

Public Housing Proximity to Highways in New York City

Introduction

Environmental justice is the concept that environmental burdens and benefits should be fairly distributed among all people, regardless of race, color, national origin, or income. Exposure to air pollution, however, is not distributed fairly among all people within the City of New York. Air pollution is largely due to automobile emissions, and Black infants have been found to be significantly more likely than White infants to live in close proximity to highways, such as in public housing located along highways in New York City. For the purpose of my project, public housing includes conventional public housing and subsidized housing. Black residents constitute the leading racial group living in New York City public housing. In 2013, 46.2% of the families in New York City public housing were Black, but only 4.9% of the families were Non Hispanic White. Hispanics constituted 43.6% of residents, Asians constituted 4.5%, and 0.8% were other.

Being exposed to higher rates of air pollution can also lead to adverse health outcomes. Studies show that air pollution is one of the leading causes of chronic lung disease and is positively associated with low birth weight and preterm birth. Many studies have examined the relationship between air pollution and adverse birth outcomes, and they have shown that mothers who live closer to highways are exposed to air pollution at greater levels than those mothers who live farther away from highways. Infant mortality and preterm birth, however, do not occur equally across all racial and ethnic groups.



Black infant mortality is consistently more than twice that of White infant mortality, primarily due to preterm birth, as the infant mortality rate for Blacks in the U.S. is 2.4 times the rate of non-Hispanic Whites. The risk of preterm birth for Blacks in the U.S. is consistently 1.5 times the rate for non-Hispanic Whites. Additionally, Blacks are 1.8 times more likely than Whites to have preterm birth in New York City. These inequities in adverse birth outcomes are due to specific social determinants of health. Due to the racial segregation in and the location of public housing developments, my project seeks to examine the association between distance to and density of highways, as well as the location of public housing in relation to these highways.



Methods

Four factors were analyzed in order to determine the community districts within Manhattan, The Bronx, Brooklyn, and Queens that were most likely to have many public housing residents located in areas with the most highways.

What are community districts?

Each borough of New York City is broken down by community districts in order to outline the various neighborhoods that exist within the boroughs. They are numbered within each borough, and each community district has its own name. Data for New York City are presented by community district.



Road Distance

Road data from NYC Open Data that were classified as highways, interstates, parkways, U.S. routes, and state routes were processed to show areas that were within 1000, 2000, 3000 and 4000 feet of the nearest highway using Euclidian Distance. This data was also classified by community district using zonal statistics and reclassified in order to give each district a score of 1 – 4, where 1 was the farthest away from highways (4000 ft.) and 4 was the nearest to highways (1000 ft.).

Road Density

Road data from NYC Open Data were processed to show areas with low road density and high road density. Using Kernel Density, areas that had 0 – 0.68 road density were classified as low, and areas that had 2 – 2.72 road density were classified as high. This data was also classified by community district using zonal statistics and reclassified in order to give each district a score of 1 – 4, where 1 was the lowest highway density and 4 was the highest highway density.

Public Housing Population

Public housing data from the New York City Housing Authority were processed by community district using zonal statistics and reclassified to show which community districts had the highest number of public housing residents where 1 was the fewest residents and 4 was the most residents. A score of 1 was 59-1000 residents, 2 was 500 – 1500 residents, 3 was 1500 – 3000 residents, and 4 was 3000 – 5000 residents.

Public Housing Units

Public housing data were processed by community district using zonal statistics and reclassified to show which community districts had the highest number of public housing units where 1 was the fewest units and 4 was the most units. A score of 1 was 1 – 24 units, 2 was 24 – 150 units, 3 was 150 – 1000 units, and 4 was 1000 – 2500 units.

Vulnerability Assessment

Reclassified data for road distance by community district, road density by community district, public housing population by community district, and public housing units by community district were added together using raster calculator to create an overall score for each community district on a scale of 4 – 16, where a score of 4 meant the community district scored 1 on each of the four factors and a score of 16 meant the community district score 4 on each of the four factors. A score of 4 signified a community district that was *not* likely to have many public housing residents located in an area near many highways, and a score of 16 signified a community district that was likely to have many public housing residents located in an area with near many highways.

Conclusions

The vulnerability assessment shows that community districts with the highest scores are community districts that were likely to have many public housing residents located in an area near many highways. It is clear from these maps that areas where there are many public housing units, or public housing residents are also those areas nearest to highways and with the highest density of highways. While these maps do not show air pollution concentration by community district, those areas nearest to highways and with higher density of highways are likely exposed to greater concentrations of traffic-generated air pollution and therefore are more likely at higher risk for health outcomes such as preterm birth and low birth weight. This conclusion cannot be drawn from the map alone, as further statistical analysis would be necessary to draw such a conclusion. By using a scoring system, the vulnerability assessment map identifies the community districts that are nearest to highways, with more highway density, public housing residents, and units, and are likely more exposed to traffic-generated air pollution. Therefore, these same community districts are likely at higher risk for adverse health outcomes. Interventions should take place in these community districts in order to lessen exposure to air pollution. Installing effective air ventilation systems in public housing could be one way to remedy this issue.



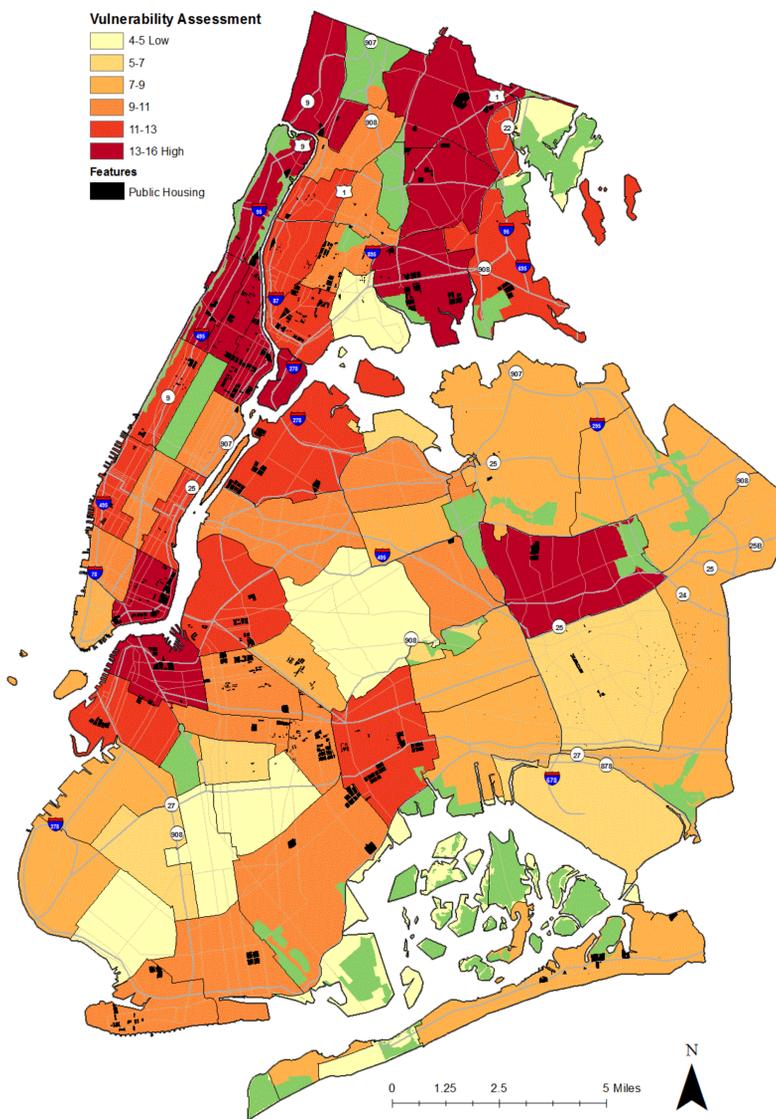
Limitations & Future Research

- Statistical analysis was not performed, but it would need to be performed in order to draw concrete conclusions about whether those areas nearer to highways are those areas that are exposed to greater concentrations of air pollution.
- These maps only consider roads classified as highways, interstates, parkways, U.S. routes, and state routes. There are many roads in New York that generate a lot of traffic and therefore a significant amount of air pollution such as Broadway, 5th Avenue, and Atlantic Avenue.
- Future research will be done to create maps of air pollution exposure by community district and adverse birth outcomes such as preterm birth and low birth weight by community district.
- This research will also include more roads that generate a significant amount of traffic, but that aren't classified as highways, interstates, parkways, U.S. routes, and state routes.
- These maps will be overlaid in order to see what correlations might exist, and the maps will be compared to maps of race/ethnicity by community district.
- Statistical analysis must be performed in order to confirm these correlations as well.

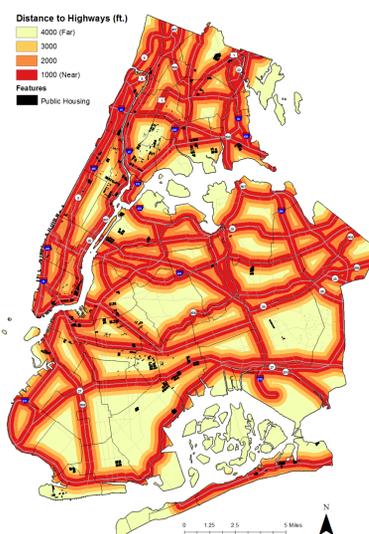
Cartographer Information

Cartographer: Becky Darin Goldberg, UEP 232
 Data Sources: NYC Open Data 2013, Tufts GIS Server Data 2010, New York City Housing Authority 2011.
 Projection: NAD_1983_StatePlane_New_York_Long_Island_FIPS_3104_Feet

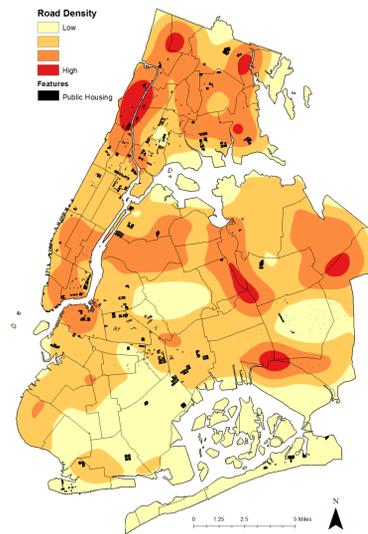
Vulnerability Assessment of Community Districts



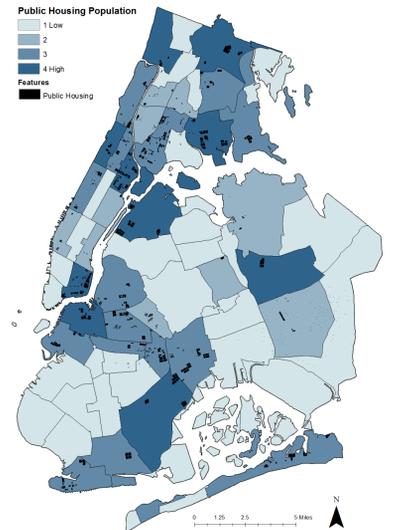
Distance to Highways



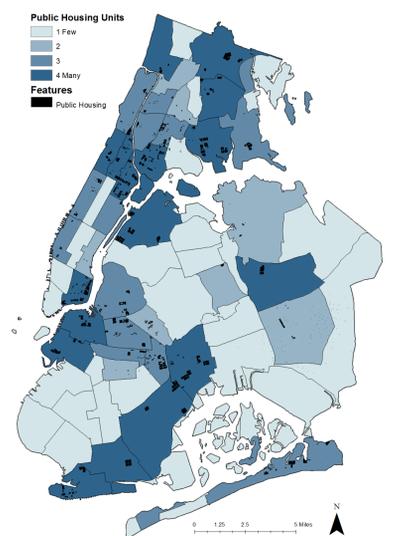
Density of Highways



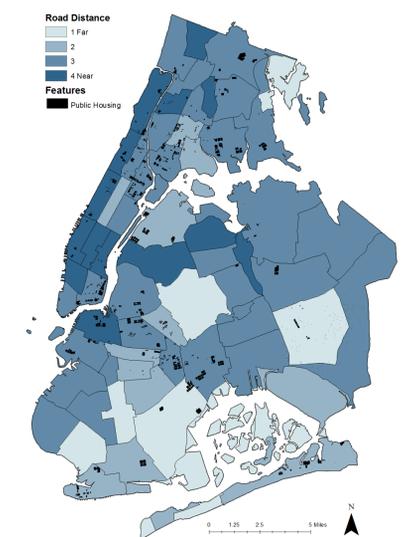
Public Housing Population by Community District



Public Housing Units by Community District



Highway Distance by Community District



Highway Density by Community District

