social interaction and cohesion, sustainable urban design, integration of technology, and adaptation to new trends (Moreno, Allam, Chabaud, Gall, & Pratlong, 2021). The concept also has the framework of four dimensions: density, proximity, diversity, and digitalization (Moreno et al., 2021). The implementation of 15-minute-city as an urban intervention is considered to bring positive changes such as a boost to the local economy, a more equitable and inclusive city, a stronger sense of community, and a better health and wellbeing (C40 Cities Climate Leadership Group, 2021).

Accessibility to Facilities by 15-minute Walking

In the 15-Minute-City concept, walkability is the main focus, namely people can achieve daily necessities in just 15 minutes. According to Weng et al. (2019), walkability means the extent to which the built environment has positive influence on walking. A better neighborhood walkability may improve physical activity, active transportation, and metal health. There is no "one-size-fits-all" measurement for walkability, so it is inappropriate to apply same methods in measuring walkability from an urban environment to other completely different urban environments (Weng et al., 2019).

Adapting from a study conducted by Weng et al. (2019), this study limits the measurement of 15-Minute-City to a simpler context that is the accessibility to facilities/daily necessities by walking for 15 minutes (hereinafter referred to as 15-minute-walk accessibility to facilities). These facilities include transportation, education and childcare, health care, and human services, library and culture, park and plazas, and commercial. There are facilities that need to be reached within 5 minutes, 10 minutes, and 15 minutes as illustrated in the diagram on the side. The diagram is adapted from Weng et al. (2019) based on the availability of public data.
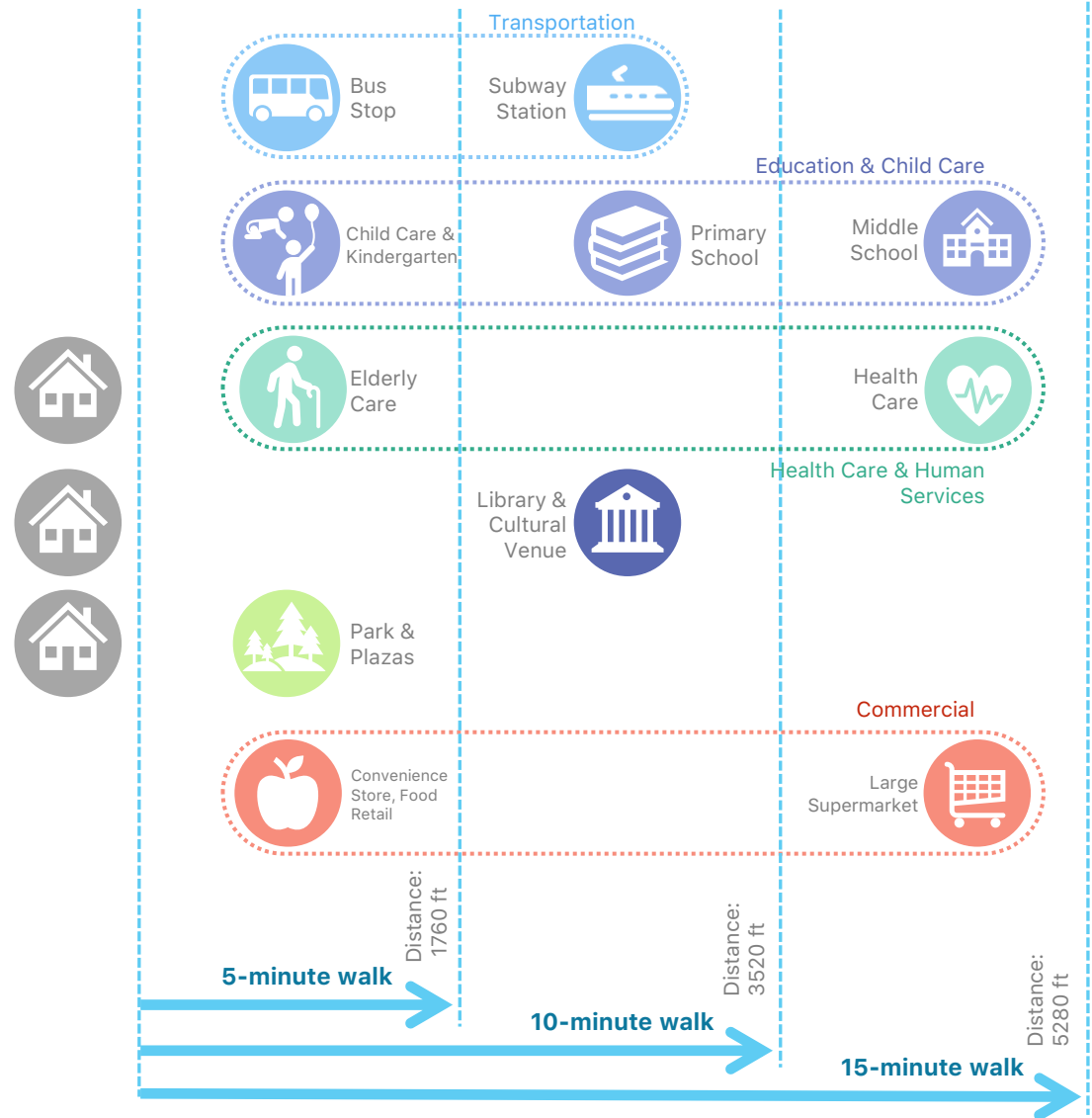
Adapted from Weng et al. (2019)

15-Minute-City in
NYC Context

In New York City context, the 15-minute-city concept has not yet become popular, but there is a recently approved master plan with a 15-minute-city concept in Astoria, Queens, known as Innovation QNS (Gjording, 2024). The master plan was approved in 2022, the construction will start in 2023, and the first building is estimated to be completed in 2025 (Dreith, 2022). The project spans five blocks, expanding the adjacent Kaufman Arts District (ODA Architecture, 2024). Planned and designed by ODA Architecture, Innovation QNS will transform the site that is currently occupied by large surface parking lots, underutilized industrial/commercial buildings, and vacant spaces into a new mixed use, consisting of housing and commercials (ODA Architecture, 2024).

The emergence of the new Innovation QNS master plan as one of the first 15-minute city concepts, amidst Astoria's rising popularity as a cool neighborhood and affordable housing option, opens up an opportunity to kickstart assessing NYC through the lens of this 15-minute-city concept. It is interesting to see whether NYC, represented in this study by Queens, inherently contains the 15-minute-walk accessibility principles or whether there is still room for improvement.

Images' source: ODA Architecture, 2024

The research questions in this study are the following.

1 What neighborhood(s) in Queens, NYC, meet the standard for a 15-minute-walk accessibility to facilities?

2 Does the 15-minute-walk accessibility to facilities cater the needs of each population group by age?

3 What is the spatial correlation between the 15-minute-walk accessibility to facilities and residential density in certain neighborhoods?

This study aims to measure whether Queens borough meets the standard for 15-minute-walk accessibility to facilities especially based on the needs of different population age groups (children, teenagers and young adults, adults, and elders). In addition, the influence of land use and residential density on 15-minute walkability is studied.
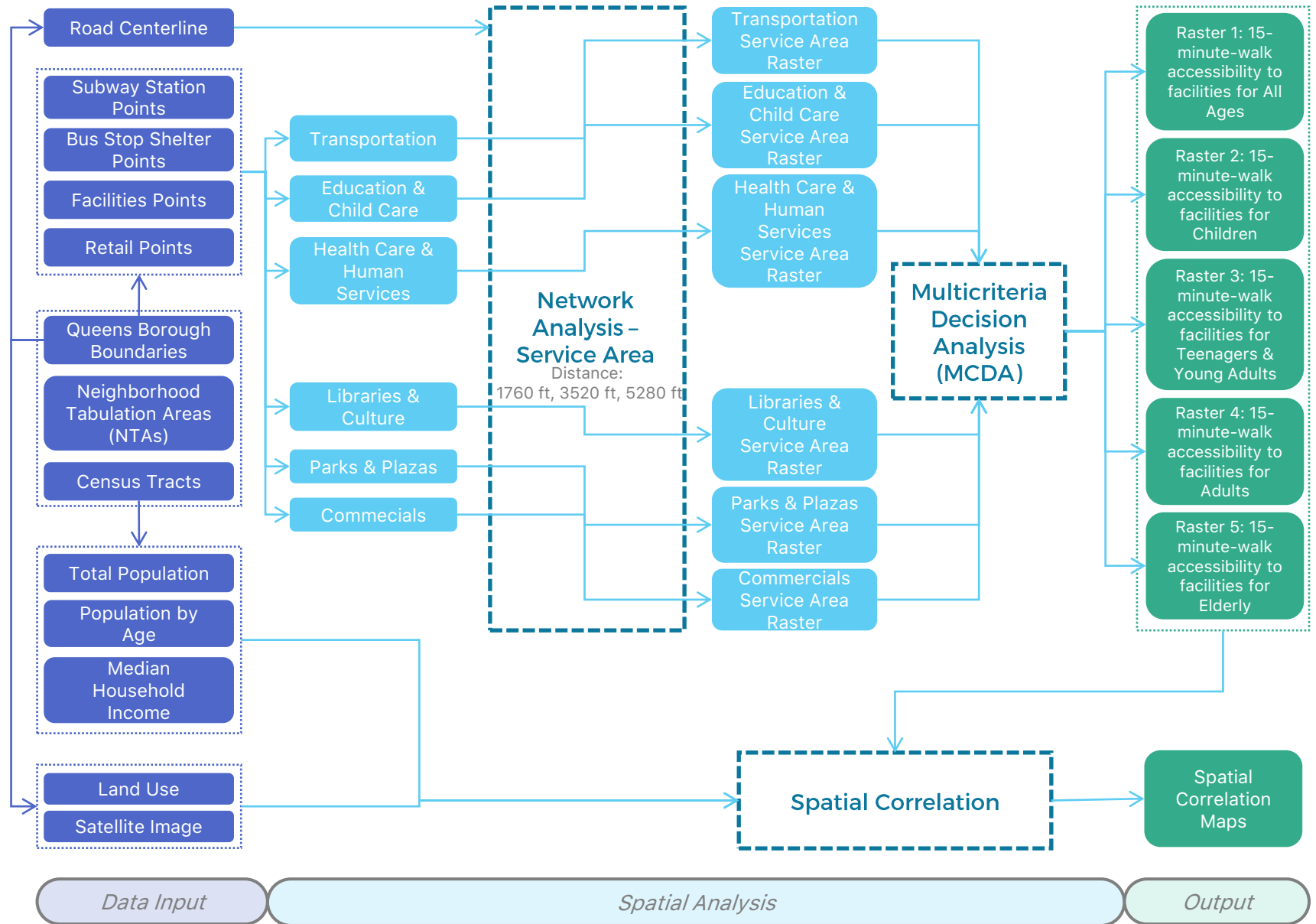

Data source: NYC Open Data

Queens Boundaries

Queens NTAs

N 0   1.5   3 Miles

0   2   4 Kilometers
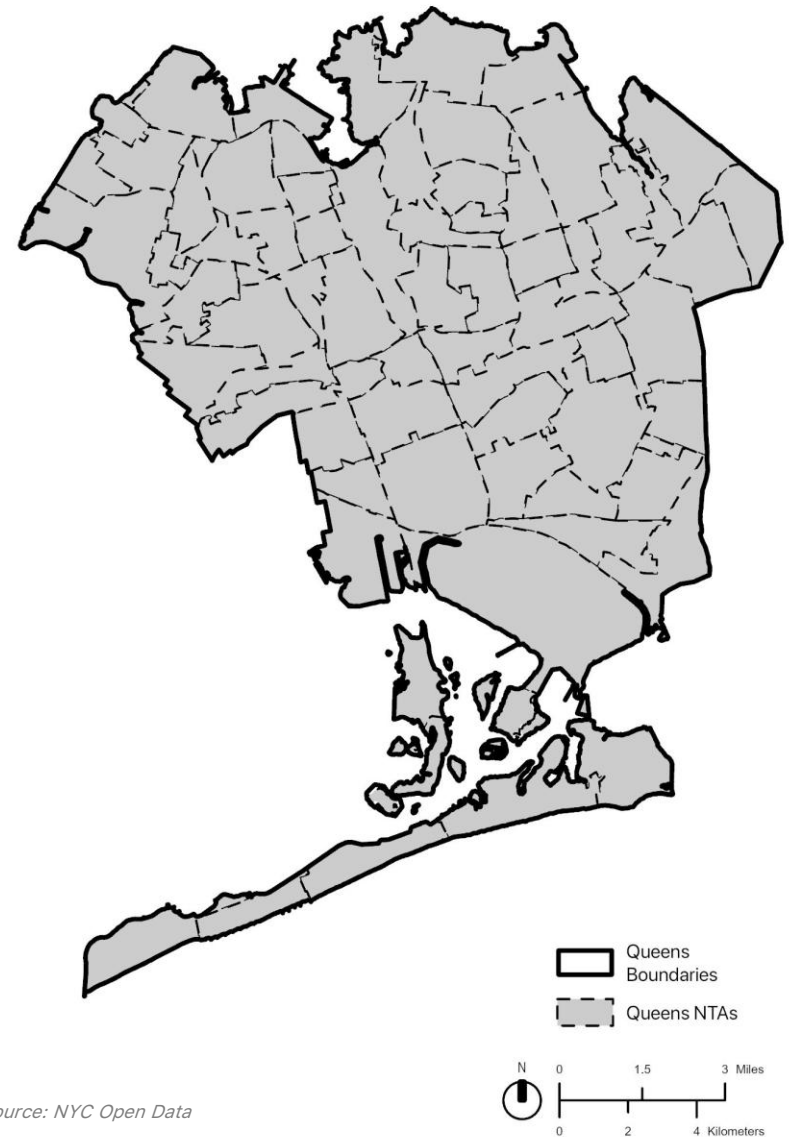
Data & Methodology

The data used in this study are divided into five main categories: road centerline, facility data points, boundaries, sociodemographic, and land use & satellite imageries. All data were obtained from publicly available sources. Facility data were grouped by category. Then, a network analysis (service area) was conducted using the road centerline for each facility category. The results of the service area network analysis became the material for Multicriteria Decision Analysis (MCDA) to determine the 15-minute-walk accessibility to facilities score based on various age groups. The scores are spatially analyzed in correlation with sociodemographic, land use, and satellite imageries data.

DATA	SOURCE(S)
Road Centerline	NYC Open Data
Subway Station Points	NYC Open Data
Bus Stop Shelter Points	NYC Open Data
Facilities Points	NYC Open Data
Retail Points	New York State Open Data
Queens Borough Boundaries	NYC Open Data
Neighborhood Tabulation Areas (NTAs)	NYC Open Data
Census Tracts	TIGER
Total Population	American Community Survey (ACS)
Population by Age	American Community Survey (ACS)
Median Household Income	American Community Survey (ACS)
Land Use	NYC Open Data
Satellite Image	Google Maps, NY Stat & Maxar in ArcGIS Pro
Street Views	Google Maps, Site Visit

Data & Methodology

Data Input:
- Road Centerline
- Subway Station Points
- Bus Stop Shelter Points
- Facilities Points
- Retail Points
- Queens Borough Boundaries
- Neighborhood Tabulation Areas (NTAs)
- Census Tracts
- Total Population
- Population by Age
- Median Household Income
- Land Use
- Satellite Image

Spatial Analysis:
- Transportation
- Education & Child Care
- Health Care & Human Services
- Libraries & Culture
- Parks & Plazas
- Commecials

Network Analysis – Service Area
Distance: 1760 ft, 3520 ft, 5280 ft

- Transportation Service Area Raster
- Education & Child Care Service Area Raster
- Health Care & Human Services Service Area Raster
- Libraries & Culture Service Area Raster
- Parks & Plazas Service Area Raster
- Commercials Service Area Raster

Multicriteria Decision Analysis (MCDA)

Spatial Correlation

Output:
- Raster 1: 15-minute-walk accessibility to facilities for All Ages
- Raster 2: 15-minute-walk accessibility to facilities for Children
- Raster 3: 15-minute-walk accessibility to facilities for Teenagers & Young Adults
- Raster 4: 15-minute-walk accessibility to facilities for Adults
- Raster 5: 15-minute-walk accessibility to facilities for Elderly
- Spatial Correlation Maps
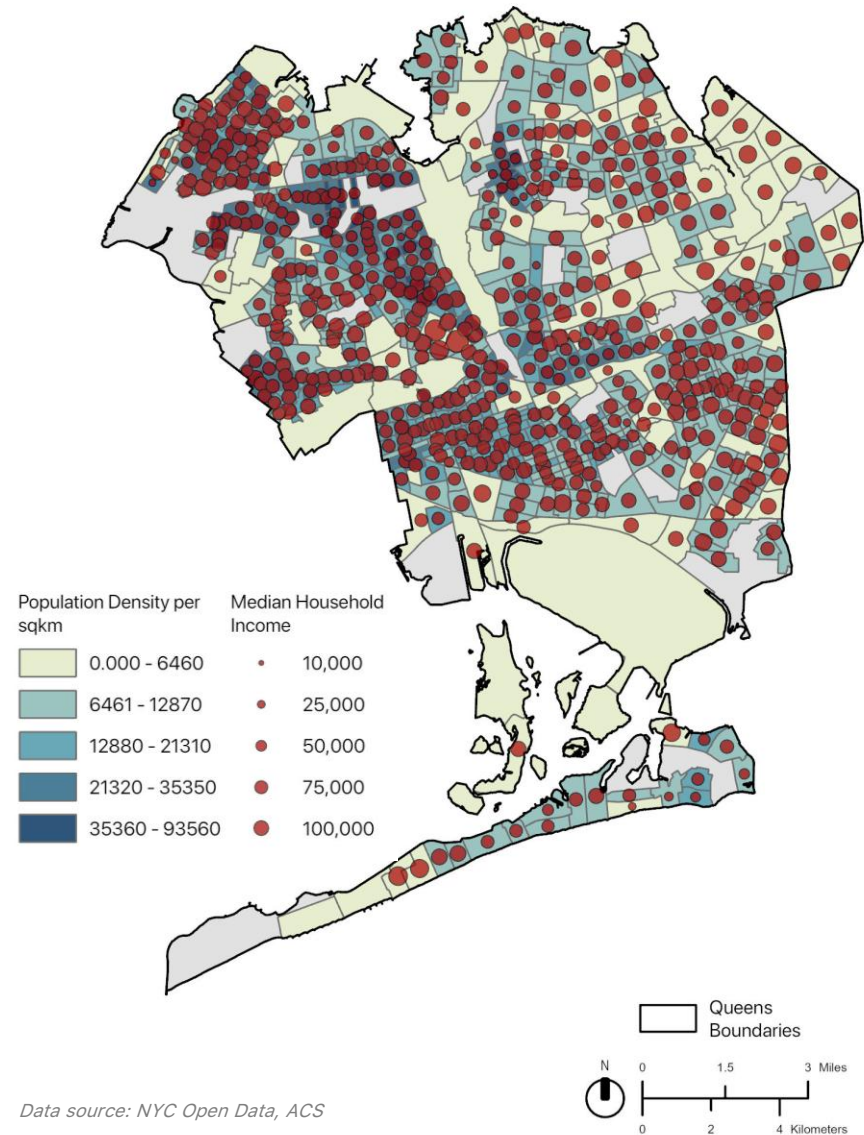
Data Input | *Spatial Analysis* | *Output*
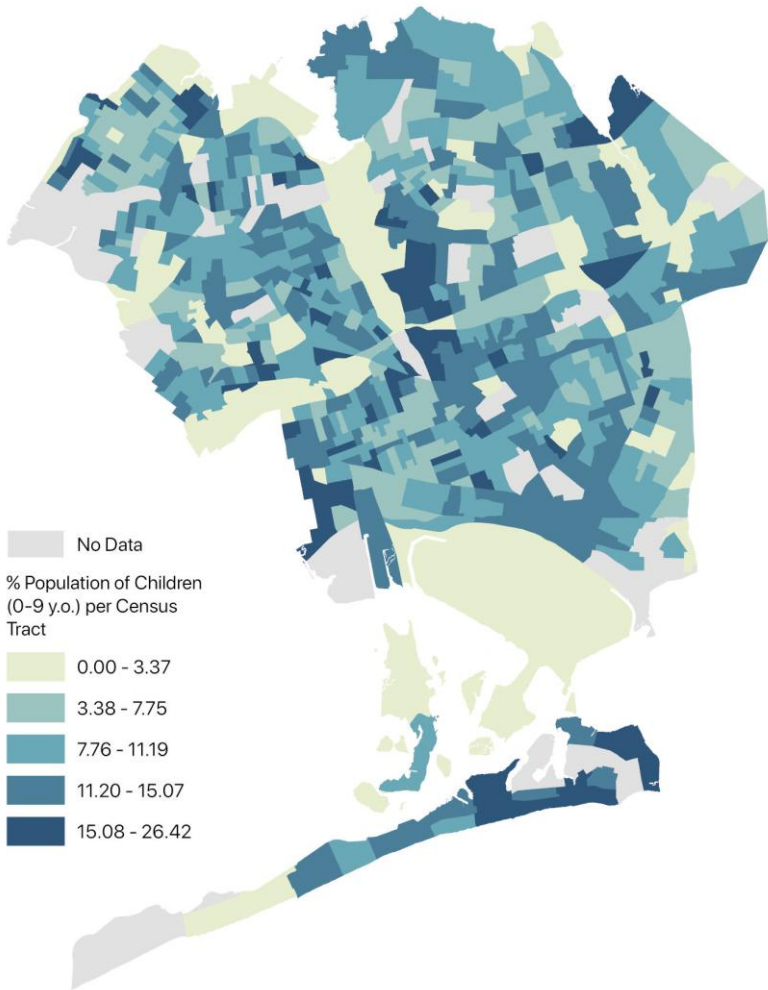
Demographics in Queens

Queens, one of the five boroughs in NYC, is known for its population diversity. Queens has a broad economic spectrum, with residents working in industries such as healthcare, education, technology, small businesses, and service sectors. Some of the notable neighborhoods are: Astoria, Flushing, Jackson Heights, and Jamaica.

The map below shows population density and median household income per census tract. Population density tends to be dense in the western part of Queens, closer to Manhattan and Brooklyn. Median household income varies significantly between census tracts, with some neighborhoods being particularly prominent, such as Forest Hills. There is no significant correlation between population density and median household income. There are some census tracts with low population density but high median household income, and vice versa.
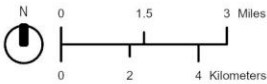
There are population percentage maps by age group on the following two pages. These maps are intended to see the distribution of population by age group (children, teenagers & young adults, adults, and elderly) which will then be correlated with the MCDA results. The children population tends to be dense in central and southern Queens. The adult's population is densest in the northwest and quite dense in the south. The elderly population tends to be denser towards the northeast of Queens, away from Manhattan and Brooklyn.
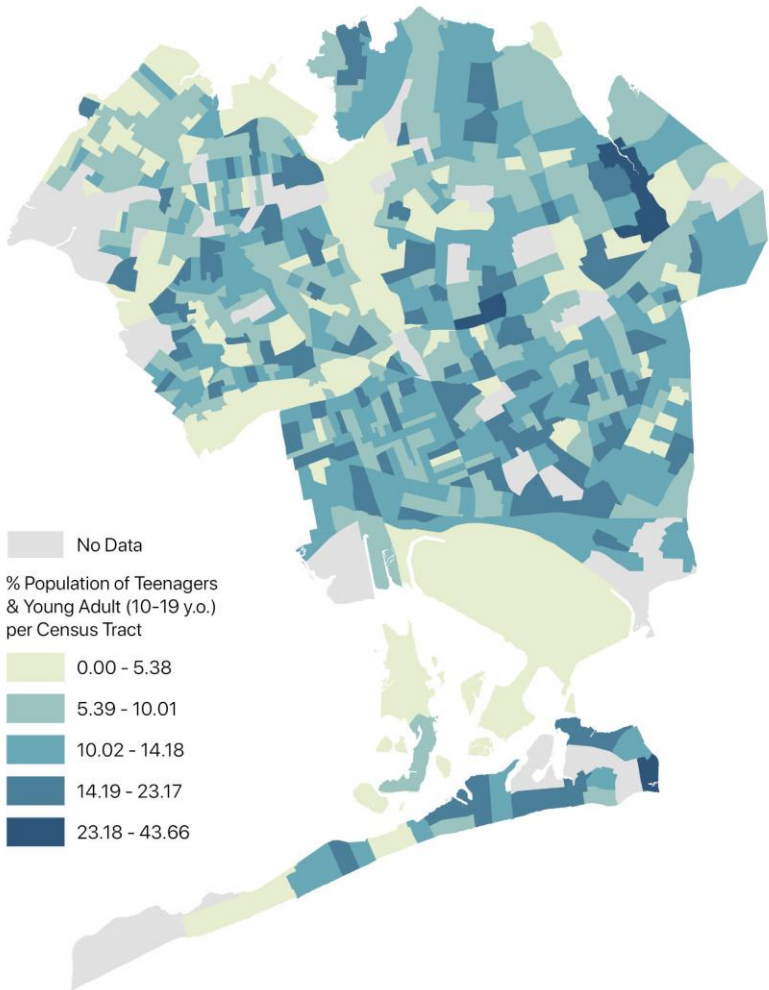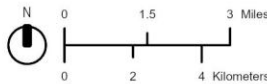

Population Density per sqkm

	0.000 - 6460
	6461 - 12870
	12880 - 21310
	21320 - 35350
	35360 - 93560

Median Household Income

- 10,000
- 25,000
- 50,000
- 75,000
- 100,000

Queens Boundaries

Data source: NYC Open Data, ACS

Children (0-9 y.o.) Population

Teenagers & Young Adults (10-19 y.o.) Population

No Data

% Population of Children
(0-9 y.o.) per Census
Tract

0.00 - 3.37

3.38 - 7.75

7.76 - 11.19

11.20 - 15.07

15.08 - 26.42

No Data

% Population of Teenagers
& Young Adult (10-19 y.o.)
per Census Tract

0.00 - 5.38

5.39 - 10.01

10.02 - 14.18

14.19 - 23.17

23.18 - 43.66

Data source: NYC Open Data, ACS

N
0   1.5   3 Miles

0   2   4 Kilometers

Data source: NYC Open Data, ACS

N
0   1.5   3 Miles

0   2   4 Kilometers

Adult (20-64 y.o.) Population
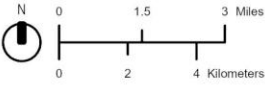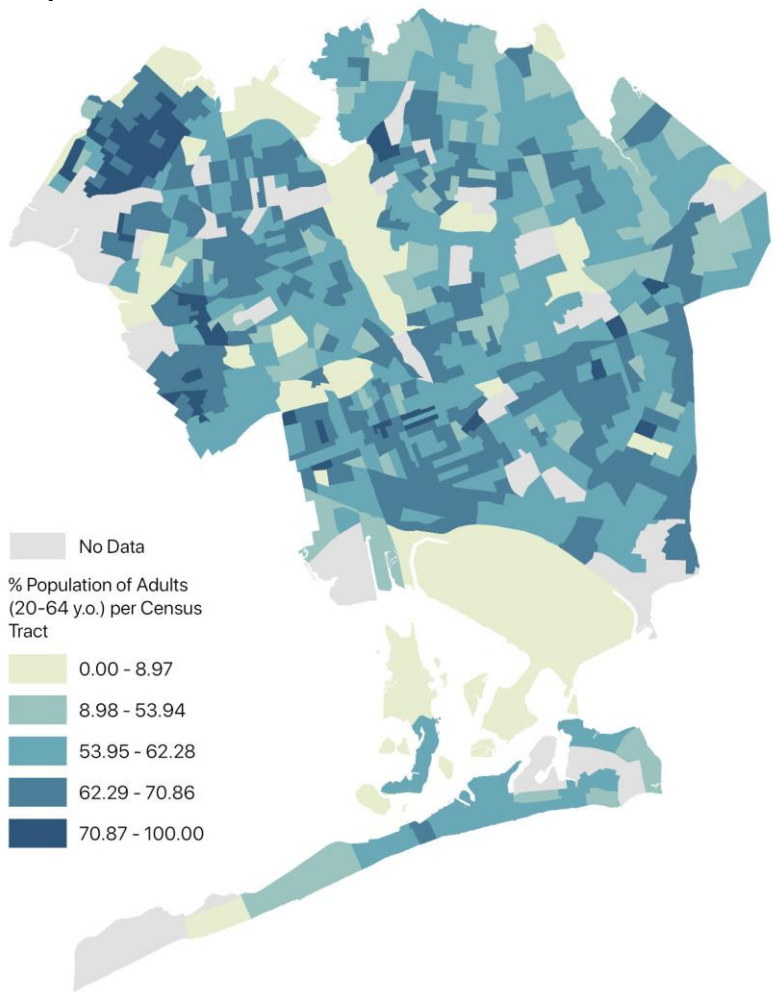
Senior (65 y.o. and Above) Population

No Data

% Population of Adults (20-64 y.o.) per Census Tract

0.00 - 8.97

8.98 - 53.94

53.95 - 62.28

62.29 - 70.86

70.87 - 100.00

N 0   1.5   3 Miles

0   2   4 Kilometers

No Data

% Population of Seniors (65 y.o. and Above) per Census Tract

0.00 - 7.83

7.84 - 15.76

15.77 - 23.55

23.56 - 40.74

40.75 - 91.03

N 0   1.5   3 Miles

0   2   4 Kilometers
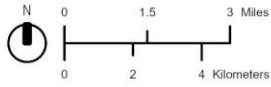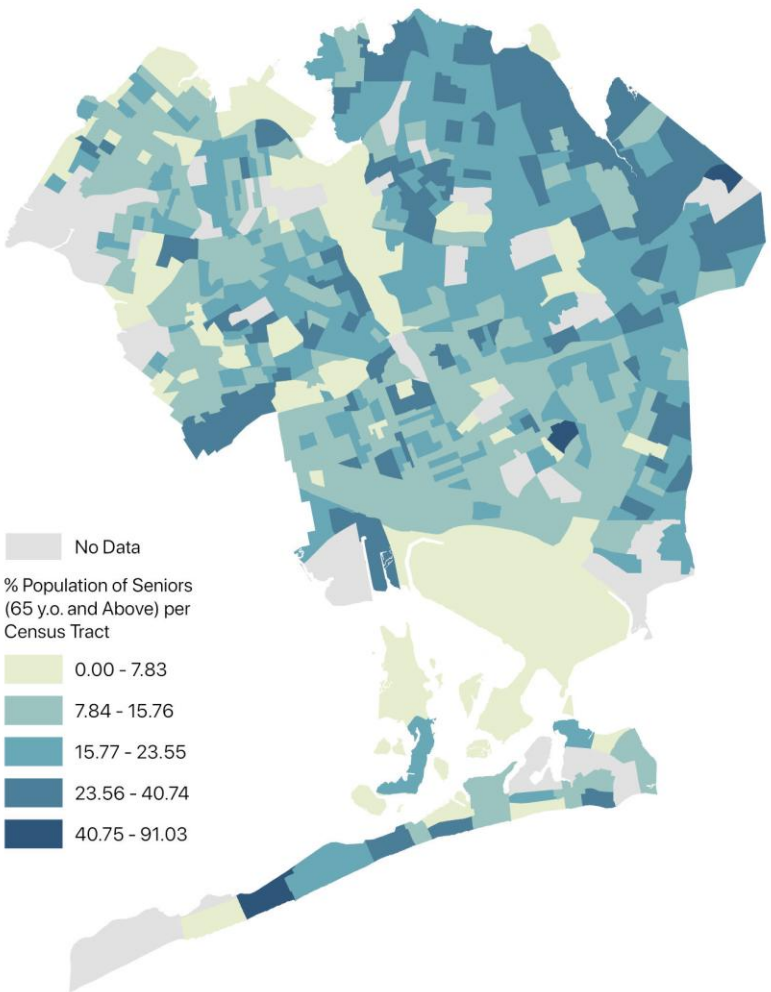
Land Use in Queens

To understand the built environment in Queens, the land use in the borough is mapped on the map below. Land uses on the map are categorized into low-density residential 1, low-density residential 2, moderate-to-high-density residential, commercial, parks, and manufacture. Most of Queens is residential, with varying densities. Low-density residential 1 generally consists of detached single-family housing. Low-density residential 2 generally consists of single-family, two-family, and multi-family housing. Moderate-to-high-density residential consists of vertical housing from mid-rise to high-rise. From the map, it can be seen that residential density tends to be concentrated in the west of Queens. The further east (the further away from Manhattan and Brooklyn), the housing density decreases. Queens also has several manufacturing areas. The most notable is that there are two airports, John F. Kennedy International Airport (JFK) and LaGuardia Airport (LGA), located in Queens and both occupy very large areas of land, especially JFK.

Land Use Categories

- Low-density residential 1 (R1-R3)
- Low-density residential 2 (R4-R5)
- Moderate-to-high-density residential (R6-R10)
- Commercial
- Parks
- Manufacture
- Airports

Queens Boundaries

Queens NTAs
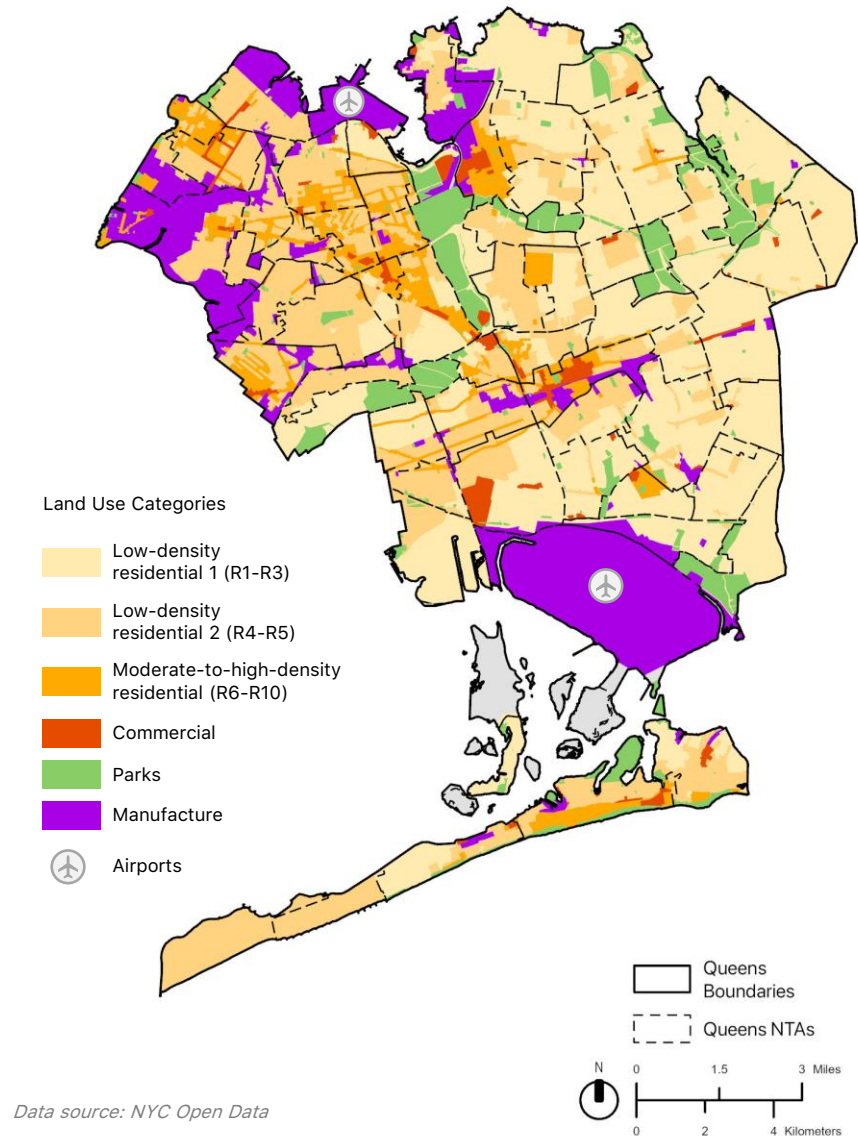
Data source: NYC Open Data
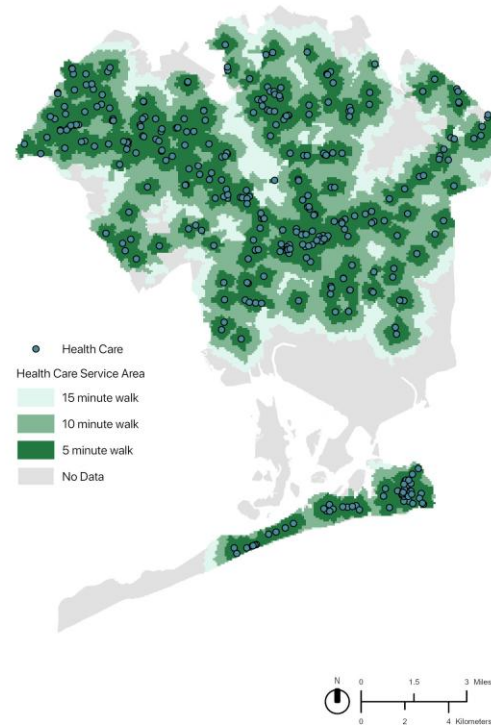
Network Analysis – Service Area

Network analysis were conducted to assess the service areas of each facility category. The distance buffer for the service area are 1760, 3520, and 5280 feet – according to 5, 10, and 15-minute walking distance. The network model was built by road centerline and facilities' data points.
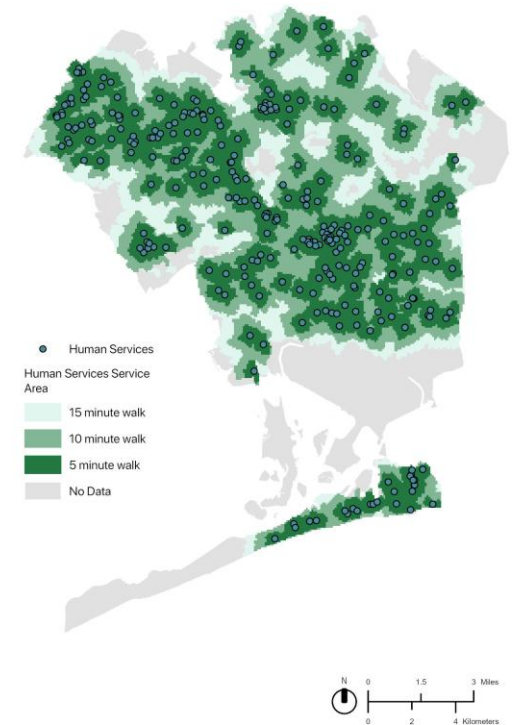

Road \Centerline

Queens Boundaries
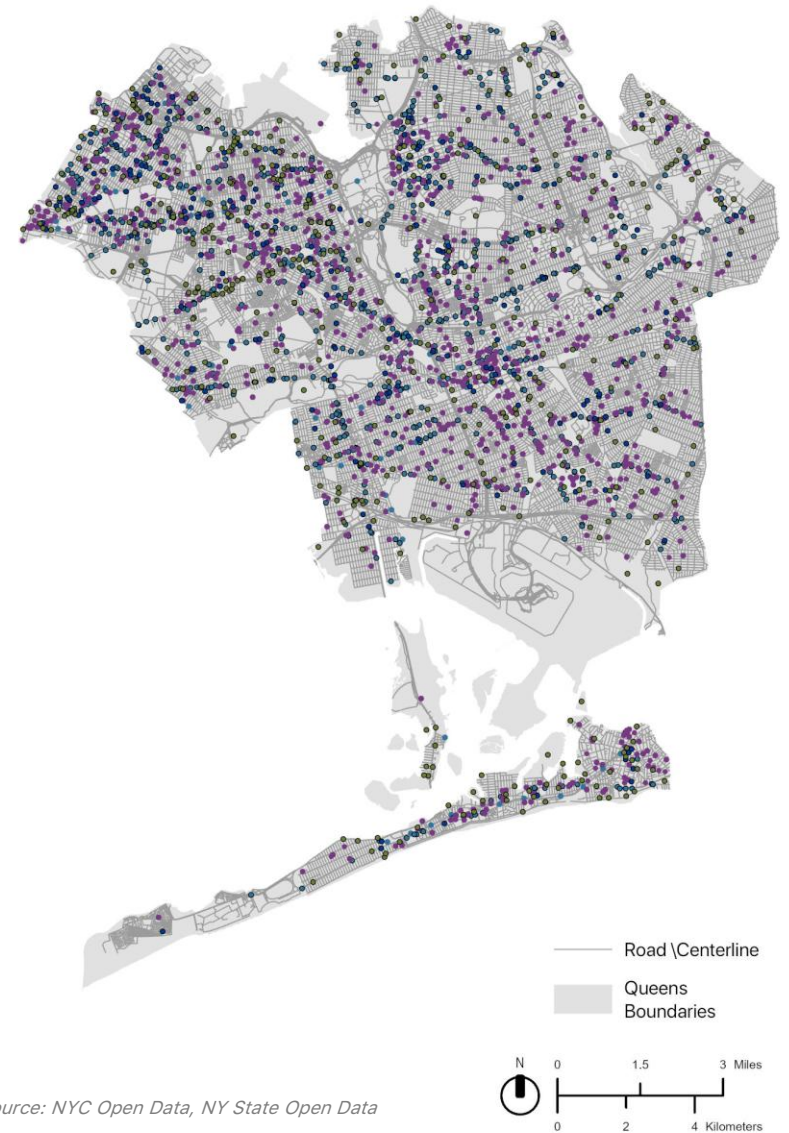
Data source: NYC Open Data, NY State Open Data

Service Area Network Analysis Results

The results of the network analysis service area vary according to the facility category. Some facility categories show an even distribution of service areas and serve most of Queens, such as commercial, bus stop shelter, education, and parks and plazas. Some facility categories serve parts of Queens but are less evenly distributed, such as health care, human services, libraries, and cultural venues. Meanwhile, subway stations only serve part of Queens, from the west to the center. Many areas are not served by the subway.
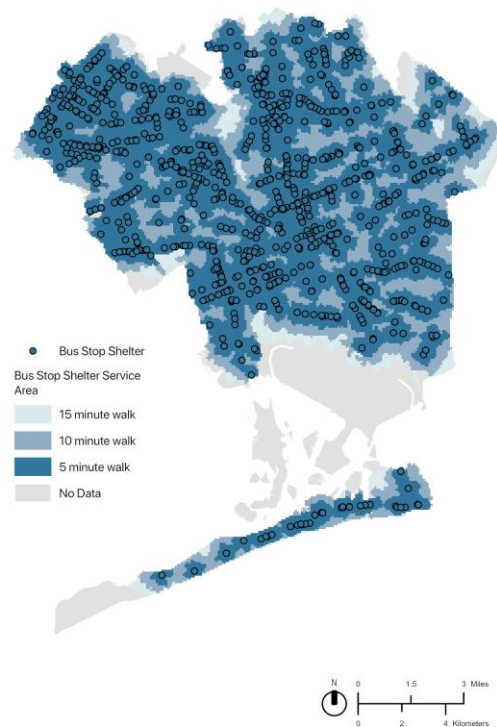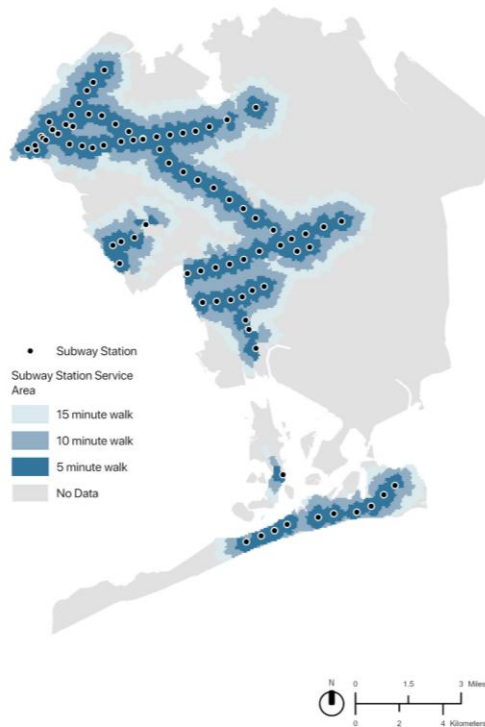

Health Care

- Health Care

Health Care Service Area
- 15 minute walk
- 10 minute walk
- 5 minute walk
- No Data

Human Services

- Human Services

Human Services Service Area
- 15 minute walk
- 10 minute walk
- 5 minute walk
- No Data

Service Area Network Analysis Results

Bus Stop Shelter

- Bus Stop Shelter

Bus Stop Shelter Service Area
- 15 minute walk
- 10 minute walk
- 5 minute walk
- No Data

Subway Station

- Subway Station

Subway Station Service Area
- 15 minute walk
- 10 minute walk
- 5 minute walk
- No Data

Commercial

- Commercials

Commercial Service Area
- 15 minute walk
- 10 minute walk
- 5 minute walk
- No Data

Data source: NYC Open Data, NY State Open Data
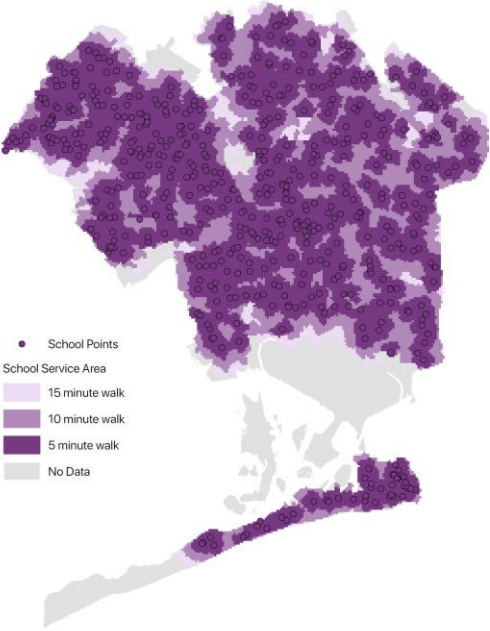
Service Area Network Analysis Results

Schools

Legend:
- School Points
- School Service Area
  - 15 minute walk
  - 10 minute walk
  - 5 minute walk
  - No Data

Day Care & Pre-Kindergarten

Legend:
- Day Care & Pre-Kindergarten
- Day Care & Pre-Kindergarten Service Area
  - 15 minute walk
  - 10 minute walk
  - 5 minute walk
  - No Data

Child Services

Legend:
- Child Services
- Child Services Service Area
  - 15 minute walk
  - 10 minute walk
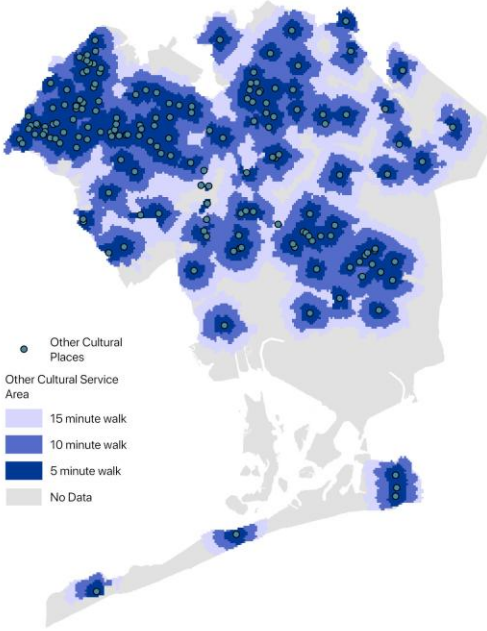 - 5 minute walk
  - No Data

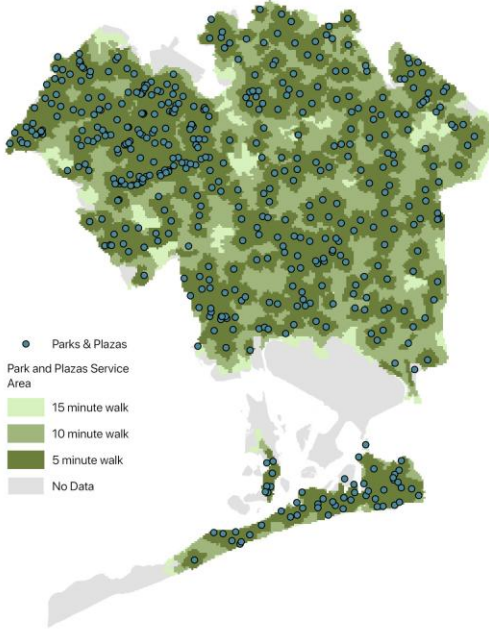*Data source: NYC Open Data, NY State Open Data*

Service Area Network Analysis Results

Libraries

Other Cultural Venues

Parks & Plazas

Data source: NYC Open Data, NY State Open Data

MCDA Category and Weight Distribution

The results of the service area network analysis are used as material for conducting MCDA. In this study, five different MCDAs were conducted, which are the MCDAs for the population (1) all ages, (2) children, (3) teenagers and young adults, (4) adults, and (5) elderly. The weight distribution in each MCDA is adjusted to the needs of each age group, adapted from the study by Weng et al. (2019). For example, for children, the education and culture categories are emphasized more, while for the elderly, the health care and human services categories are emphasized more. The weight distribution of the transportation and parks & plazas categories is made generally consistent for all age groups because their importance is also consistent for all age groups.

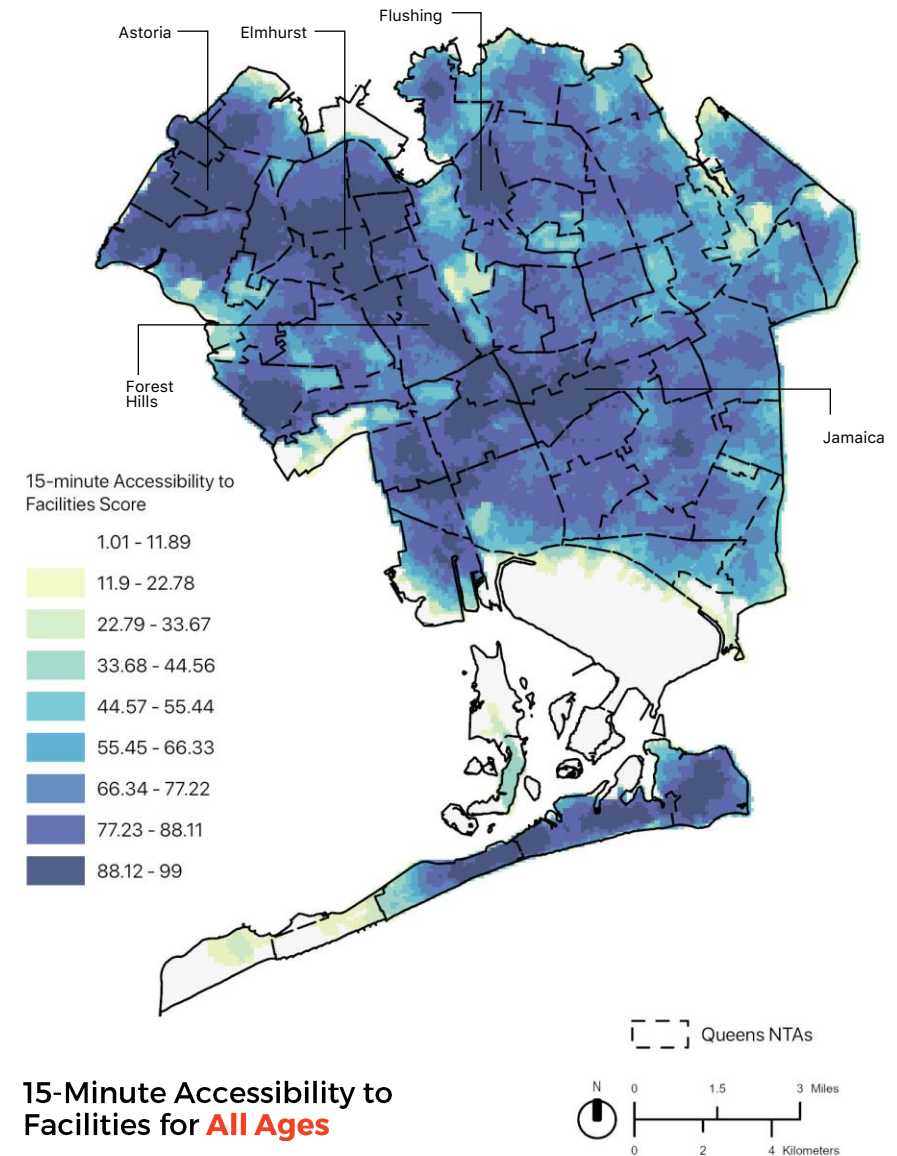| Facilities		Overall (All Ages)	Children (0-9 y.o.)	Teen – Young Adults (10-19 y.o.)	Adults (20-64 y.o.)	Elderly (65 y.o. and Above)
Transportation	Bus Stop Shelter	15%	12%	15%	15%	15%
	Subway Stations	10%	5%	10%	10%	10%
Education & Child Care	Schools (K-12)	10%	15%	15%	7%	5%
	Child Services	6%	10%	6%	8%	5%
	Day Care & Pre-Kindergarten	6%	10%	2%	8%	8%
Health Care & Human Services	Health Care	10%	10%	8%	8%	12%
	Human Services	4%	-	4%	6%	9%
Libraries & Culture	Libraries	8%	10%	10%	10%	8%
	Other Cultural Places	4%	8%	8%	4%	4%
Park & Plazas	Park & Plazas	12%	12%	12%	12%	12%
Commercials	Convenience Store, Culinary Business	15%	8%	10%	12%	12%
Total		100%	100%	100%	100%	100%

Adapted from Weng et al. (2019)

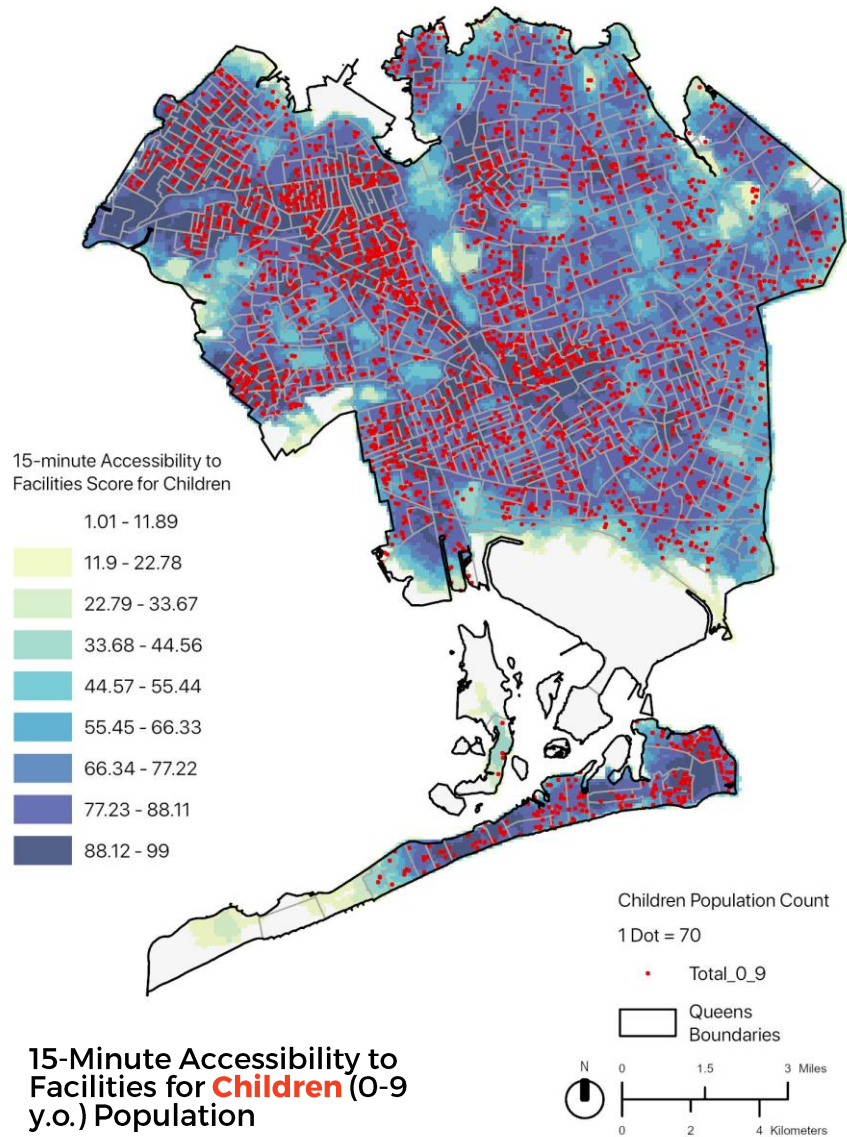# MCDA Results:
15-minute-walk Accessibility to Facilities

Based on the MCDAs results, accessibility to amenities by 15-minute-walk scores in Queen are generally quite good. This generally good result may be surprising for some, but it is supported by the distribution of various facilities and the results of the service area network analysis. Neighborhoods that get high scores mean they have complete facilities based on the categories included in this study.

There are a few neighborhoods that achieve optimal scores, especially those served by subway stations. Neighborhoods served by subways tend to have denser amenities and denser population. Neighborhoods that are not served by subways tend to have lower scores, especially closer to the borough's periphery. Therefore, neighborhoods with high scores are concentrated in the western part of Queens. Neighborhoods in the middle, such as Flushing and Jamaica, score high because the farthest subway stations are located in those neighborhoods. Some of the neighborhoods with optimum scores are Old Astoria, Astoria, Queensbridge-Ravenswood-Long Island City, Hunters Point-Sunnyside-West Maspeth, Woodside, Jackson Heights, North Corona, Elmhurst, Rego Park, Ridgewood, Forest Hills, Flushing, Jamaica, and Woodhaven.
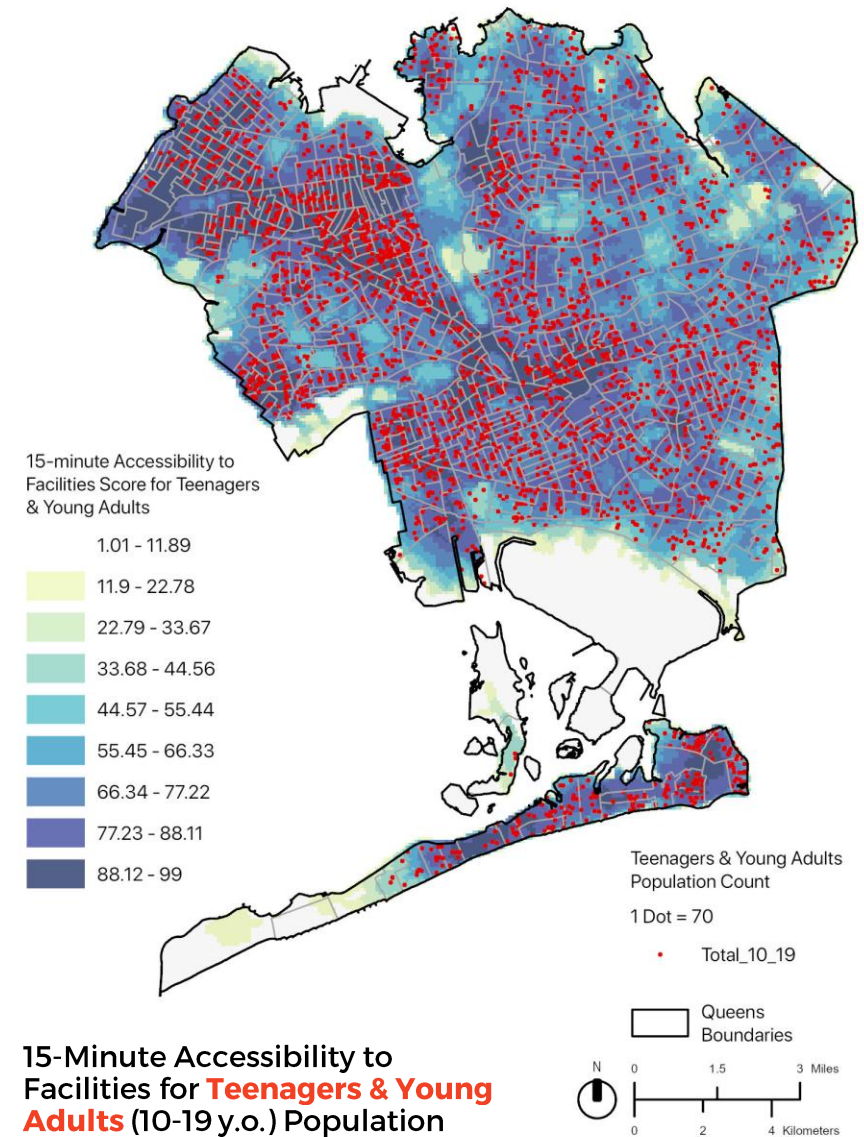
The following two pages contain the MCDA results for each age group. The MCDA results are superimposed with population density by age group. The maps show areas that have pedestrian accessibility scores and their relationship to population density for each age group. There are areas that have good scores in densely populated areas, but there are also areas that have poor accessibility scores in densely populated areas.
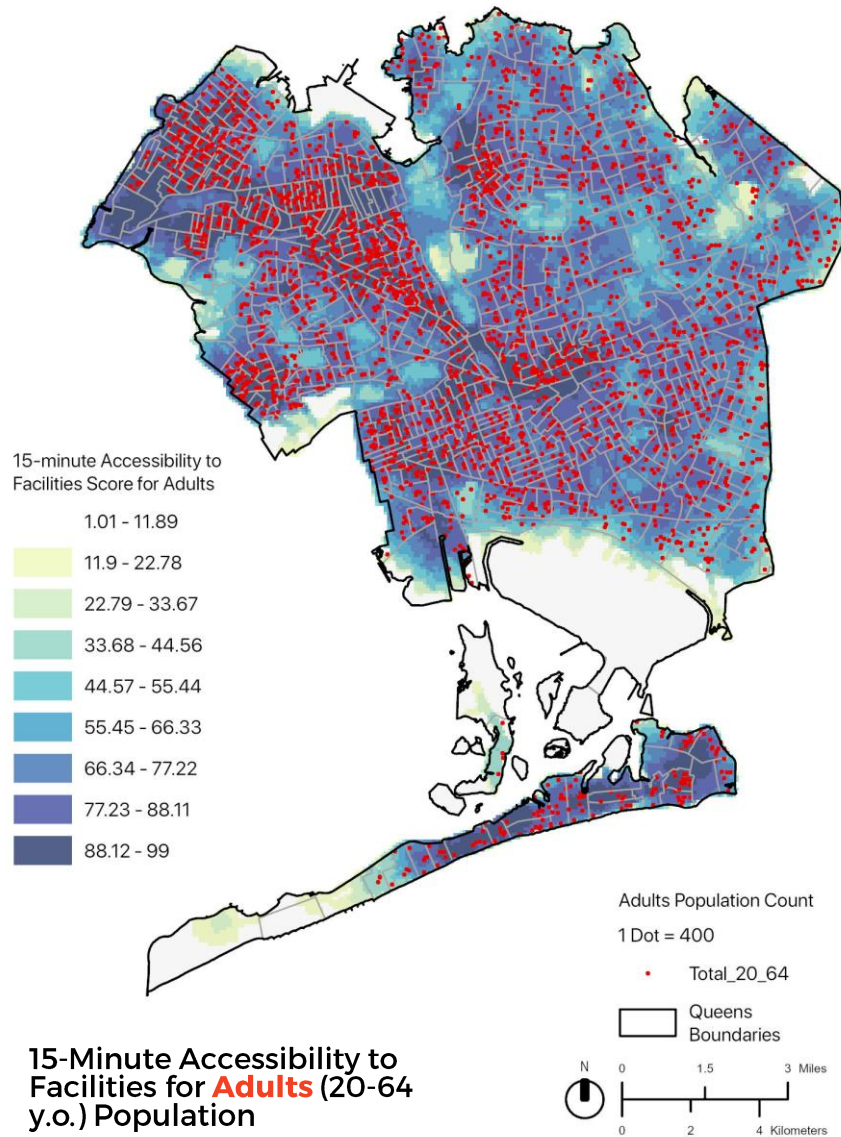

Data source: NYC Open Data, NY State Open Data

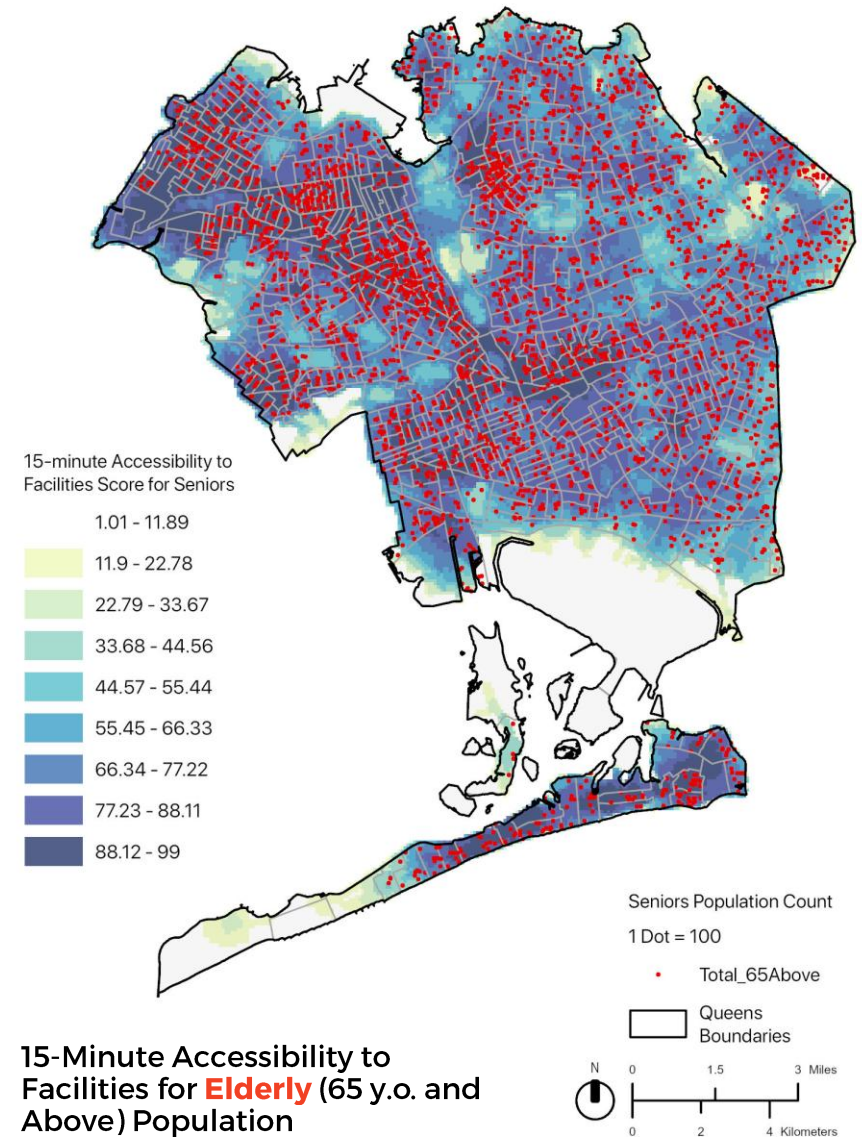15-minute Accessibility to Facilities Score

- 1.01 - 11.89
- 11.9 - 22.78
- 22.79 - 33.67
- 33.68 - 44.56
- 44.57 - 55.44
- 55.45 - 66.33
- 66.34 - 77.22
- 77.23 - 88.11
- 88.12 - 99

Queens NTAs

15-Minute Accessibility to Facilities for All Ages

15-minute Accessibility to
Facilities Score for Children

	1.01 - 11.89
	11.9 - 22.78
	22.79 - 33.67
	33.68 - 44.56
	44.57 - 55.44
	55.45 - 66.33
	66.34 - 77.22
	77.23 - 88.11
	88.12 - 99

Children Population Count

1 Dot = 70

• Total_0_9

☐ Queens Boundaries

N   0   1.5   3 Miles
    0   2   4 Kilometers

15-Minute Accessibility to Facilities for Children (0-9 y.o.) Population

15-minute Accessibility to
Facilities Score for Teenagers
& Young Adults

	1.01 - 11.89
	11.9 - 22.78
	22.79 - 33.67
	33.68 - 44.56
	44.57 - 55.44
	55.45 - 66.33
	66.34 - 77.22
	77.23 - 88.11
	88.12 - 99

Teenagers & Young Adults
Population Count

1 Dot = 70

• Total_10_19

☐ Queens Boundaries

N   0   1.5   3 Miles
    0   2   4 Kilometers

15-Minute Accessibility to Facilities for Teenagers & Young Adults (10-19 y.o.) Population

15-minute Accessibility to
Facilities Score for Adults

1.01 - 11.89

11.9 - 22.78

22.79 - 33.67

33.68 - 44.56

44.57 - 55.44

55.45 - 66.33

66.34 - 77.22

77.23 - 88.11

88.12 - 99

Adults Population Count

1 Dot = 400

Total_20_64

Queens
Boundaries

N   0   1.5   3 Miles

0   2   4 Kilometers

**15-Minute Accessibility to
Facilities for Adults (20-64
y.o.) Population**

15-minute Accessibility to
Facilities Score for Seniors

1.01 - 11.89

11.9 - 22.78

22.79 - 33.67

33.68 - 44.56

44.57 - 55.44

55.45 - 66.33

66.34 - 77.22

77.23 - 88.11

88.12 - 99

Seniors Population Count

1 Dot = 100

Total_65Above

Queens
Boundaries

N   0   1.5   3 Miles

0   2   4 Kilometers

**15-Minute Accessibility to
Facilities for Elderly (65 y.o. and
Above) Population**

Ft. Totten-Bay Terrace - Clearview

Douglas Manor – Douglaston – Little Neck

Oakland Gardens

Rosedale

Population density of all age groups is concentrated in the western area of Queens, correlating with areas that get high 15-minute-walk accessibility to facilities scores. The population in this area is already well served by various facilities. Because the accessibility score tends to decrease towards the east and approaches the periphery of Queens, there are several neighborhoods with residents who are not well served in the area. For example, for the elderly population as shown in the map on the side, several neighborhoods have a fairly high elderly population but have poor accessibility scores.
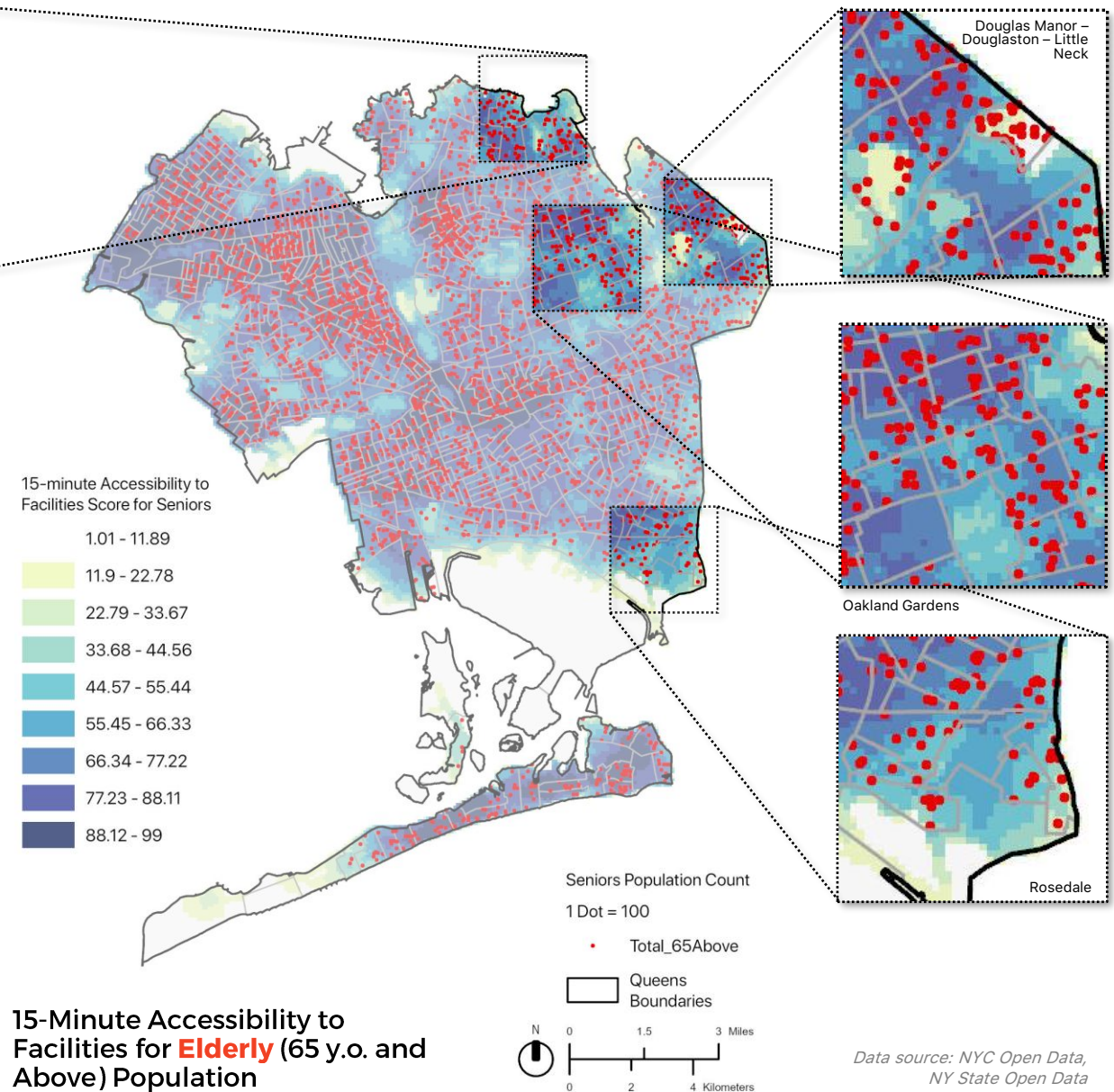
15-minute Accessibility to Facilities Score for Seniors

- 1.01 - 11.89
- 11.9 - 22.78
- 22.79 - 33.67
- 33.68 - 44.56
- 44.57 - 55.44
- 55.45 - 66.33
- 66.34 - 77.22
- 77.23 - 88.11
- 88.12 - 99

Seniors Population Count

1 Dot = 100

- Total_65Above

⬜ Queens Boundaries

N   0   1.5   3 Miles

0   2   4 Kilometers

Data source: NYC Open Data, NY State Open Data

15-Minute Accessibility to Facilities for Elderly (65 y.o. and Above) Population

Spatial Correlation in
Neighborhood:
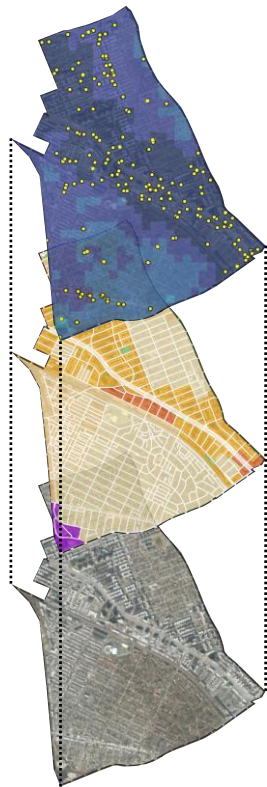# 15-minute-walk Accessibility to Facilities and Residential Density

To further understand the 15-minute-walk accessibility to facilities beyond the scores, an analysis was conducted on several specific neighborhoods. The accessibility scores were analyzed in correlation with land use and residential density in these neighborhoods. The analysis was also supplemented with observations of satellite images and street views. Neighborhoods that were reviewed further are the following.
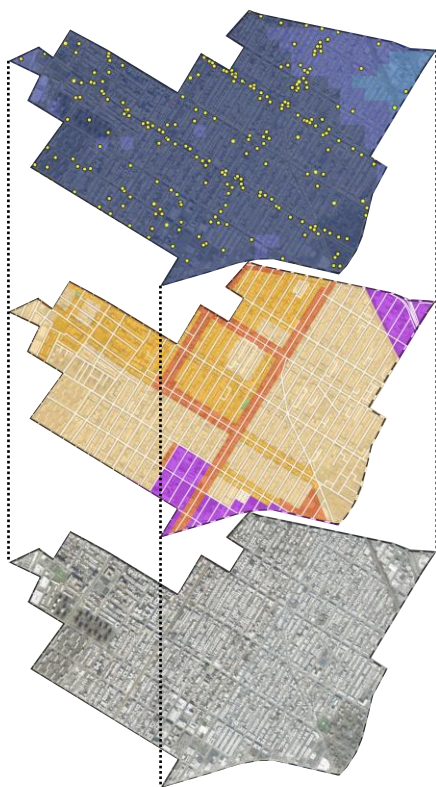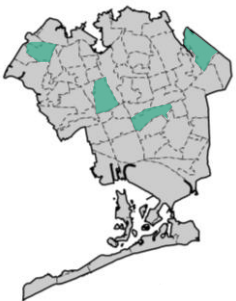
Astoria
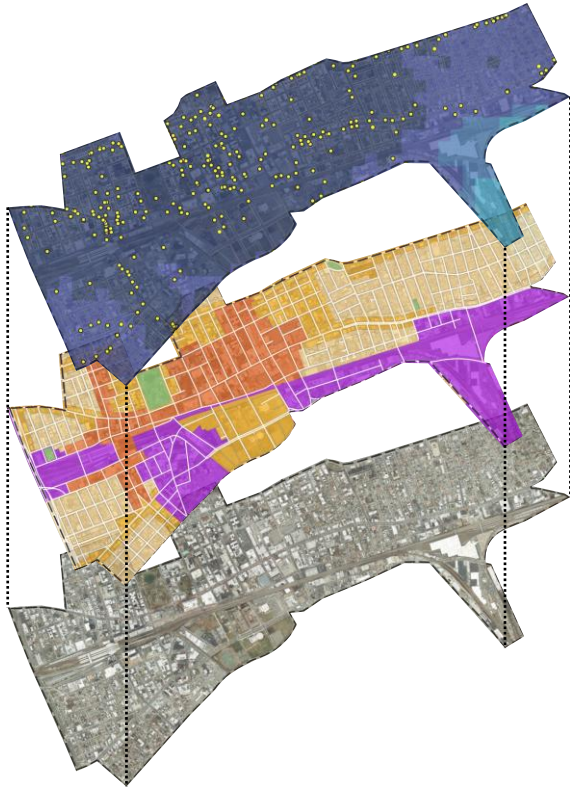
Jamaica

Forest Hills
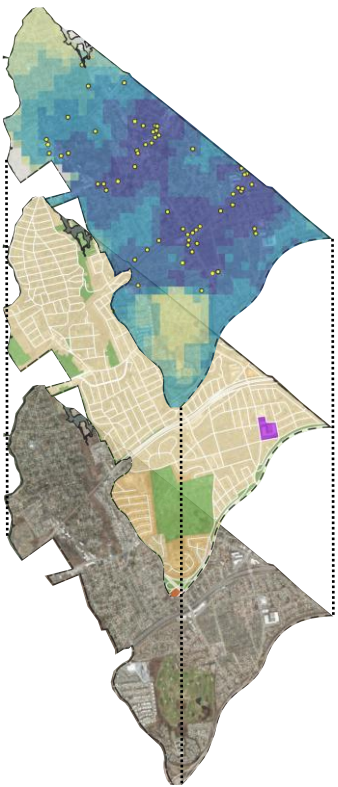
Douglas Manor – Douglaston – Little Neck

Spatial Correlation in Neighborhood: 15-minute-walk Accessibility to Facilities and Residential Density
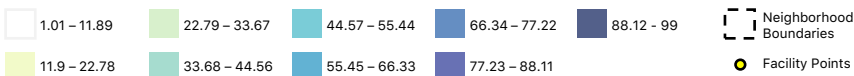
Based on the MCDA results, Astoria is one of the neighborhoods with the highest score for 15-minute-walk accessibility to facilities. When compared to the land use map, a small area in northeastern Astoria that does not score as well as other areas is under the manufacture land use category. In that area, the facility points are also not dense. The central area in Astoria is filled with high-density commercial and residential areas. The facility points are mostly gathered in that area, such as in the commercial strip at 31st Street, Broadway, and 30th Avenue. This strengthens the analysis that the highest 15-minute-walk accessibility to facilities value is influenced by the presence of subway lines and stations, both directly and indirectly. More facilities are available close to subway lines and stations, which positively influence the 15-minute-walk accessibility to facilities value in that area.

Data source: NYC Open Data, NY State Open Data
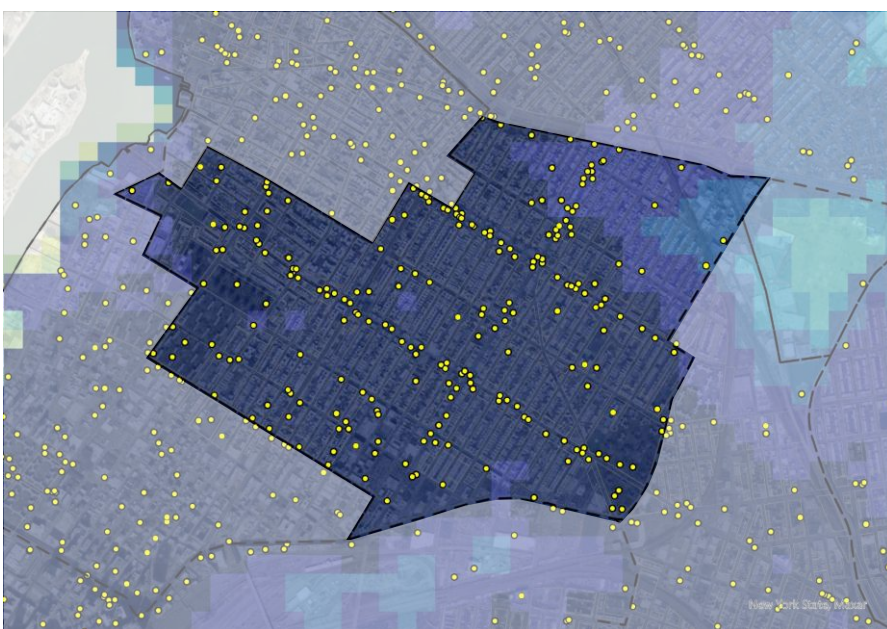
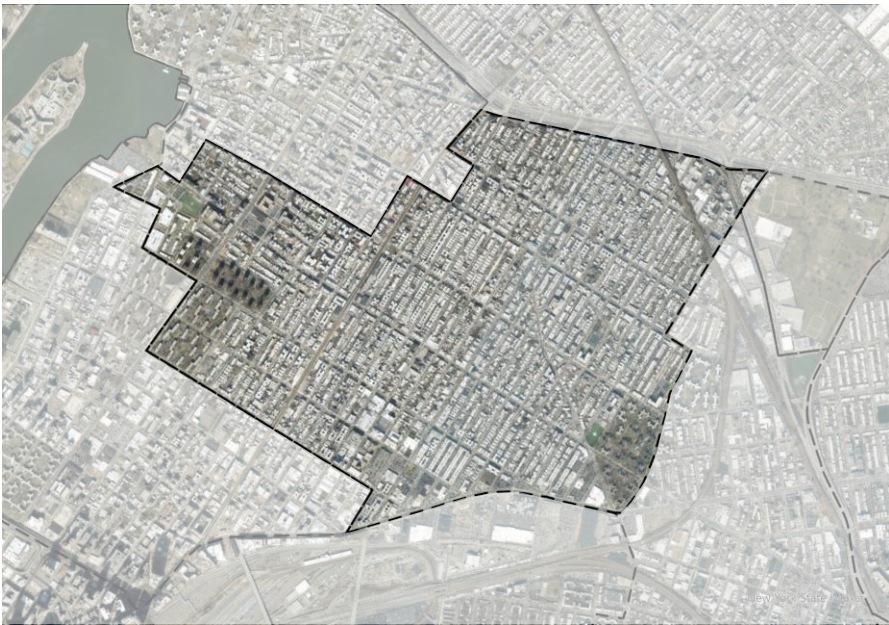15-minute-walk Accessibility to Facilities Score for All Ages

Color	Range	Color	Range
	1.01 – 11.89		22.79 – 33.67
	11.9 – 22.78		33.68 – 44.56

| | 44.57 – 55.44 | | 66.34 – 77.22 | | 88.12 - 99 |
| | 55.45 – 66.33 | | 77.23 – 88.11 |

Neighborhood Boundaries

Facility Points

Land Use Categories

- Low-density residential 1 (R1-R3)
- Low-density residential 2 (R4-R5)
- Moderate-to-high-density residential (R6-R10)
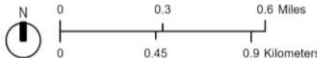- Commercial
- Parks
- Manufacture
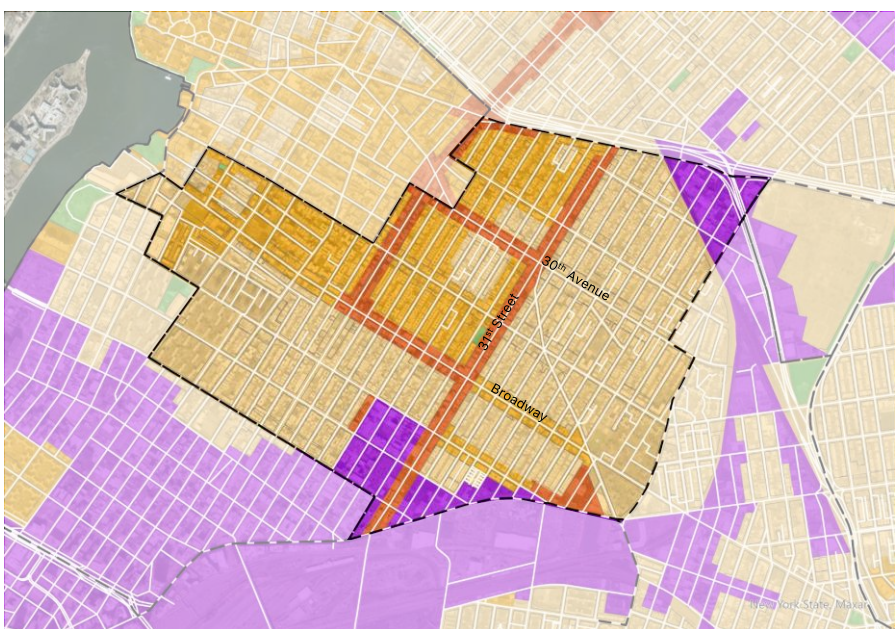
Spatial Correlation in Neighborhood:
15-minute-walk Accessibility to Facilities and Residential Density

Astoria

Based on satellite images, street views, and site visits, Astoria is confirmed to contain residential areas with varying densities. Streets close to subway stations are filled with various facilities and are busy with pedestrians. Meanwhile, other streets tend to be filled only with housing. These residential streets tend to be quiet and not many pedestrians pass by.

Neighborhood Boundaries

N
0   0.3   0.6 Miles

0   0.45   0.9 Kilometers

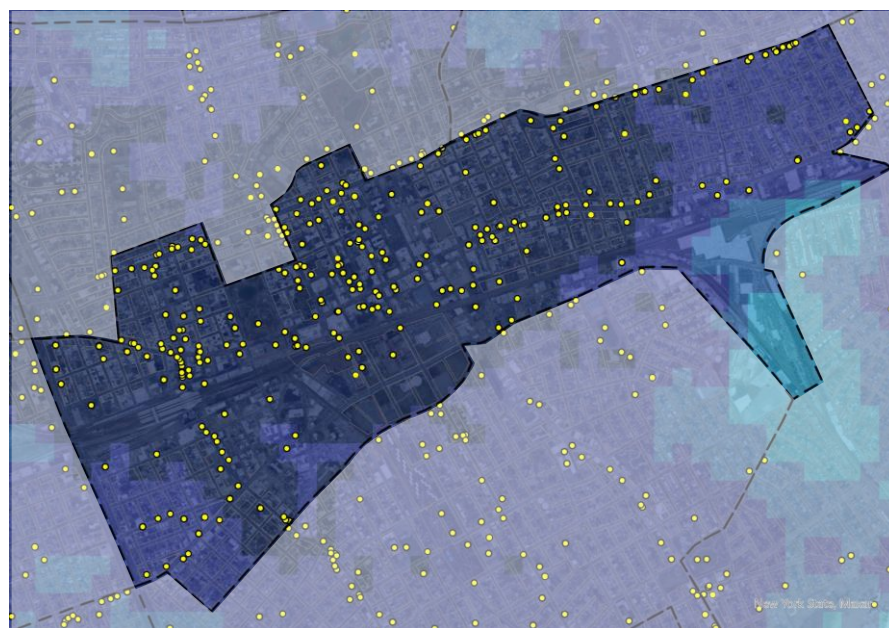# Spatial Correlation in Neighborhood: 15-minute-walk Accessibility to Facilities and Residential Density
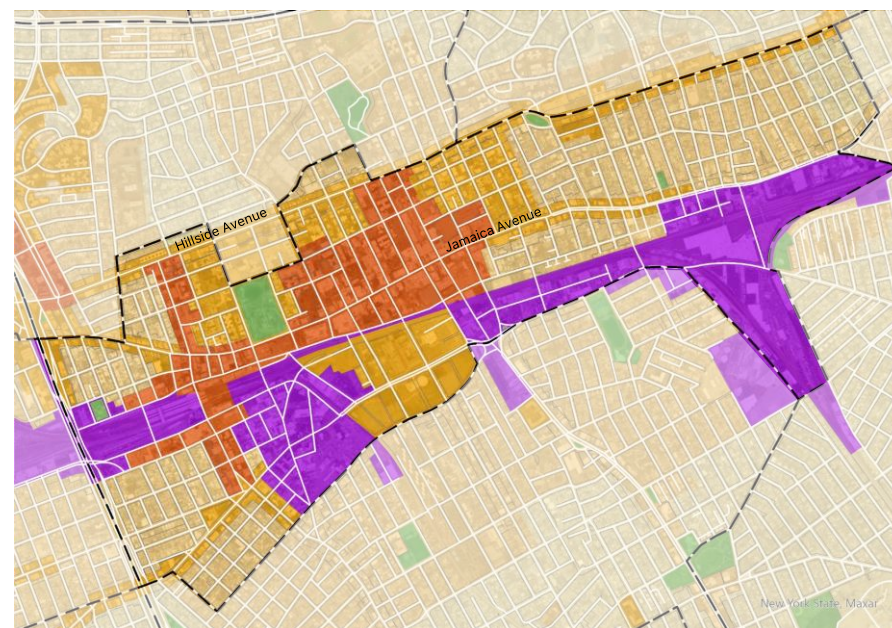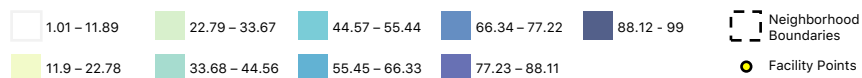
Similar to Astoria, Jamaica is also one of the neighborhoods with the highest 15-minute-walk accessibility to facilities scores. When compared to the land use map, a small portion of the southern Jamaica area that does not score as well as other areas is under the manufacture land use category. In this area, the facility points are also not dense and almost nonexistent. The central area of Jamaica is filled with high-density commercial and residential areas and has the most optimal score. This neighborhood is also served by the subway, but the facility points tend to be crowded along Jamaica Avenue and Hillside Avenue.

Data source: NYC Open Data, NY State Open Data

15-minute-walk Accessibility to Facilities Score for All Ages

1.01 – 11.89	22.79 – 33.67
11.9 – 22.78	33.68 – 44.56

44.57 – 55.44
55.45 – 66.33

66.34 – 77.22
77.23 – 88.11

88.12 - 99

Neighborhood Boundaries

○ Facility Points

Land Use Categories

Low-density residential 1 (R1-R3)	Moderate-to-high-density residential (R6-R10)	Parks
Low-density residential 2 (R4-R5)	Commercial	Manufacture

Spatial Correlation in Neighborhood: 15-minute-walk Accessibility to Facilities and Residential Density

Based on satellite imagery and street views, a portion of the southeastern area of Jamaica that serves as a manufacturing area is a train depot. A portion of the other manufacturing area to the south contains storage buildings and warehouses. The presence of these manufacturing functions, especially the train depot, reduces the availability of neighborhood amenities and as a result, reduces pedestrian accessibility to these amenities.

Train Depot

Train Depot

Neighborhood Boundaries

N

0   0.3   0.6 Miles
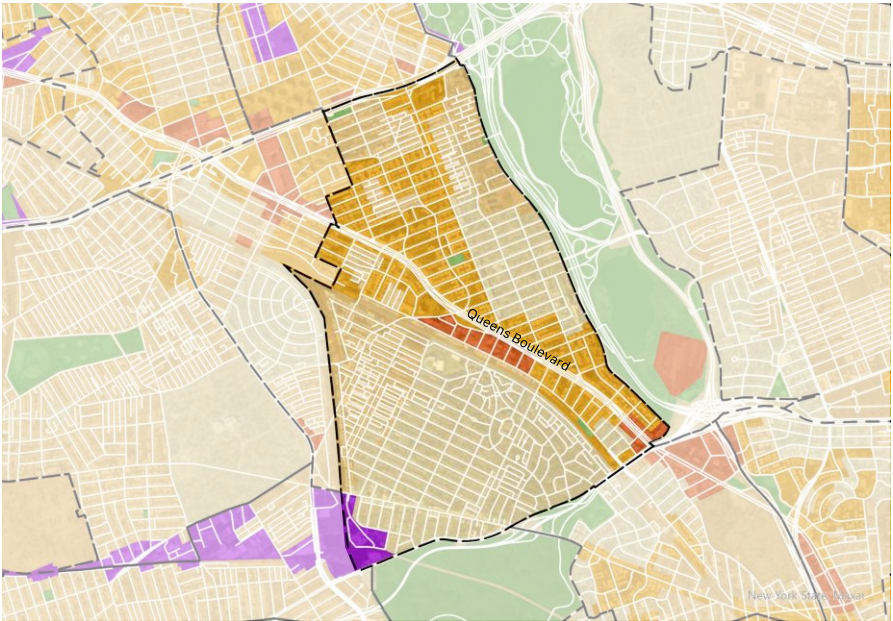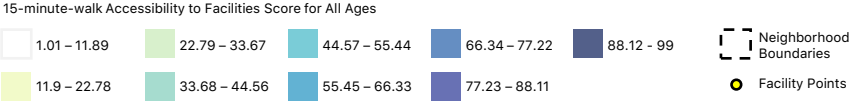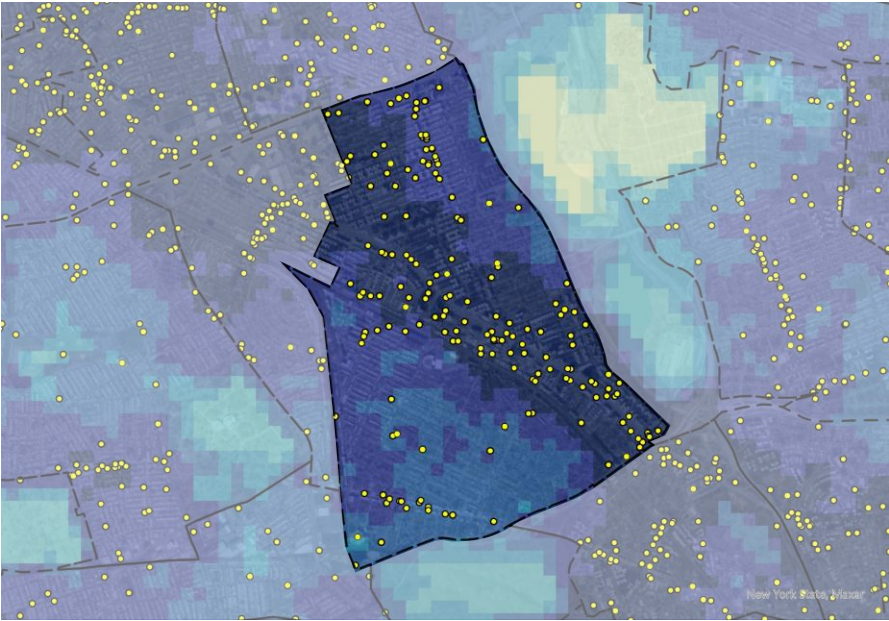
0   0.45   0.9 Kilometers

Street views' source: Google Maps, 2024
Satellite image source: New York State, Maxar, in ArcGIS Pro
Map data source: NYC Open Data

Spatial Correlation in Neighborhood:
15-minute-walk Accessibility to Facilities and Residential
Density

Forest Hills neighborhood tends to have mixed 15-minute-walk accessibility to facilities scores. The central area of Forest Hills has an optimal score. The area is filled with high-density commercial and residential functions. Amenity points are also mainly concentrated in the area.
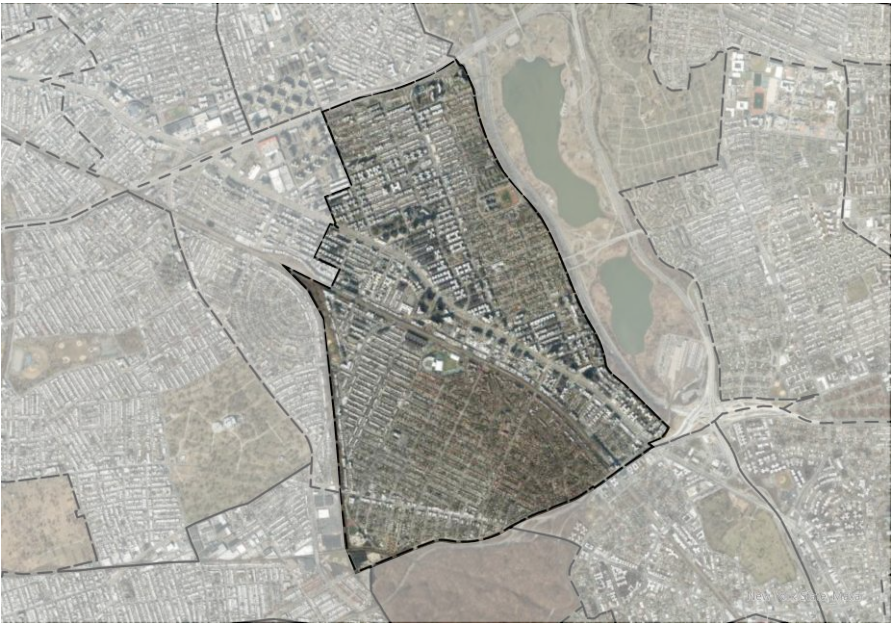
In this neighborhood, there is quite a contrast between high-density and low-density residential. In the low-density residential areas (northeast and southwest), there are fewer amenity points so the 15-minute-walk accessibility to facilities score is not optimal.
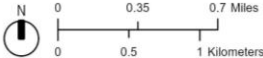
Data source: NYC Open Data, NY State Open Data

15-minute-walk Accessibility to Facilities Score for All Ages

1.01 – 11.89	22.79 – 33.67
11.9 – 22.78	33.68 – 44.56

44.57 – 55.44 | 66.34 – 77.22 | 88.12 - 99
55.45 – 66.33 | 77.23 – 88.11

Neighborhood Boundaries

Facility Points

Land Use Categories

Low-density residential 1 (R1-R3)
Low-density residential 2 (R4-R5)
Moderate-to-high-density residential (R6-R10)
Commercial
Parks
Manufacture

Spatial Correlation in Neighborhood:
15-minute-walk Accessibility to Facilities and Residential Density

Based on satellite imagery and street views, Forest Hills is confirmed to be filled with various residential densities, from single-family housing, multifamily housing, to high-rise apartments. The density tends to be centered towards the center, where Queens Boulevard is located as the main road. The availability of facilities is also concentrated near the road.

Neighborhood
Boundaries

N 0   0.35   0.7 Miles
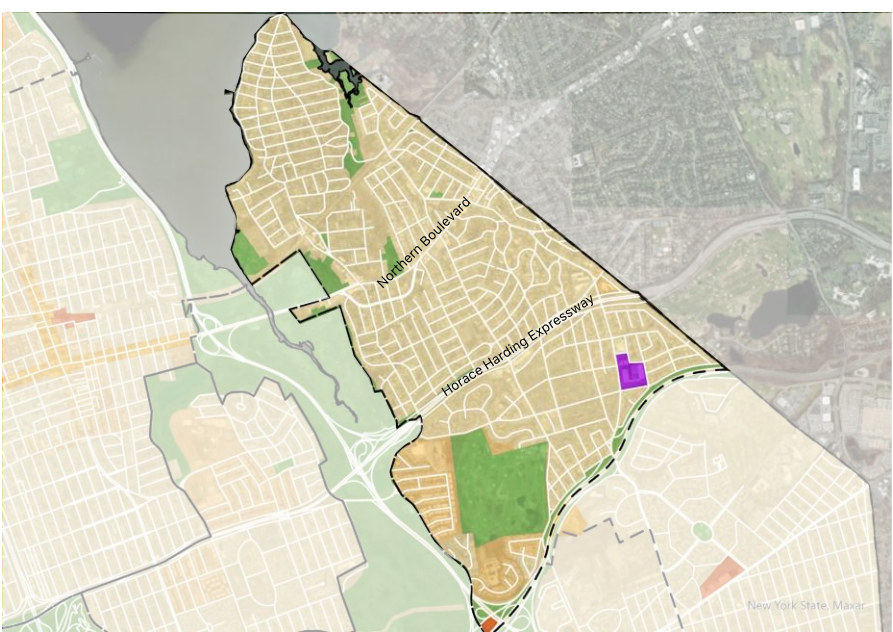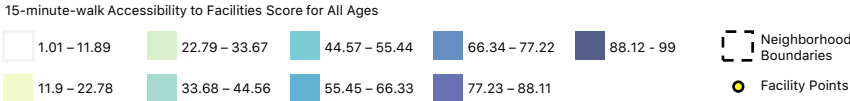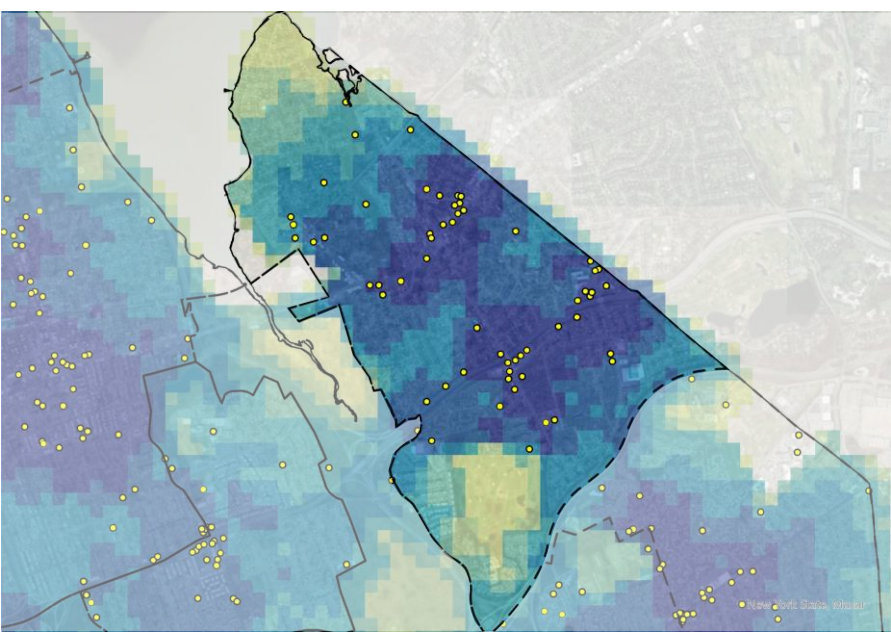
0   0.5   1 Kilometers

Spatial Correlation in Neighborhood: 15-minute-walk Accessibility to Facilities and Residential Density

The Douglas Manor – Douglaston – Little Neck neighborhood scored 15-minute-walk accessibility to amenities that were relatively poor compared to the neighborhoods mentioned above. Some of the central areas of this neighborhood scored quite well because of the amenities located in those areas. However, there are not as many amenities in those areas as the central areas of the other neighborhoods analyzed above.

The accessibility score decreases toward the periphery of the neighborhood and there are some patches with low scores to the north and south. The northern area is filled with low-density residential, while the southern area is filled with land use parks. In both areas, there are almost no amenities available. The amenities are concentrated on major roads such as Northern Boulevard and Horace Harding Expressway.
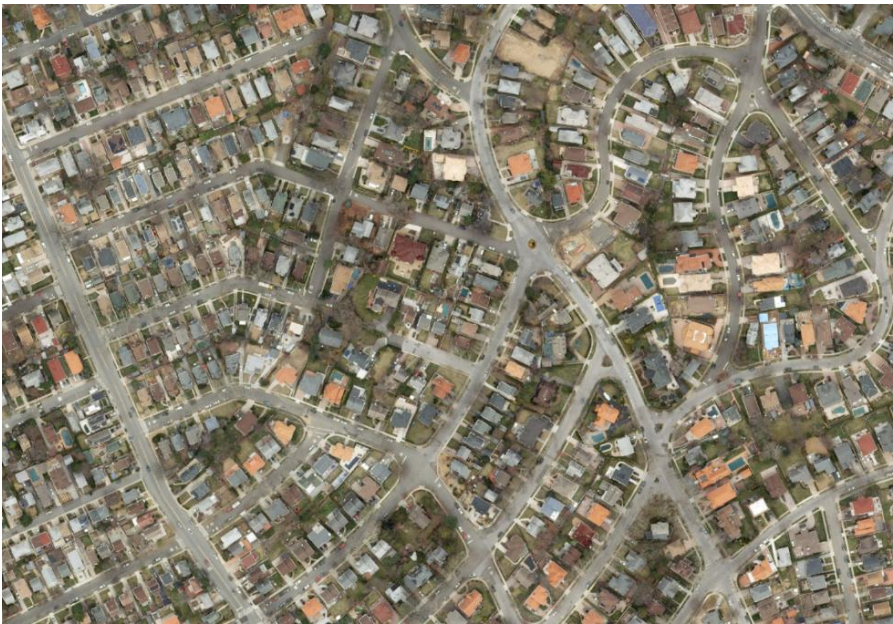
Data source: NYC Open Data, NY State Open Data

15-minute-walk Accessibility to Facilities Score for All Ages

- 1.01 – 11.89
- 11.9 – 22.78
- 22.79 – 33.67
- 33.68 – 44.56
- 44.57 – 55.44
- 55.45 – 66.33
- 66.34 – 77.22
- 77.23 – 88.11
- 88.12 - 99
- Neighborhood Boundaries
- Facility Points

Land Use Categories

- Low-density residential 1 (R1-R3)
- Low-density residential 2 (R4-R5)
- Moderate-to-high-density residential (R6-R10)
- Commercial
- Parks
- Manufacture

Spatial Correlation in Neighborhood: 15-minute-walk Accessibility to Facilities and Residential Density

Reviewing from satellite imagery and street views, the big patch to the south with a low accessibility score and functioning as a park is a golf course. The existence of the golf course reduces the availability of other public facilities and becomes a barrier to pedestrian accessibility. Meanwhile, the residential in this neighborhood is also dominated by single-family houses of which environments are designed for cars. With public facilities available on major roads and such an environmental design, people will tend to drive to reach these facilities.
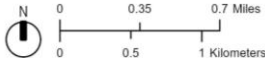
Golf Course

Neighborhood Boundaries

N
0   0.35   0.7 Miles
0   0.5   1 Kilometers

Street views' source: Google Maps, 2024
Satellite image source: New York State, Maxar, in ArcGIS Pro
Map data source: NYC Open Data

Conclusion

From this study, it can be concluded that, 15-minute-walk accessibility to facilities throughout Queens is generally quite good. This shows the completeness of various types of facilities in Queens. There are several neighborhoods that achieve optimal scores of 15-minute-walk accessibility to facilities, especially those served by subway stations. These neighborhoods tend to be spread west and northwest, closer to Manhattan and Brooklyn. The accessibility scores tend to decrease closer to the borough's periphery.

Meanwhile, several neighborhoods have not yet achieved the optimal score needed to cater to the density of specific age-based population groups. This is especially evident in the senior's population (65 y.o. and above) who live in the northeast area of Queens, while the accessibility scores in this area are not good.

When observed in more detail at the neighborhood level, areas with lower residential density tend to be supported by fewer neighborhood facilities. Areas with lower residential density, for example, neighborhoods with single family housing, are less able to encourage people to walk and people tend to rely on motorized vehicles. Therefore, even if the accessibility value to the facility is high, people may not necessarily walk to the destination.

Limitation & Reflection

During the course of this study, it became increasingly apparent that this study has been a simplified version of the overall 15-Minute-City concept. It was claimed at the beginning of this report that this project focused on the accessibility of various neighborhood-level facilities that can be reached by walking for 15 minutes and its correlation with population by age and residential density. Meanwhile, there are other factors that influence walkability to consider, such as pedestrian infrastructure, safety factor and tree canopies. Further studies should consider these other factors to make the analysis results more complete.

In addition, this project was limited to neighborhood-level facility data that could be found in existing open data sources. It is possible that there are other types of facilities that were not included in this project, such as sports venues. Due diligence in data management is also important in sorting out facilities that are considered relevant to this study. Some facilities in this study were categorized more simply due to time constraints, such as human services, other cultural venues, and commercials. In a follow-up study, if resources are sufficient, the data on the types of facilities included in the study could be more complete, cleaned, and categorized more carefully to maintain relevance to the study.

Finally, in this study, the network analysis was conducted using road centerlines throughout Queens. In the future, this study can be continued using sidewalk network data so that the analysis is more accurate.

References

C40 Cities Climate Leadership Group. (2021, May). *Why every city can benefit from a '15-minute city' vision.* C40 Knowledge Hub. https://www.c40knowledgehub.org/s/article/Why-every-city-can-benefit-from-a-15-minute-city-vision?language=en_US&gad_source=1&gclid=Cj0KCQiAire5BhCNARIsAM53K1jpiAkUJSeyMcGtoAnSYMBnmJvhxIABaY5xyIoViOpgvShms_dWUUEaAvbLEALw_wcB

CityNeighborhoods.NYC. (n.a.). *Astoria Queens.* CityNeighborhoods.NYC. https://www.cityneighborhoods.nyc/astoria

Crook, L. (2021, October 26). *15-Minute City concept by Carlos Moreno wins Obel Award 2021.* Dezeen https://www.dezeen.com/2021/10/26/15-minute-city-carlos-moreno-obel-award/

Dreith, B. (2022, December 14). *ODA designs "15-minute city" for Innovation QNS in Astoria.* Dezeen. https://www.dezeen.com/2022/12/14/oda-innovation-qns-astoria/

Gjording, L.R. (2024, April 11). *What is a 15-minute city and how it's coming to NYC.* CitySignal. https://www.citysignal.com/what-is-a-15-minute-city/

Moreno, C., Allam, Z., Chabaud, D., Gall, C., & Pratlong, F. (2021). Introducing the "15-minute city": Sustainability, resilience, and place identity in future post-pandemic cities. *Smart Cities, 4*(1), 93-111. https://doi.org/10.3390/smartcities4010006

ODA Architecture. (2024). *Innovation QNS.* ODA Architecture. https://oda-architecture.com/projects/innovation-qns/

Sands, R. (2023, February 7). *Neighborhood to watch: Astoria, Queens, New York.* Forbes. https://www.forbes.com/sites/rogersands/2023/02/05/neighborhood-to-watch-astoria-queens-new-york/

Weng, M., Ding, N., Li, J., Jin, X., Xiao, H., He, Z., & Su, S. (2019). The 15-minute walkable neighborhoods: Measurement, social inequalities and implications for building healthy communities in urban China. *Journal of Transport & Health, 13*, 259–273. https://doi.org/10.1016/j.jth.2019.05.005

Thank you!

Kania Ulfa (kau2102@columbia.edu)

GIS Fall 24 – Final Project Memo

All images, diagrams, tables, and maps are by author, unless stated otherwise.