

## Introduction

Air pollution in New York City is a significant environmental threat which contributes to an estimated 6% of annual deaths by conditions such as Asthma. \* Although clean air laws and regulations have helped to improve the air quality in New York City, air pollutants in the city's air are still at a alarmingly high levels that are enough to cause harm.

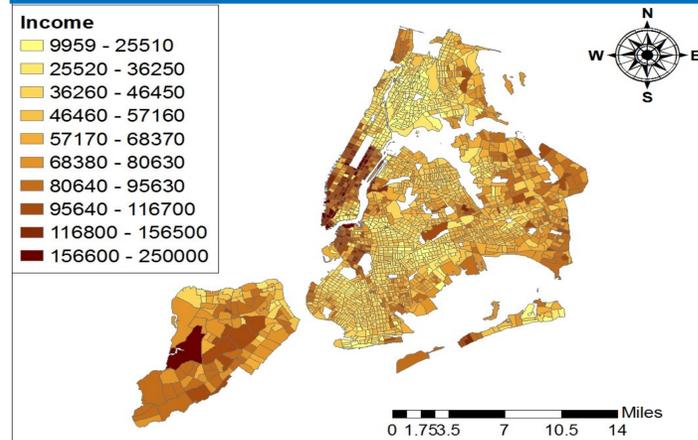
Each year, Health Department estimates that air pollution in NYC causes approximately 6,000 emergency department visits for asthma in children and adults.\*\* Other estimates show that the health impacts of air pollution in New York City heavily effect infants, young children, and seniors.\*\*\*

Asthma causing air pollution comes from a number of sources both within and outside the city and is influenced by a number of factors. This project will look at four factors within the City of New York (average income, family population density, number of hospitals, and distance to major highways) and the impact these factors have on Asthma occurrences and death.

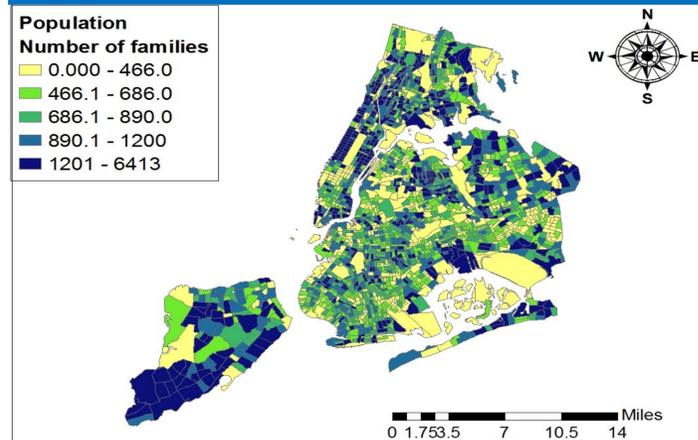
## Sources & Citations

- \* Clougherty, J., Ross, Z., Johnson, S., Kheirbek, I., & Matte, T. (n.d.). Buildings and Population Density in Intra-Urban Air Pollution Epidemiology: The New York City Community Air Survey (Nycas). *Epidemiology*.
  - \*\* Stevens, L. (Ed.). (n.d.). Air Pollution and the Health of New Yorkers: The Impact of Fine Particles and Ozone. Retrieved December 14, 2015, from <http://www.nyc.gov/html/doh/downloads/pdf/eode/eode-air-quality-impact.pdf>
  - \*\*\* Patel, M., Quinn, J., Jung, K., Hoepner, L., Diaz, D., Perzanowski, M., ... Miller, R. (n.d.). Traffic density and stationary sources of air pollution associated with wheeze, asthma, and immunoglobulin E from birth to age 5 years among New York City children. *Environmental Research*, 122-1229.
  - Asthma Information. (n.d.). Retrieved December 14, 2015, from <http://www.health.ny.gov/diseases/asthma/>
  - Cream, S. (2014, June 19). While Improving, City's Air Quality Crisis Quietly Persists. Retrieved December 14, 2015, from <http://www.gothamgazette.com/index.php/government/5111-while-improving-quiet-crisis-air-quality-persists-new-york-city-asthma-air-pollution>
  - Nakai, Satoshi; Crest, Jst; Maeda, Kakuho. "Respiratory Health Associated with Exposure to Automobile Exhaust. III. Results of a Cross Sectional Study in 1987, and Repeated Pulmonary Function Tests from 1987 to 1990." Archives of Environmental Health. Vol. 51: 1. Jan/Feb 1999.
- Data Sources: Bytes of the Big Apple - Department of City Planning; City of New York, New York GIS Clearing House, New York City Census Fact Finder  
Projection: NAD\_1983\_HARN\_StatePlane\_New\_York\_West\_FIPS\_3103\_Feet/Transverse\_Mercator (Monday, December 13, 2015)

## Average Income

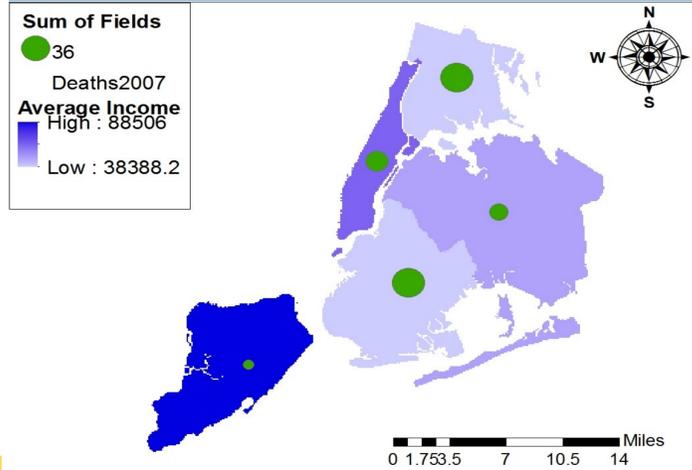


## Number of Families (Population)

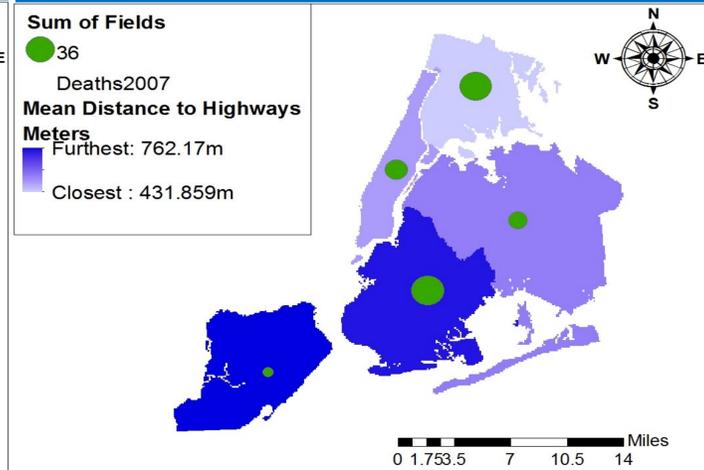


## Final Maps Correlated to Asthma Deaths

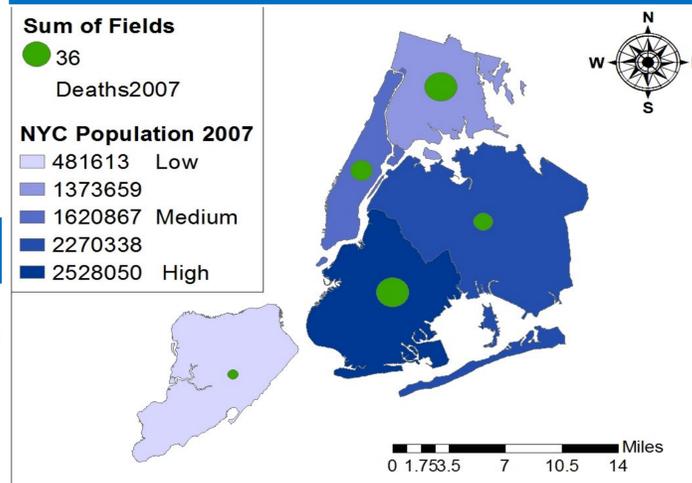
### Asthma Deaths & Average Income



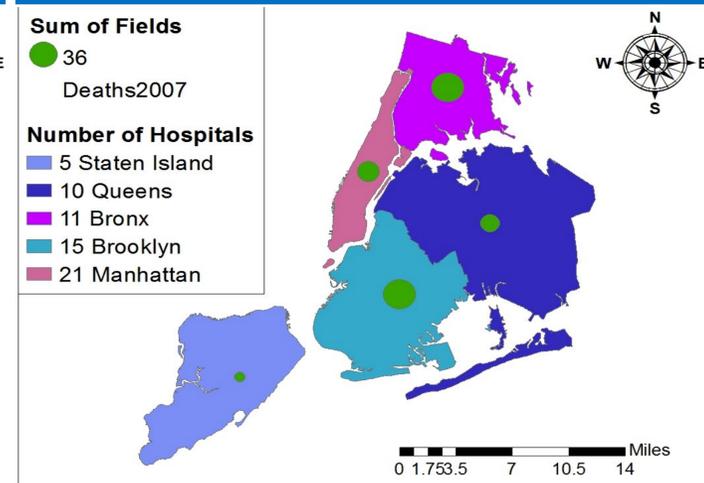
### Asthma Deaths & Mean Distance to Highways



### Asthma Deaths & Population



### Asthma Deaths & Number of Hospitals



## Methodology

### Calculating Asthma Deaths by Borough

Data for Asthma Death was obtained from "Bytes of the Big Apple". This data included various illnesses in the State of New York including depression, diabetes, etc. In order to isolate the Asthma, a query of the attribute table was performed. This enabled me to create a map based solely on Asthma Death Rates within the five boroughs.

### Identifying and Estimating Distance to Highways

This data originally included all streets, roads and sidewalks in New York State. A query of the attribute table, as well as Clip Features, were performed in order to isolate New York City data from New York State and identify only the major highways. Buffering Tool was then used to calculate distance from the highways.

### Locating Hospitals and Calculating Numbers

Point data for hospital location was acquired through "New York State GIS Clearing House". The data was clipped in order to identify hospitals in New York City vs the whole state. A spatial analysis join was then used to combine the hospital locations and the boroughs data in order to calculate the number of hospitals in each borough.

### Gathering Population (Family) Data

(Family) Population Data was acquired from "NYC Census Fact Finder" as an excel spreadsheet. The Conversion Tool was used to convert excel to table. Once completed, data management tool was used to build a raster attribute table. The resulting map was then clipped to separate New York City from NYS family population data.

### Gathering Average Income Data

Income data was also acquired from "NYC Census Fact Finder" as an excel spreadsheet. The Conversion Tool was used to convert excel to table. Once complete, data management tool was used to build a raster attribute table. The resulting map was then clipped to separate NYC from NYS income data.

### Final Correlated Data to Asthma Deaths

Data acquired for the Number of Hospitals, Mean Distance to Highways, Average Income and Population Density, all were converted into Raster in order to perform Mask. Once completed, the Zonal Statistics tool was used in order to summarize all data for each community district into five boroughs. This was especially necessary for Income and Population data. Asthma death was changed from a polygon to a pie chart image in order to correlate hospitals, highways, income and population with total deaths.

## Findings

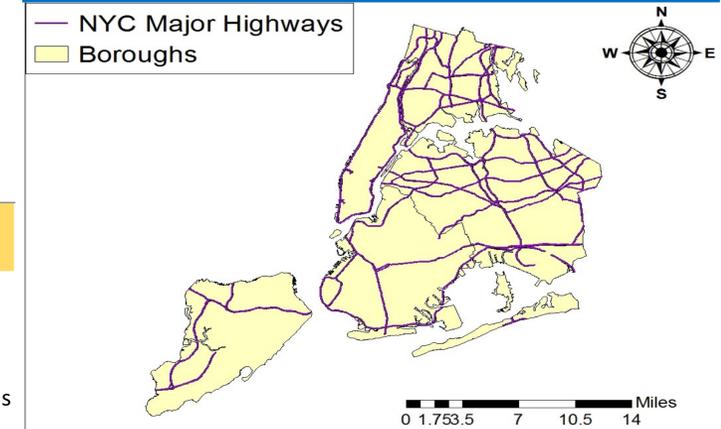
Due to the nature of the Asthma deaths data, limiting conclusions can be drawn about the correlations. Asthma death data was provided in the five boroughs as a whole and could therefore not be manipulated to see the detailed areas within the community districts of each borough.

When comparing the Distance to Highways Data to Deaths, no correlation was found. Residents in Staten Island lived the furthest away from a major highway, making them the least susceptible to death by Asthma. However, residents in Brooklyn also lived far from major highways yet their death rates are one of the highest.

Data between Average Income and Death shows a distinct correlation. Residents in Staten Island, who have the highest average income, seem to have the least number of deaths by Asthma. Brooklyn and The Bronx residents have the lowest income on average and have the highest death tolls. A theory is that higher wages mean better access to prime healthcare. Low income families have access to minimal, or perhaps, no healthcare. There was some correlation between the number of hospitals and deaths within each borough. It's possible that the number of recorded deaths can depend on the location of admitted patients. Therefore, explaining the concept that Staten Island, having fewer hospitals, also has fewer recorded deaths. While The Bronx and Brooklyn have a greater number of hospitals as well as recorded deaths.

Finally, the correlation between death and population density is minimal. Data between Brooklyn and Staten Island confirm that low populations equal low death rates and vice versa. However, that does not apply to Manhattan, The Bronx and Queens.

## NYC Highways



## Hospital Locations

