Socioeconomic Status and its Correlation to Urban Air Pollution Exposure

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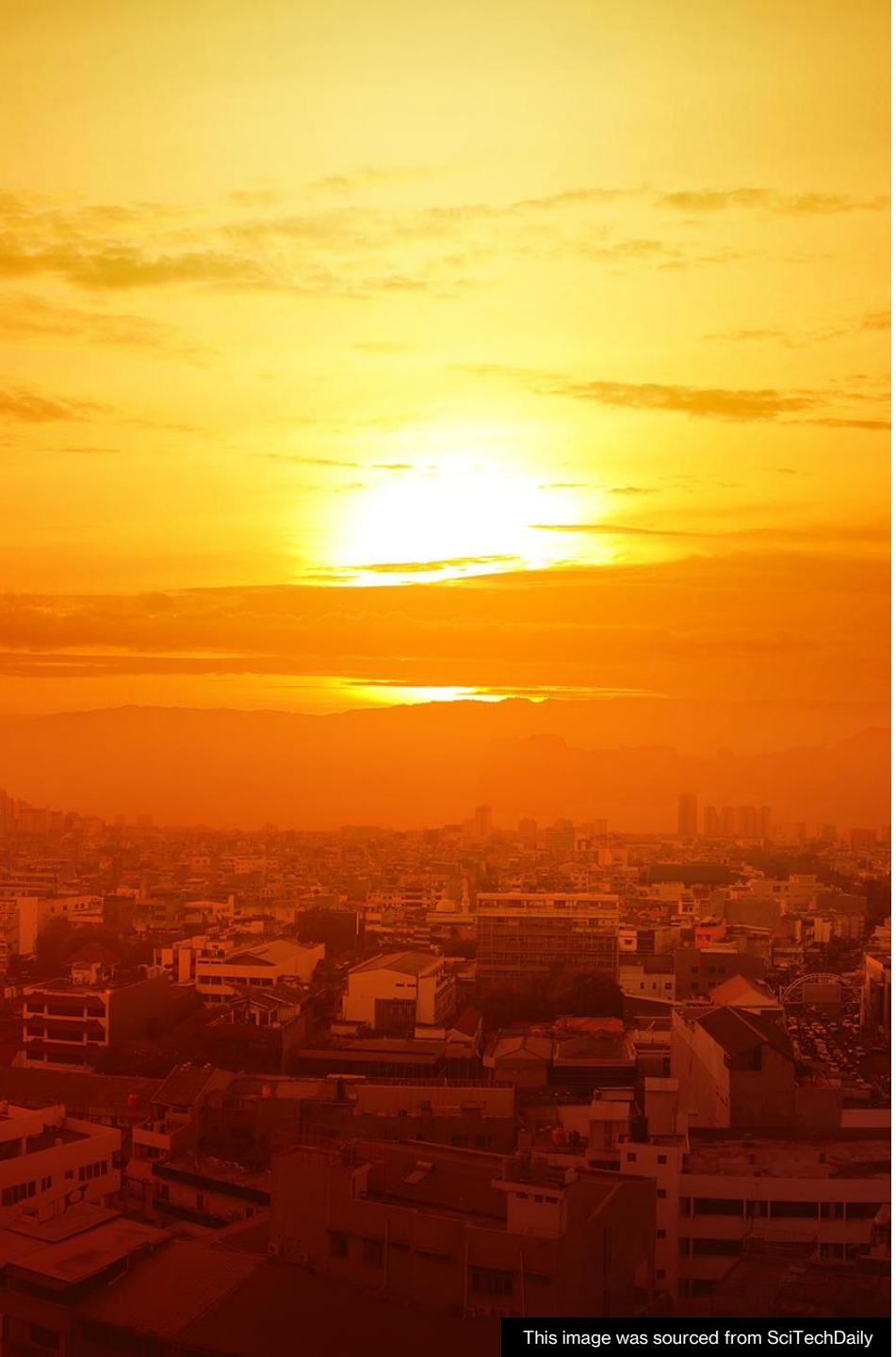
Introduction

- Ozone is one of the six criteria pollutants noted by the 1970 Clean Air Act to be harmful to the environment and human health.[1]
- This research comprises of ozone level data near various NYCHA buildings (public housing) during heat waves, health factor data, and socioeconomic status data.

This image was sourced from Deccan Herald

1. 42 U.S.C. § 7401 (1970)


This image was sourced from SciTechDaily

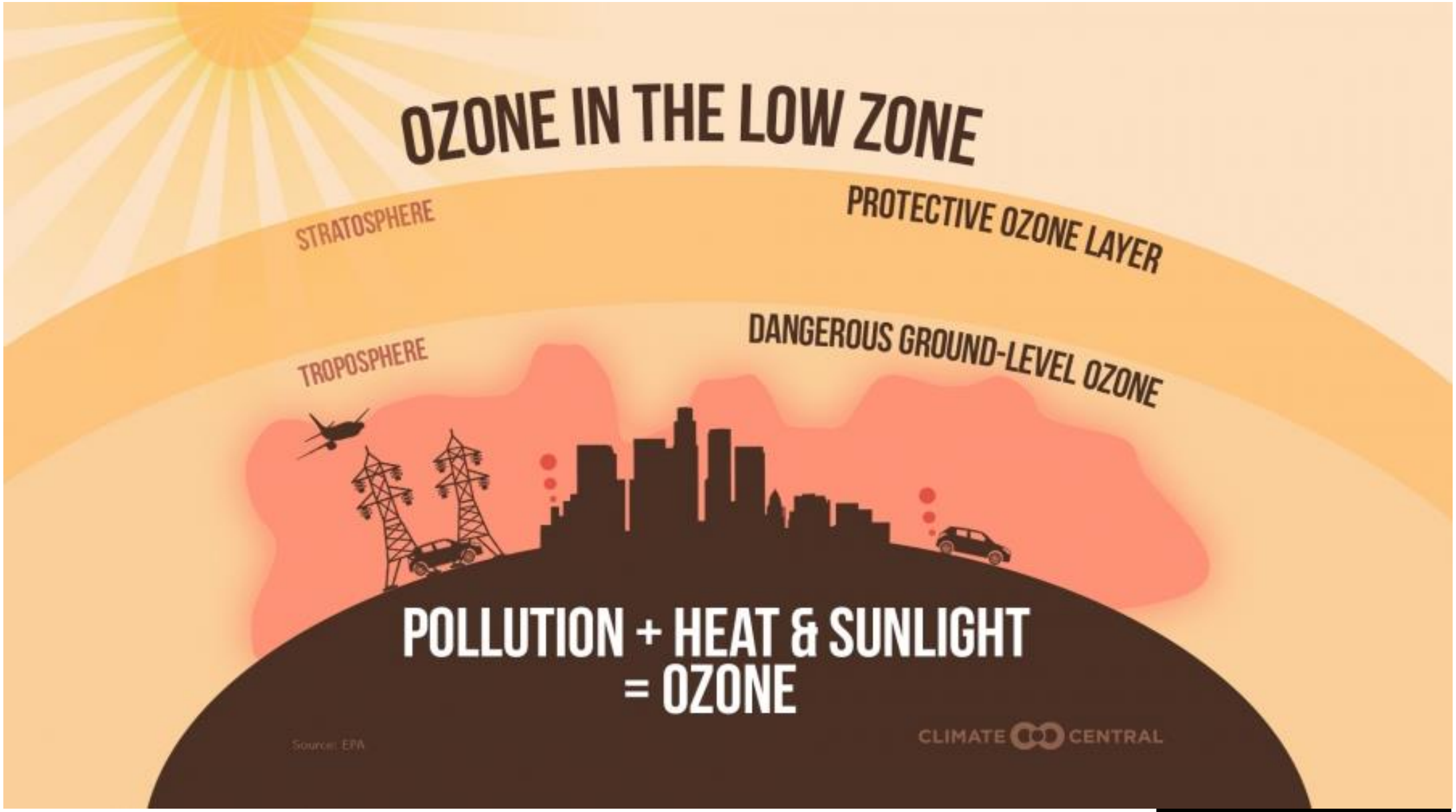
Objective

- To determine if there is a correlation between socioeconomic status and exposure to air pollution.
- Observe and monitor ozone values in various locations in New York City before and during heatwaves, and cross analyze data with health and socioeconomic status factors.

Motivation

- Lower income or minority communities tend to be exposed to higher levels of air pollution.[2]
- High levels of tropospheric (ground-level) ozone can be toxic, affecting human health, crop yields, as well as grassland and tree species
- Air pollution also poses significant environmental and health threats, contributing to approximately 6% of deaths in New York City annually. [3]

2. Hajat, Anjum et al. “Socioeconomic Disparities and Air Pollution Exposure: a Global Review.” *Current environmental health reports* vol. 2,4 (2015): 440-50. doi:10.1007/s40572-015-0069-5
3. New York City Community Air Survey, Air Pollution & the Health of New Yorkers: The Impact of Fine Particles and Ozone Report



This image was sourced from Climate Central

Ozone

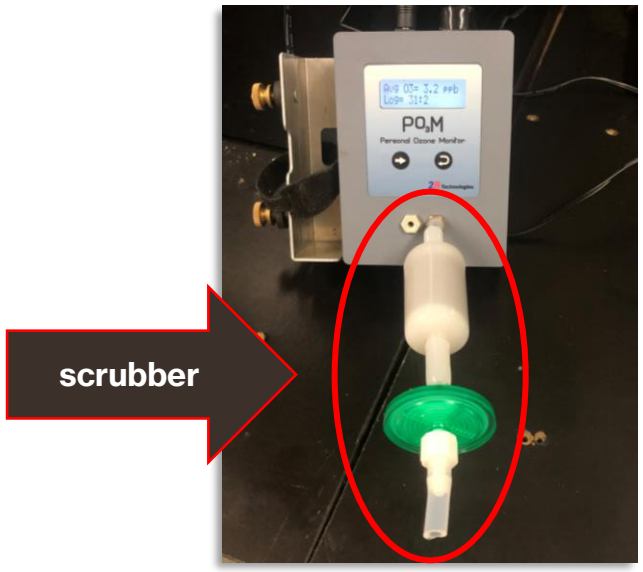
Tropospheric Ozone (prevalent in summer months)

- Ozone concentrations are generally highest in cities and urban areas (emission of cars, power plants, chemical plants, etc.)[4]
- Downwind of cities and industrial facilities can also be affected by ozone
- Ozone is a main ingredient in smog and is considered a greenhouse gas.

4. Environmental Protection Agency

Methodology

- Currently we have stabilized and ran the POM (portable ozone monitor) for 10 days to compare the results with the NYSDEC's data as a baseline.
- Research will continue beyond the summer, measuring ozone with a drone from street level up near NYCHA buildings during heat waves.

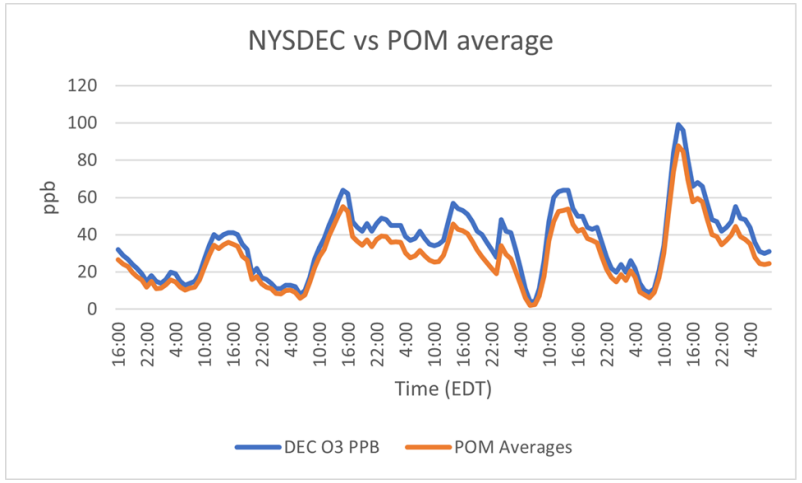


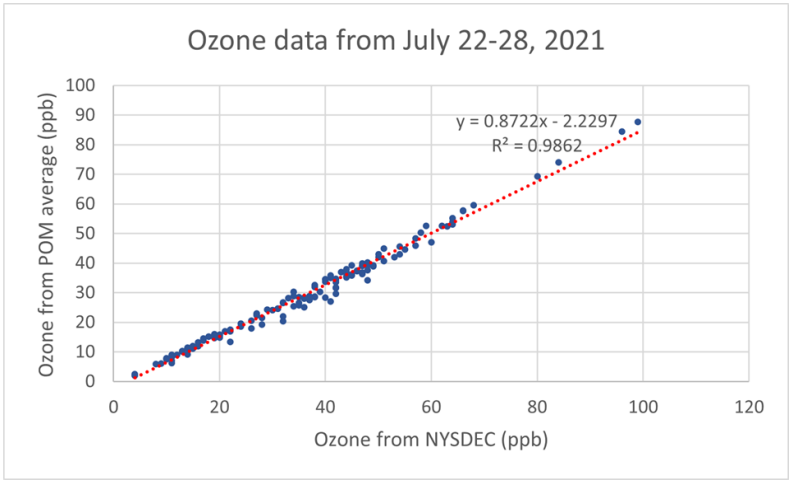
Methodology

- A regression analysis was necessary to determine the relationship between the NYSDEC ozone data and the POM ozone data.
- MATLAB will be used to further analyze and model ozone and health data after the summer.
- QGIS will be used to create visual comparisons amongst the ozone data, health factors and socioeconomic factors.

Results

- The data shows consistent temporal variation trend during July 22-28, 2021
- A strong linear correlation with R>0.98 and a slight underestimate of O3 by POM are indicated.
  - The linear regression results will help correct the POM-measured O3.

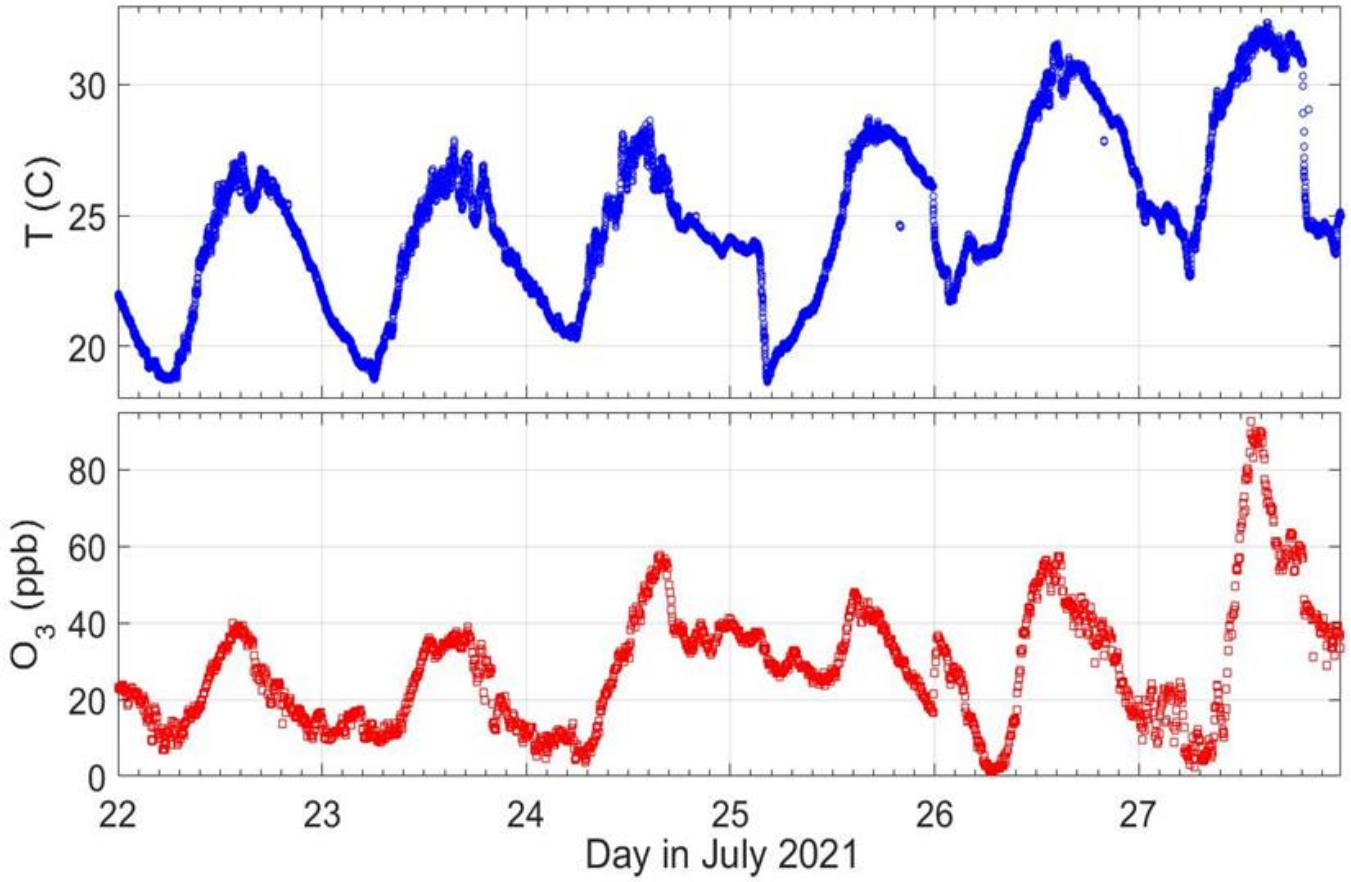




Results

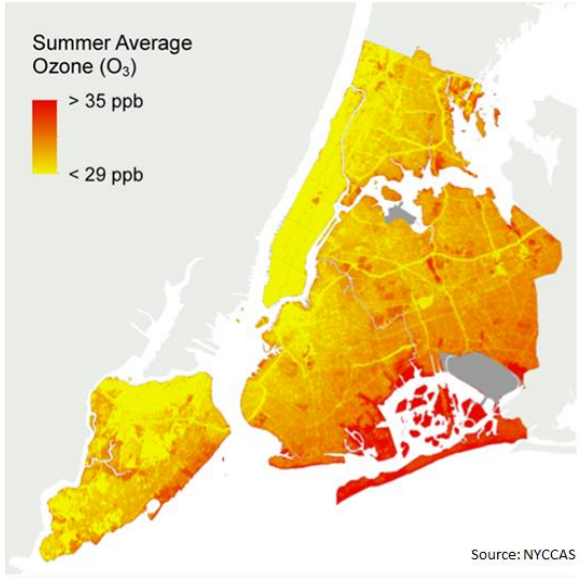
- **High O3 on the hot days (O3>70 ppb on July 27,T> 32.2C or 90 F)**
- Both high O3 and high temperature increases the risks towards human health.
- Ozone data was gathered from POM.

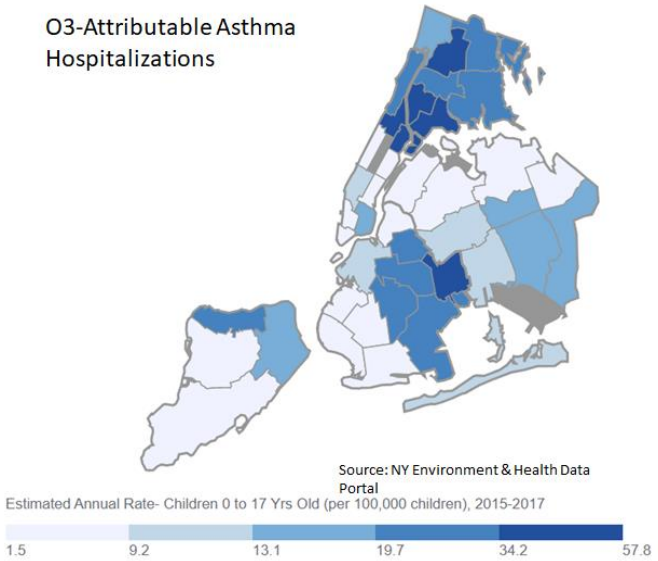
Temperature and Ozone

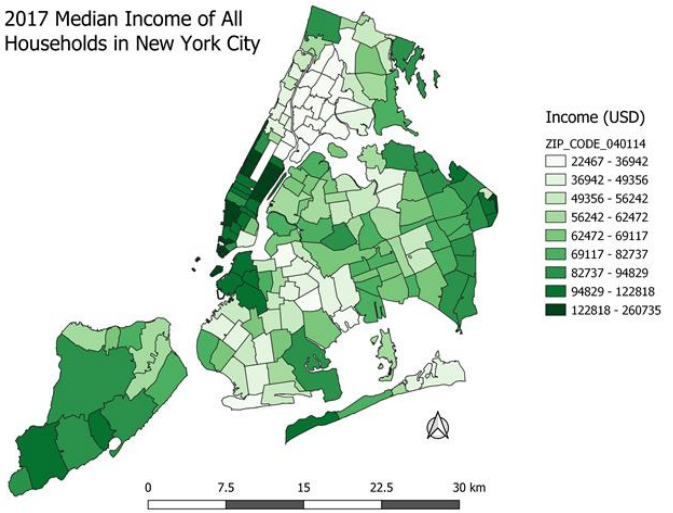


Future Works

- Besides ozone measurements, we plan to gather health, income and other types of socioeconomic status factor data to compare in relation with the ozone level measurement.
- We will utilize QGIS to map out the income levels, ozone related health hospitalization and ozone levels will help visualize the possible correlation.







Conclusion

- This research will help in understanding socioeconomic disparities and its correlation to air pollution exposure.
- This research will also provide meaningful insight to the NYCDOH, NYSDEC and FDNY.

Image by Scott Graham

Acknowledgments

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42 U.S.C. § 7401 (1970)

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THANK YOU!
Image by Marc Wieland