An Analysis of Community Resilience and Response Capacity to Systemic Air Quality Threats in the South Bronx

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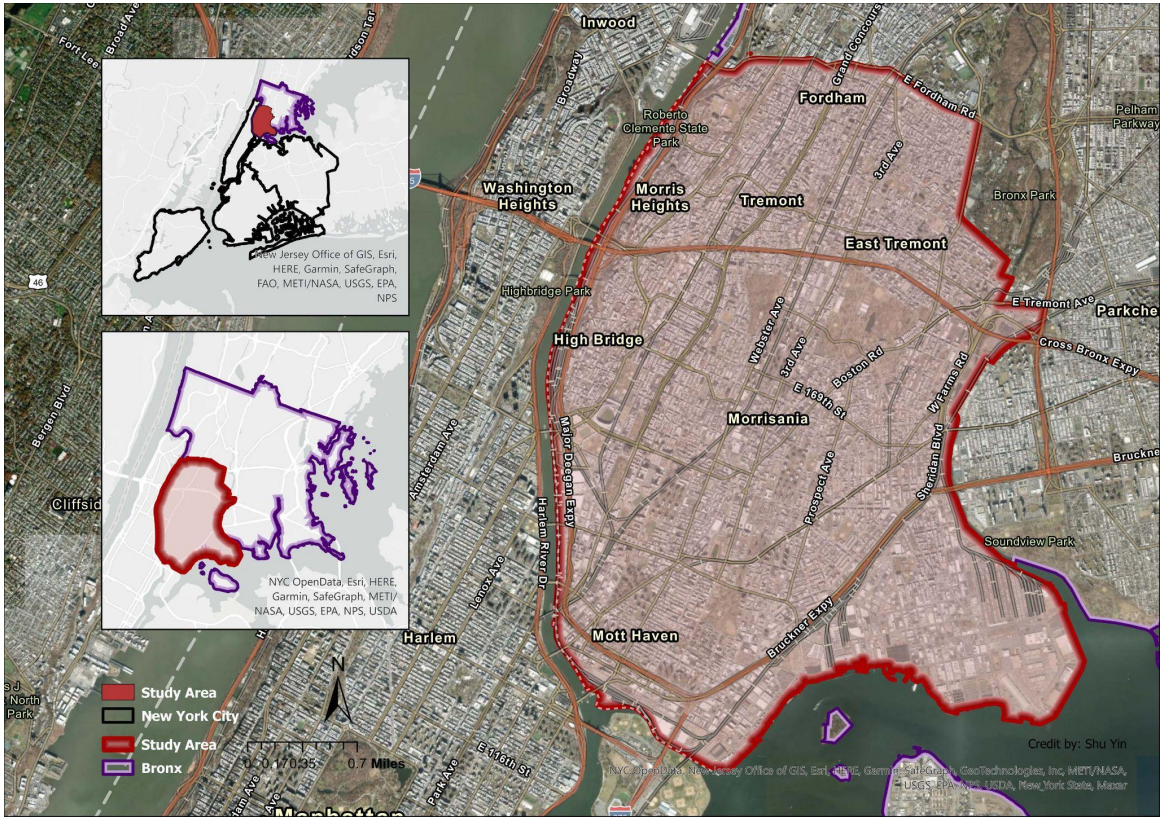
Project Location



Project Background

'Asthma alley': why minorities bear burden of pollution inequity caused by white people

The population in the Mott Haven neighborhood in the South Bronx is 97% Hispanic or bl
pollution than is caused by their consumption, and Hispanics 63% more. Photograph: Barry

Op-Ed | It is time for the South Bronx to breathe clean air

By Kaitlin Hiciano

Posted on June 28, 2022

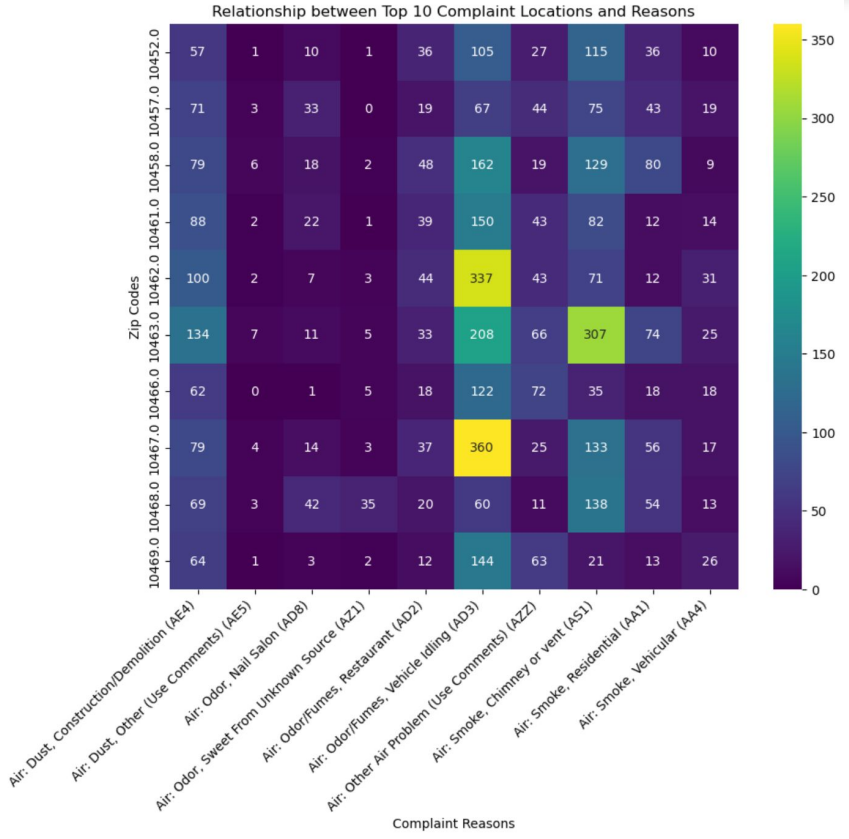
IDEAS AND SOLUTIONS

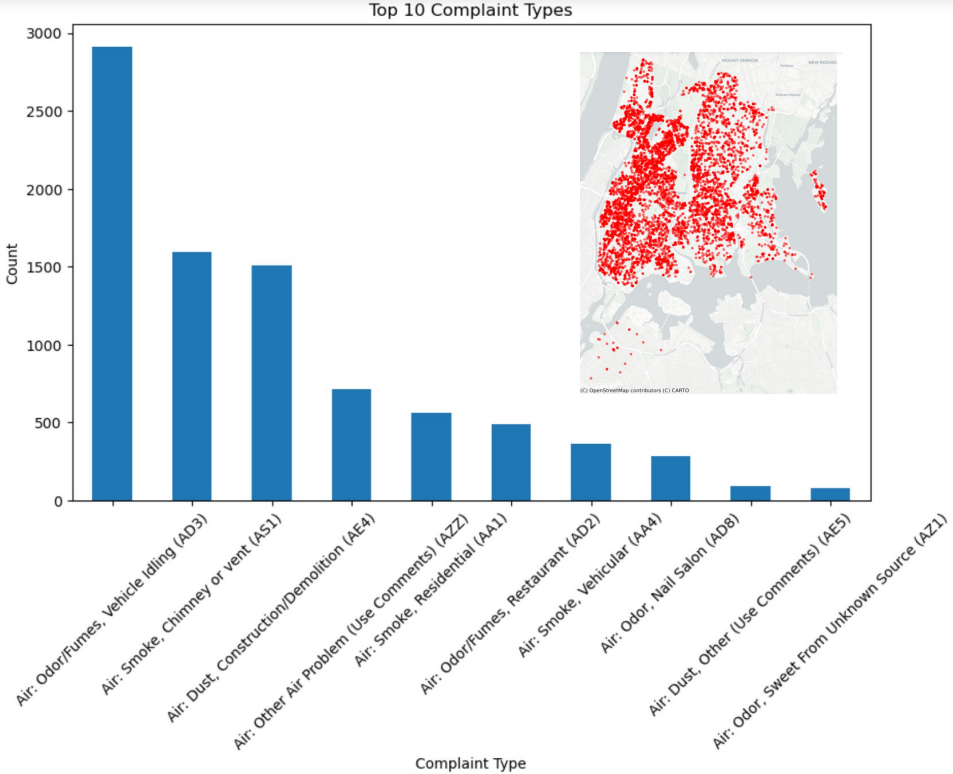
Students Combat Air Pollution in 'Asthma Alley'

A school in New York City is teaching teenagers about the local history of environmental racism. It's inspiring a new generation of student activists who want to fight pollution in their community.

April 21, 2022

311 Air Quality Complaints Data





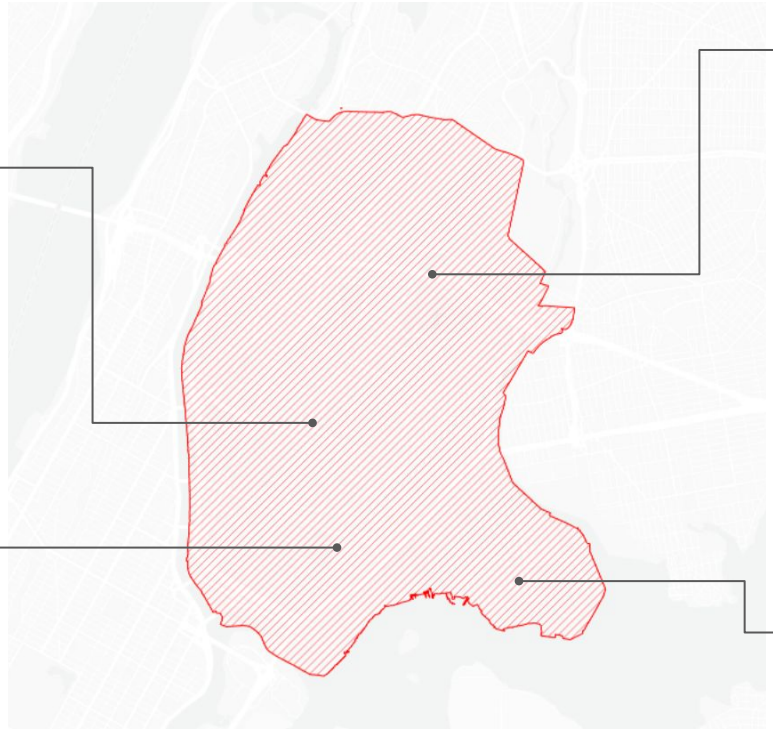
Characterizing the South Bronx

Industrial Contamination

Historical legacies of industrialization, abandoned factories and contaminated sites

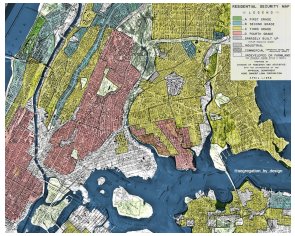
Air Pollution

Proximity to transportation hubs and industrial facilities, high rates of respiratory diseases



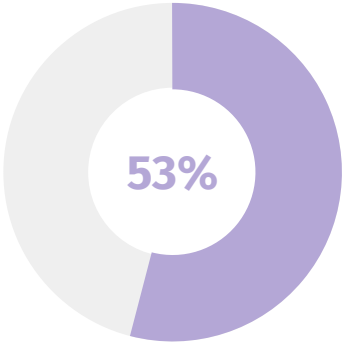
Redlining and Disinvestment

Inadequate infrastructure and housing conditions



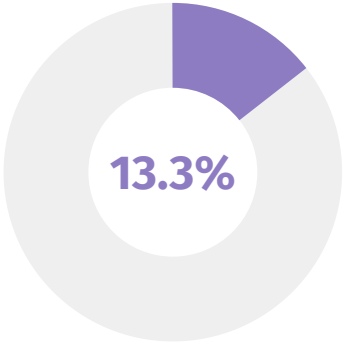
Economic Disparities

Limited Resources for community development alongside high poverty rates



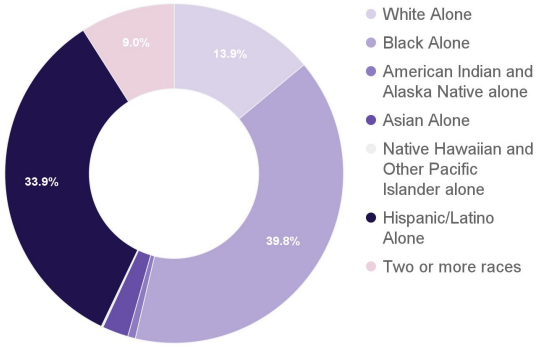
Income

53% of households in our study area earn less than $35,000 yearly.



Unemployment

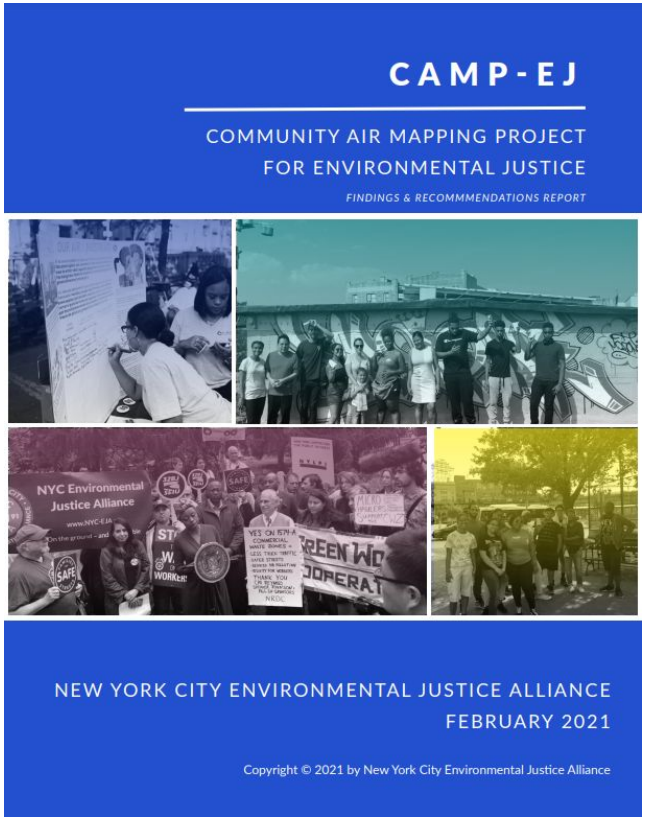
Unemployment rate averages 13.3% as opposed to 5.4% across New York.

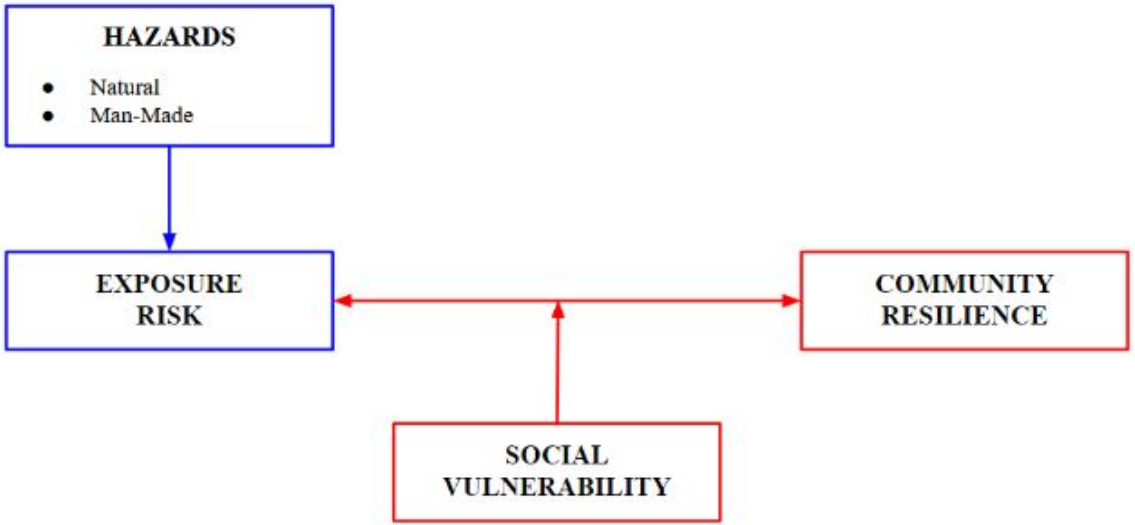


Race and Ethnicity

The study area comprises **39.8%** of people who identify as Black alone and **33.9%** of people who identify as Hispanic/Latino alone.

Defining the Problem





Research Question

HOW TO CHARACTERIZE THE EFFECTS OF SOCIAL VULNERABILITY ON RESILIENCE-EXPOSURE DYNAMICS IN THE SOUTH BRONX?

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HOW TO CHARACTERIZE THE EFFECTS OF SOCIAL VULNERABILITY ON RESILIENCE-EXPOSURE DYNAMICS IN THE SOUTH BRONX?

- Geographic Variations → **SPATIAL ANALYSIS**
- Compounding Elements → **FACTOR ANALYSIS**
- Assessing Impacts → **RISK MODELING**

Methodology

Framework

Key Issues

- Exposure Risk
- Community Vulnerability
- Resilience Capacity
- Cumulative impacts

Relevant Theories

1. Burden of air pollution is carried by the most vulnerable (Mikati et. al, 2018)
2. Proximity to polluting sources increase vulnerability (Shearston et al, 2020)
3. Multivariate Indexes are useful in order to devise holistic policies (Tuccillo & Spielman, 2022)
4. Air pollution is only one of the many components contributing to environmental injustices (Beevers & Williams, 2020)

Outputs

Prioritization framework through risk index

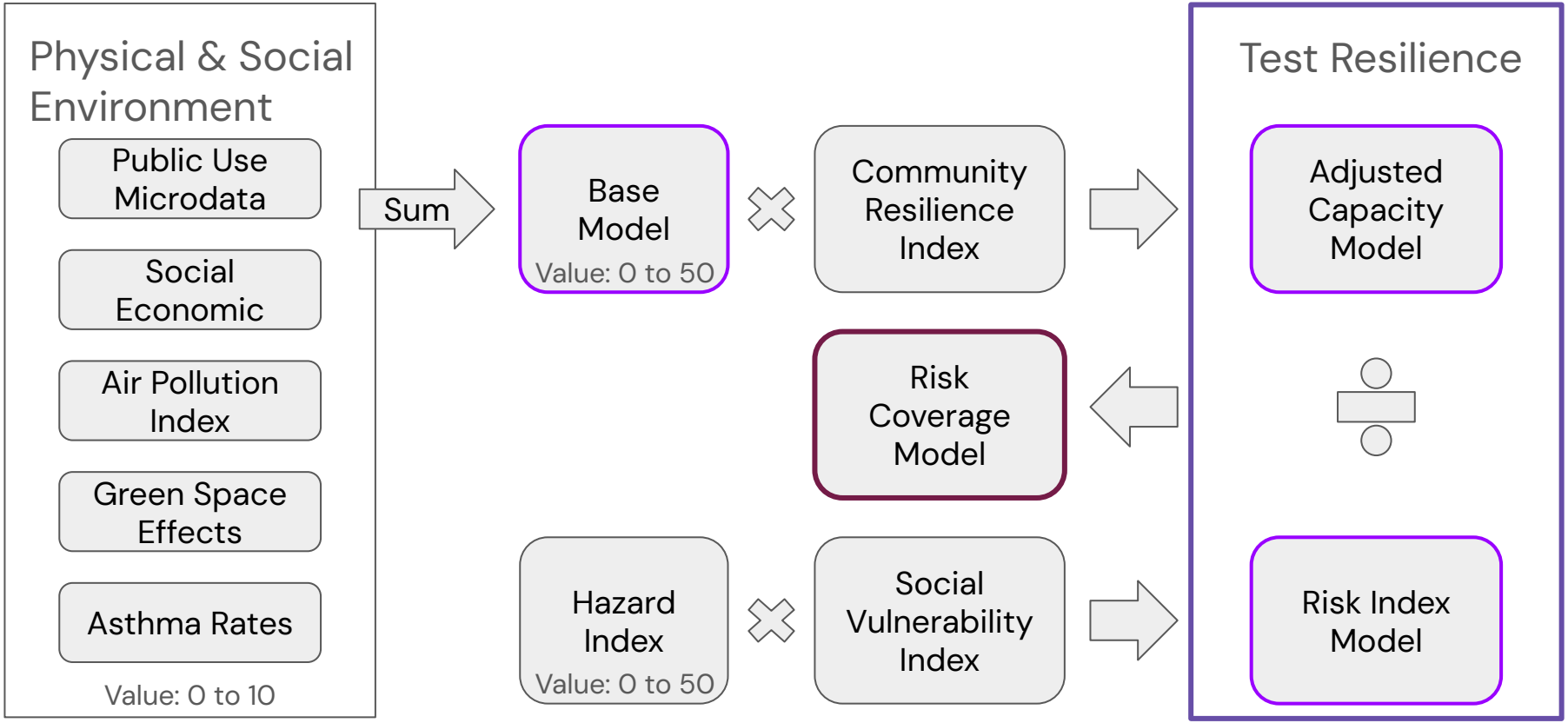
Discursive analysis through stakeholder interviews

Policy Recommendations

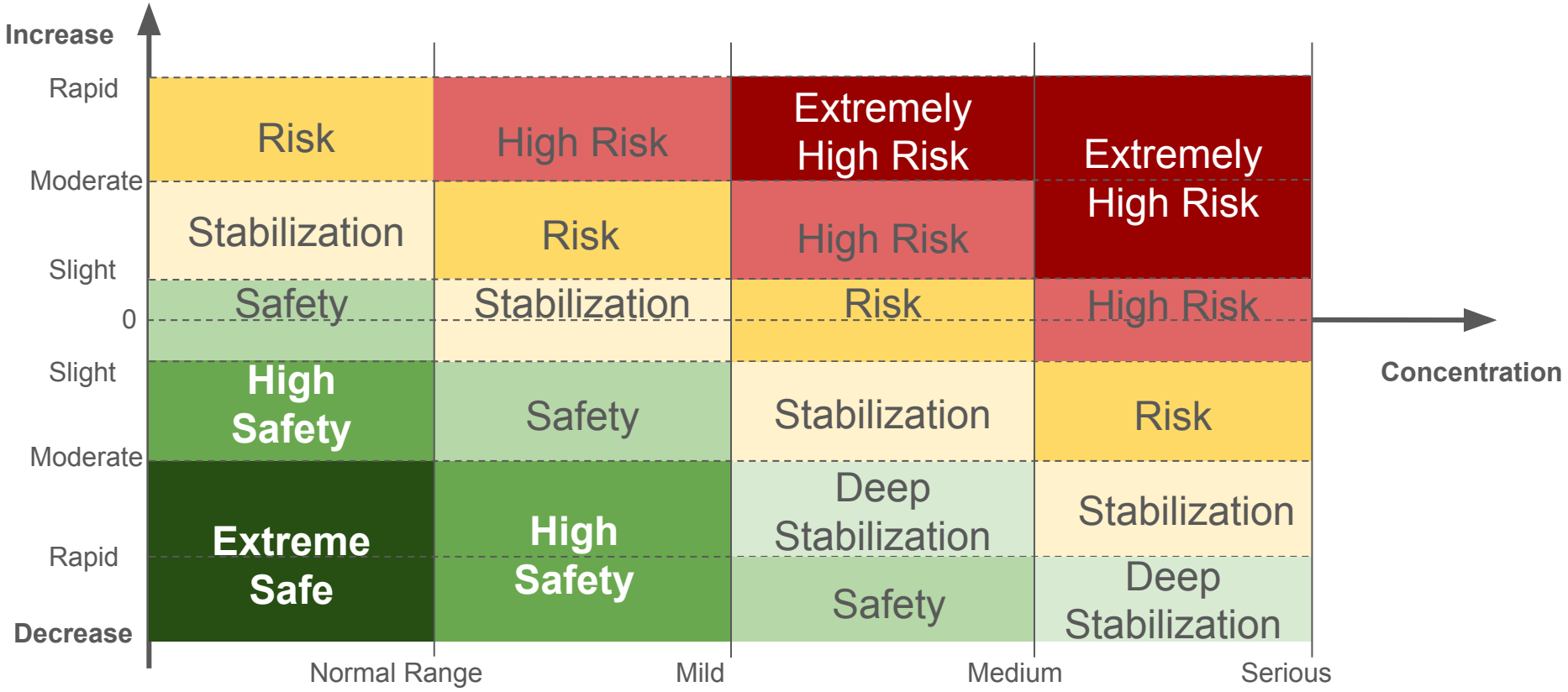
Methodological Limitations

- Mixed methodology and **availability of qualitative data**
- Non-responses for interviews
- Potential **measurement errors**
- **Confounding variables**

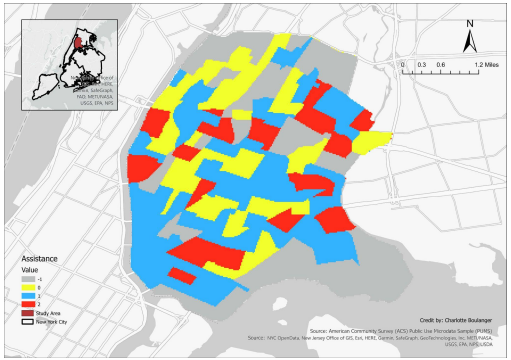
Conceptual Framework for Risk Model



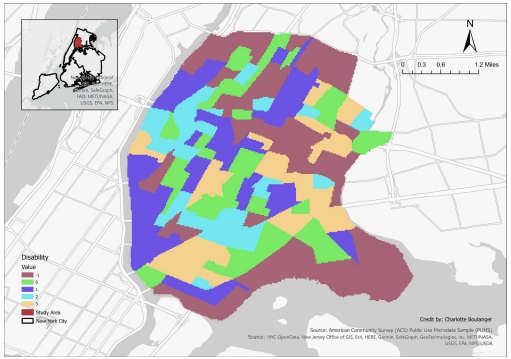
Base Model Indexes Standardized Matrix



Factors Contributed to Base Model —— Public Use Microdata

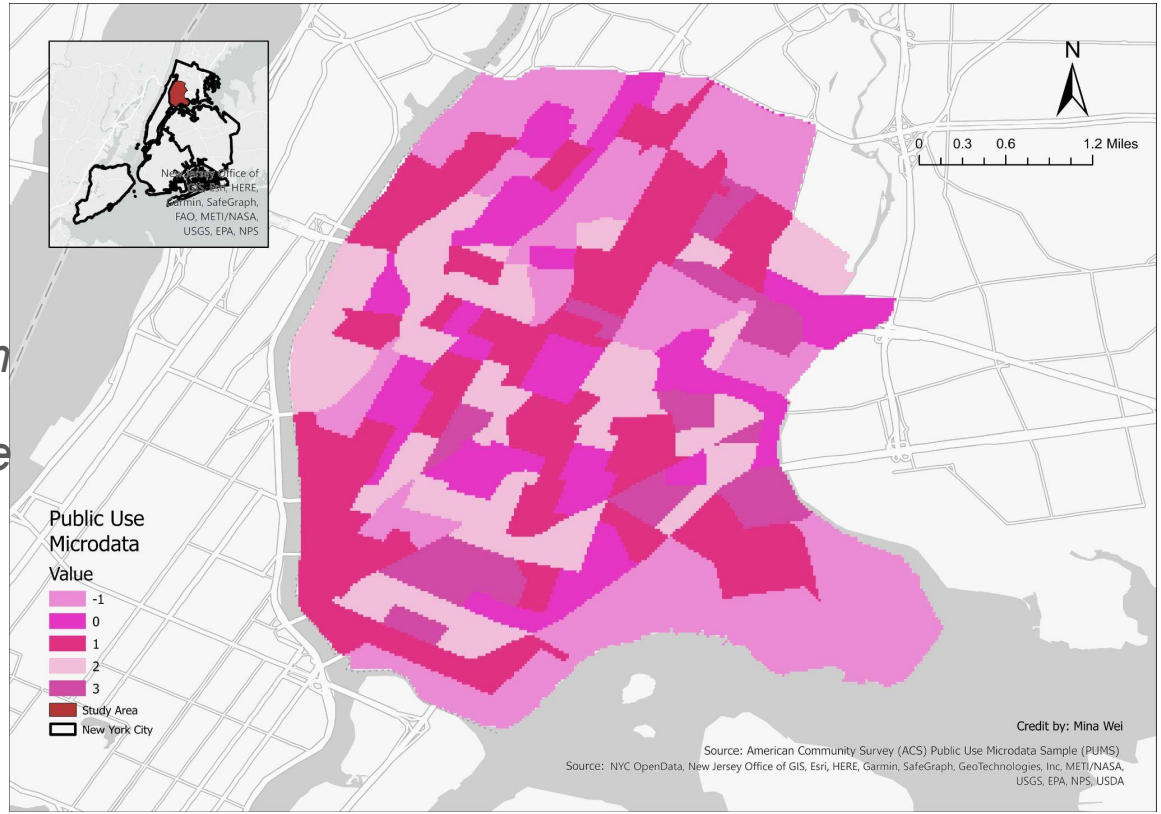


Assistant

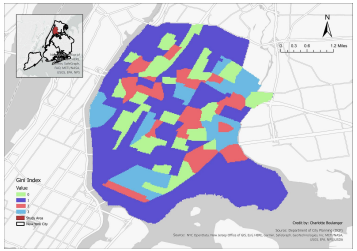


Disability

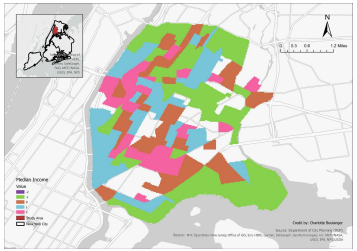
Mean Value



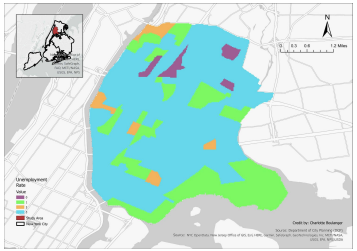
Factors Contributed to Base Model —— Social Economic



Gini Index

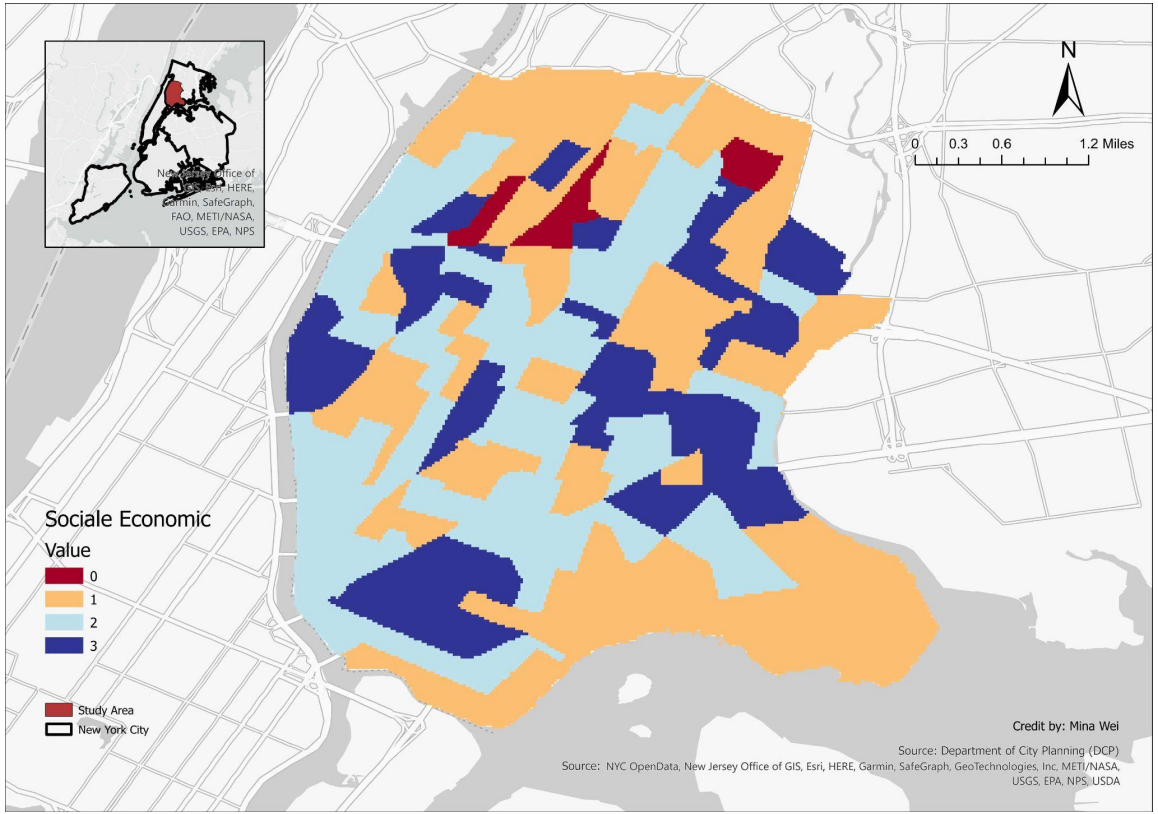


Median Income Index

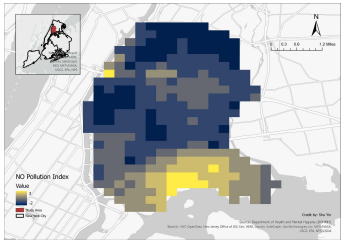


Unemployment Index

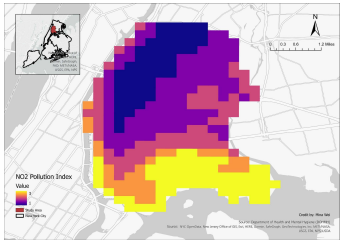
Mean Value



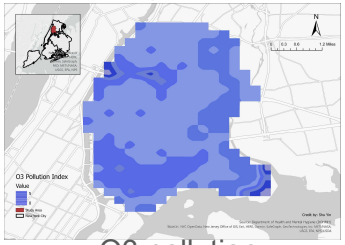
Factors Contributed to Base Model —— Air Pollution Index



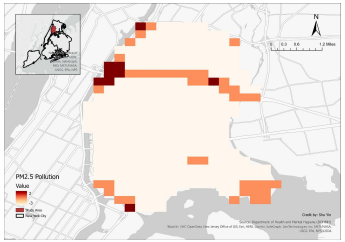
NO pollution



NO2 pollution



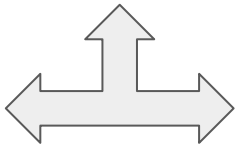
O3 pollution

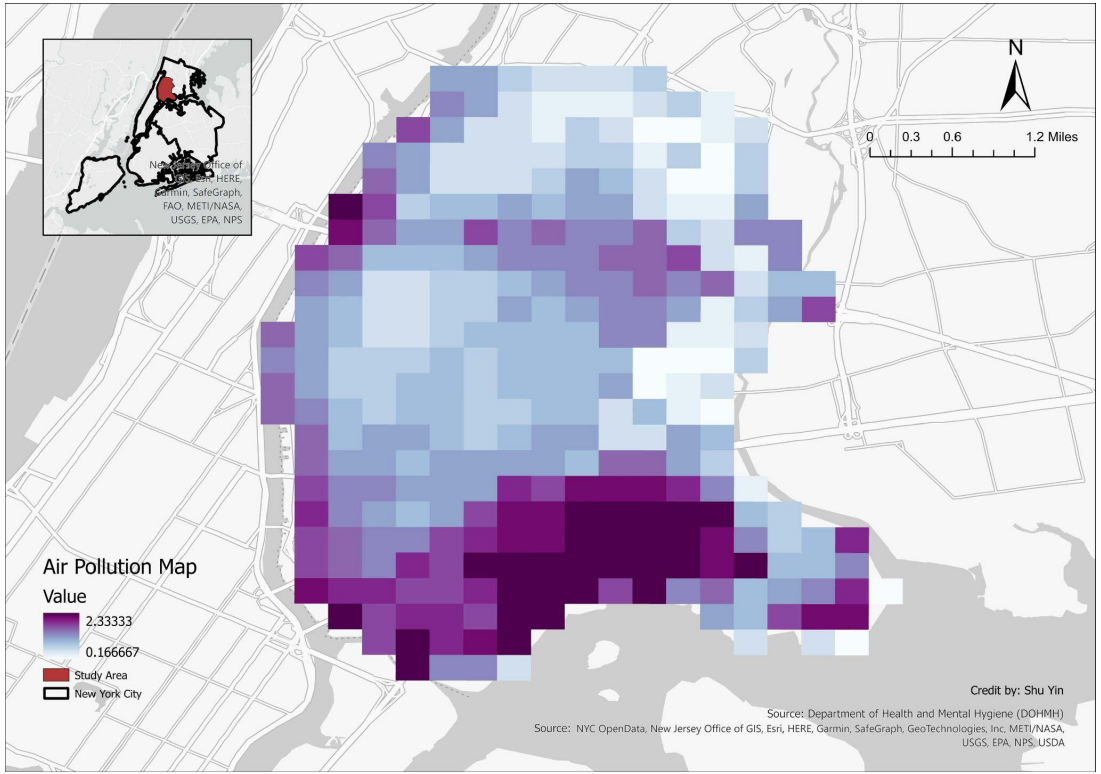


PM2.5 pollution

Mean

Value



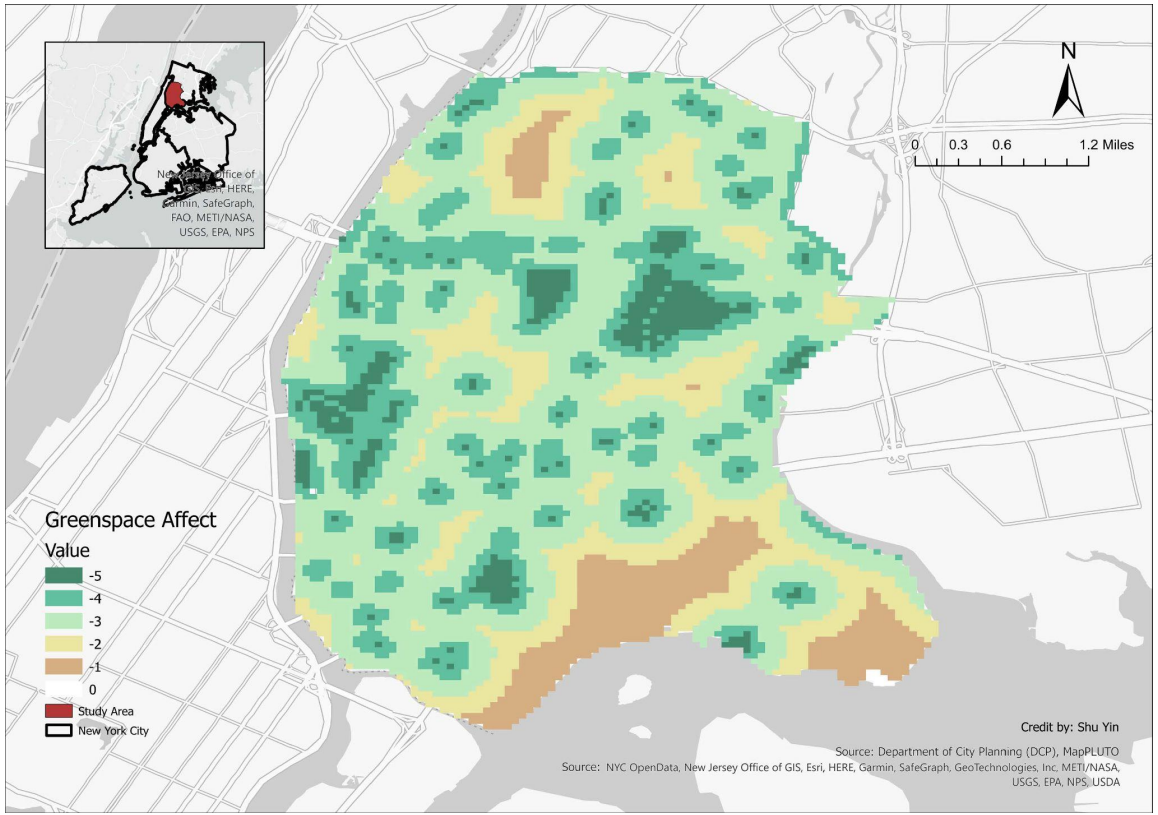


Factors Contributed to Base Model —— Green Space Effects

Distance to Green Space	Effect Value
0 m (green space itself)	-5
100 m	-4
300 m	-3
500 m	-2
1000 m	-1
Above 1000m	0

Extremely Strong

Slight



Factors Contributed to Base Model —— Asthma Rates Index

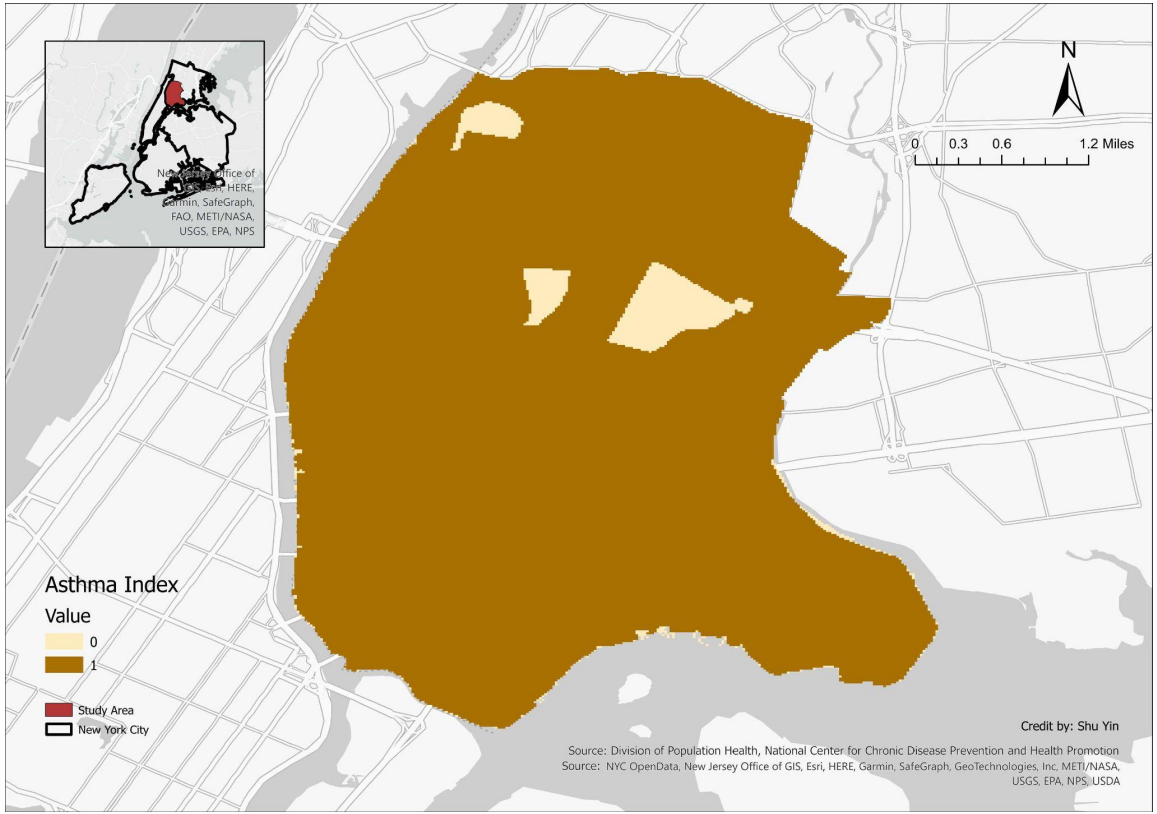
Based on the prevalence of asthma among children in the United States of America of approximately 9.4%

The prevalence of asthma among adults of approximately 7.7%

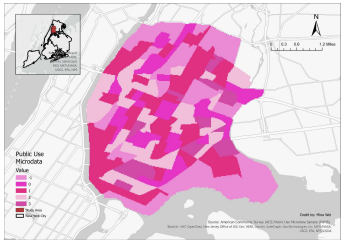
The mean standard for overall asthma prevalence was calculated to be 8.091%.

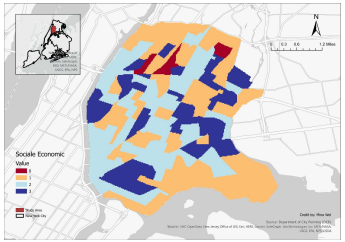
While the minimum air pollution levels for NO2 (1.5 µg·m−3) and PM2.5 (0.4 µg·m−3) were estimated to prevent 23% and 33% of incident cases, respectively

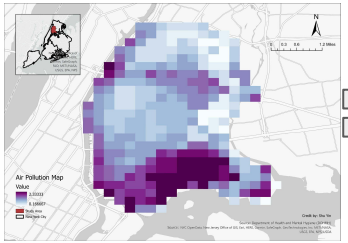
→ get the edge affected percentage to the max value (33%)

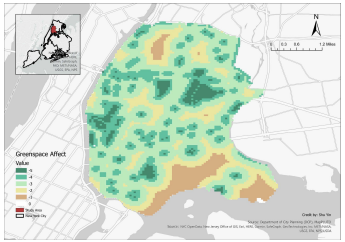


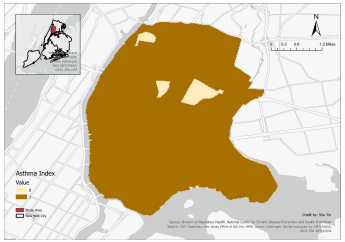
Base Model and Indexes

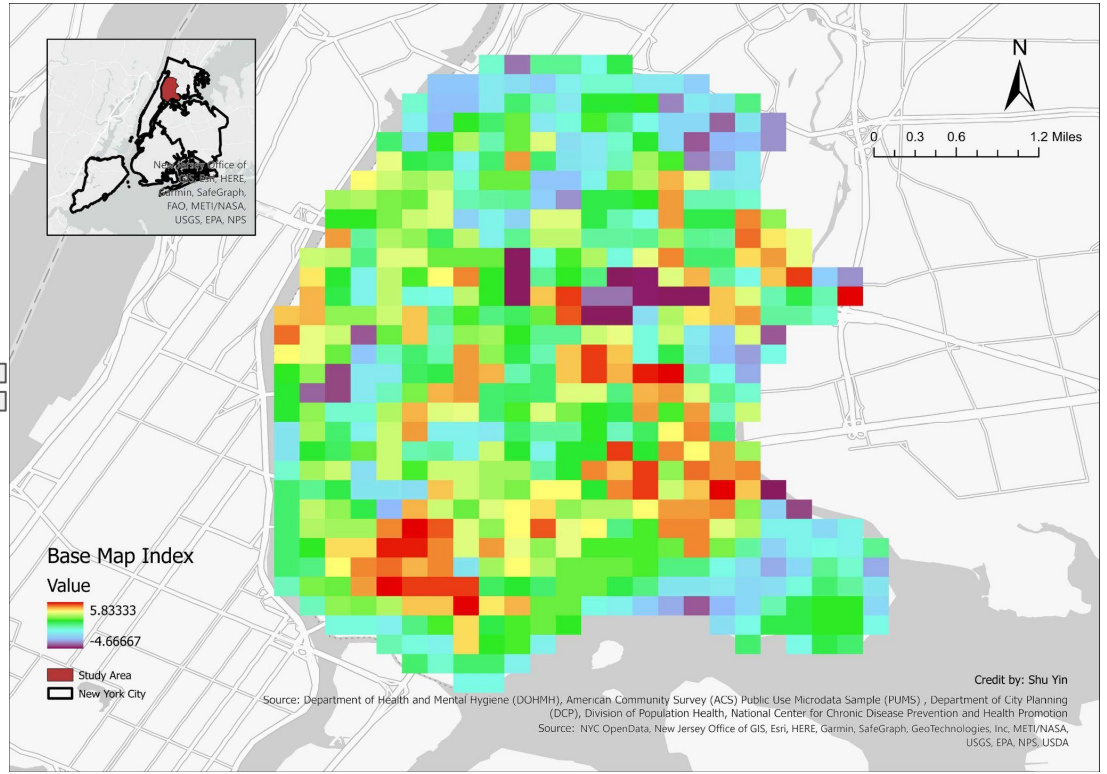




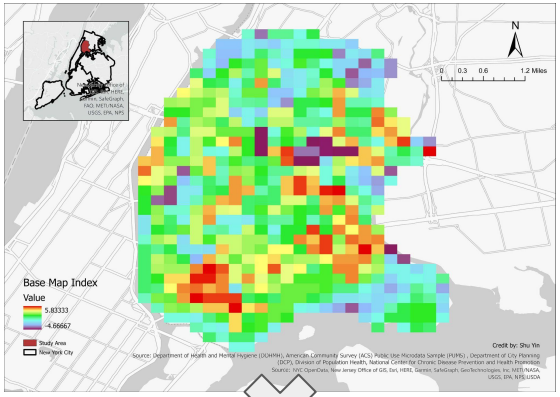


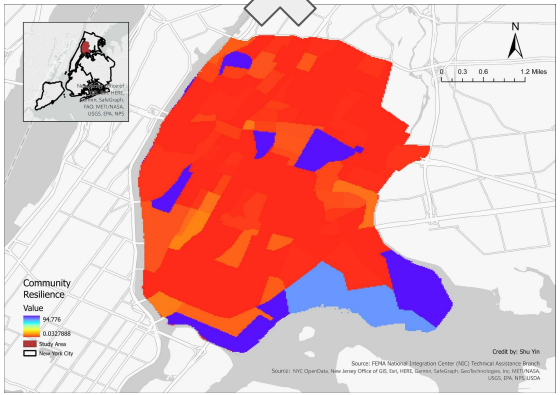


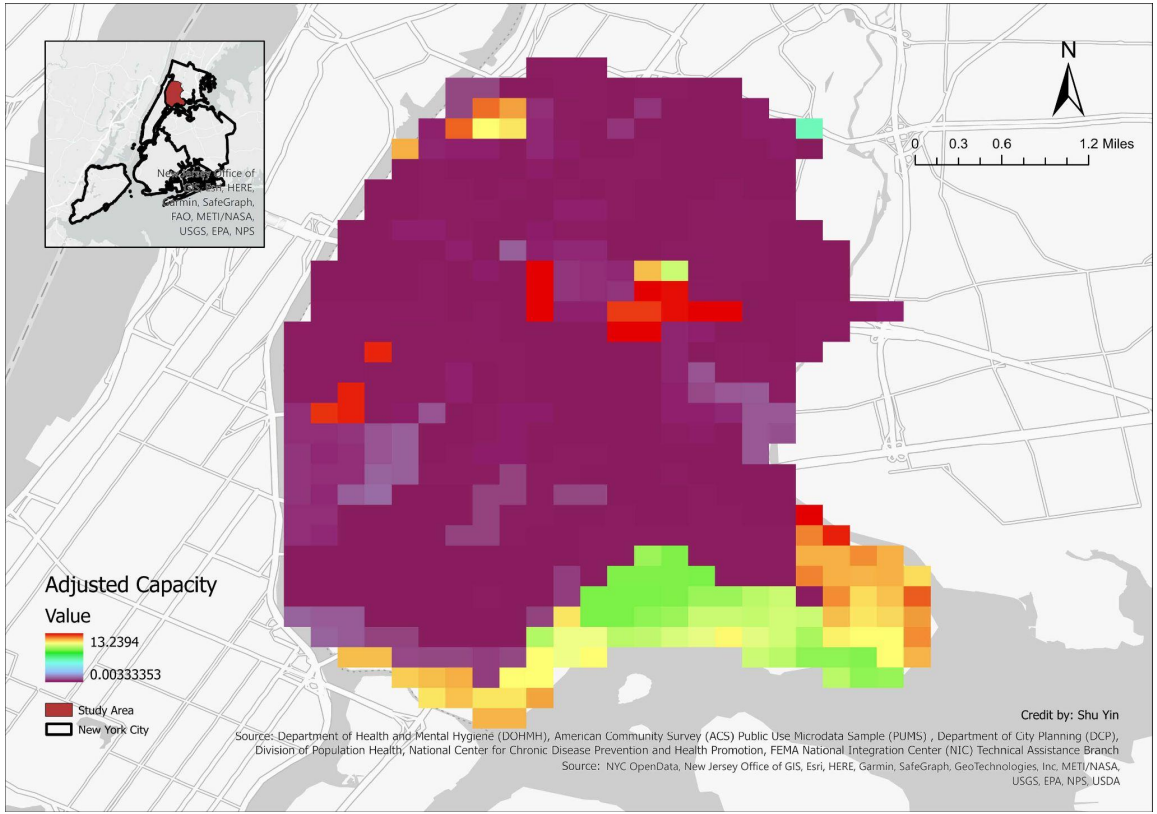




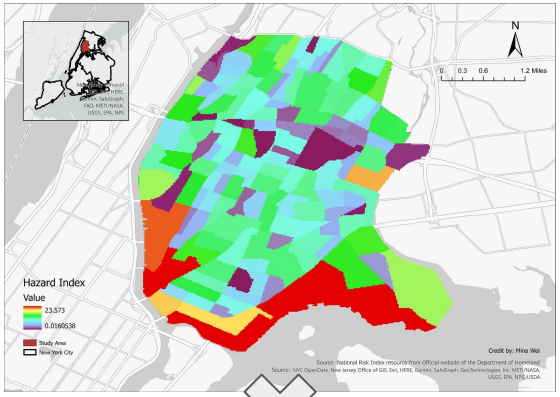
Adjusted Capacity Model and Indexes

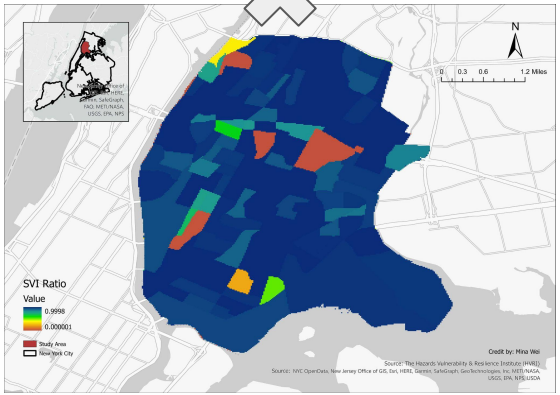


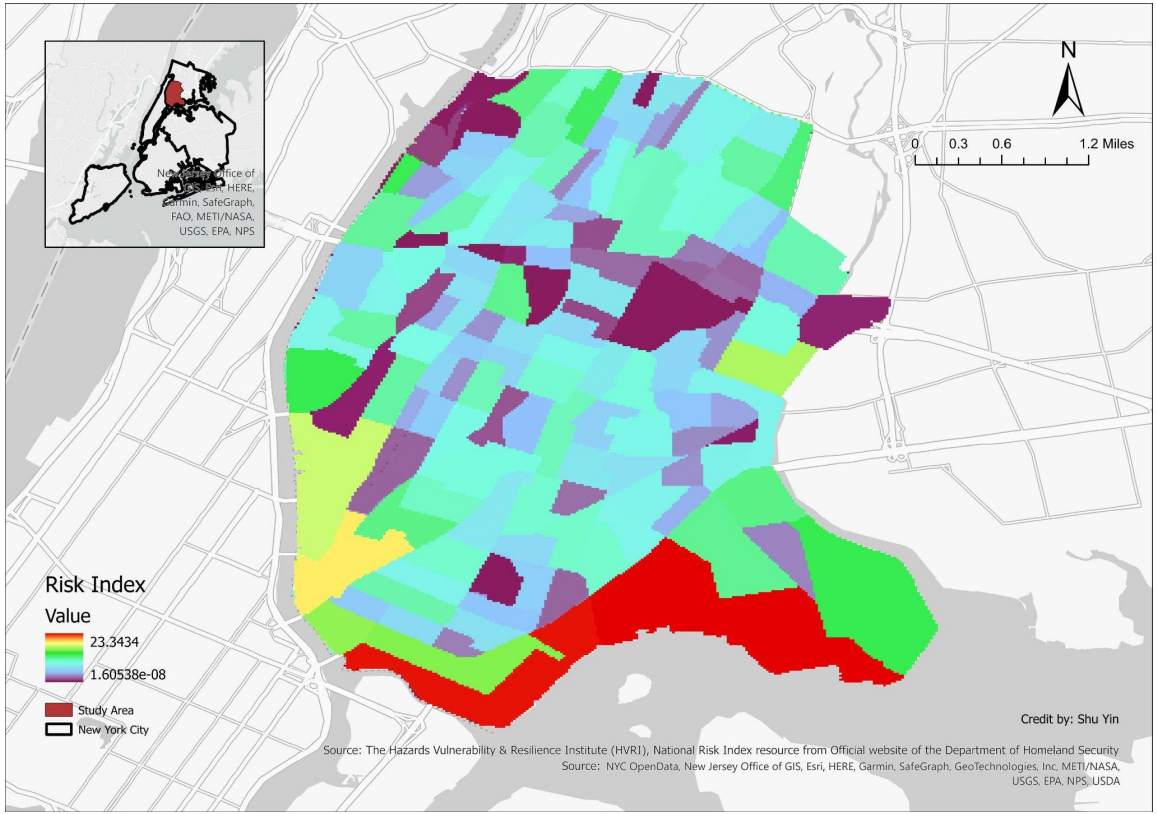




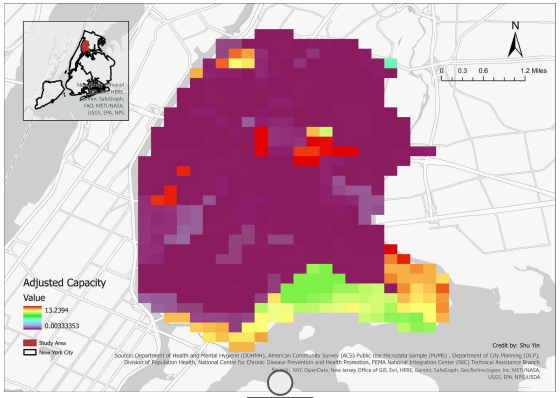
Risk Index Model

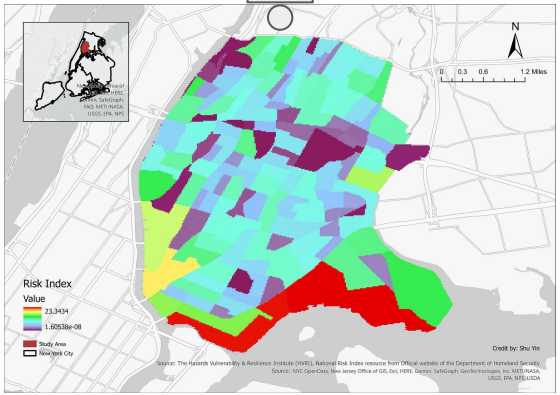






Risk Coverage Model





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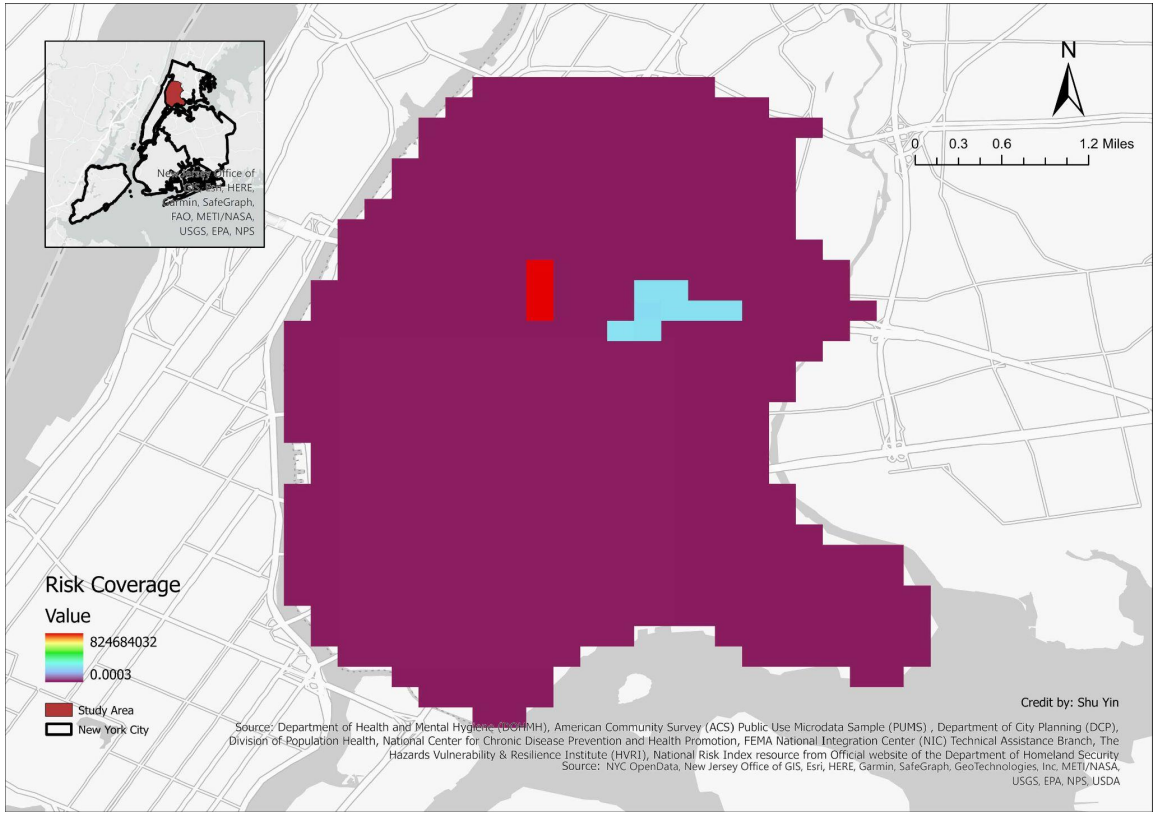

Summary

- **Physical and Social Environment:** Negative values are usually closely associated with green spaces and schools. And factories as well as main roads pose a higher risk to the area.
- **Carrying capacity of communities to cope with disruption:** In the affordability-oriented maps, the results are more positive for wealthier areas. Areas represented by factories and environmental justice ghettos are less resilient.
- **Risk Distribution:** Areas of human activity in the region are at greater risk of natural hazards along their natural boundaries.
- **Matching Community Resilience to Disaster:** Mismatch between carrying capacity and risk values. It is clear that the social resilience of this community is low.

Interview

Cesar Yoc
CD1 Board Member and Urban Planner,
Founder of the Bronx Institute for Urban Systems

- Deplores the **increased rate of construction projects combined with remaining hazardous sites** such as the Peaker plants in Port Morris and the waste stations near the Bruckner Expressway.
- Identifies **car traffic, idling trucks and fossil fuel use** as the most crucial contributors to air pollution vulnerability.
- **Data is not sufficient on its own,** rather data needs to be accompanied by the implementation of innovative projects in order to truly address environmental injustices.
- Promotes a **systemic approach** that accounts for existing *"holons within holons"*, with future plans and policies that promote equity above all.
- **Alternative energy infrastructures** might become problematic and disproportionately affect communities of color in the long run.

"**Residents are not engaged.** It is mainly volunteers and staff from Environmental groups that are engaged on advocating for policies to reduce air pollution and water contamination. Many people in the South Bronx are under **economic pressures and have little time to focused on those issues**. [...] Even if residents are engaged, there is a **lack of vision** of what should happen."

Words to describe the neighborhood:

GENTRIFICATION, JUSTICE, DIVERSITY

	Very satisfactory	Satisfactory	Neutral	Unsatisfactory	Very Poor
How would you characterize environmental activism in the neighborhood?		✔			
How would you characterize your interactions with governmental/municipal agencies in promoting climate justice?			✔		
How is the speed of response to residents' demands for air quality as a management and decision-making body?			✔		
How satisfied are you with current environmental policies governing the neighborhood?				✔	

Main Research Findings

- There is a very obvious lack of risk coverage which attests to the vulnerability of the overall study area.
- Green spaces and wealth are the most important contributors to resilience capacity.
- The most at risk areas are geographically located near warehouses and main transportation hubs even after considering aggregated data.
- Awareness of environmental injustices is negatively correlated with existing policies.
- Data on its own is not sufficient, as it needs to be public facing and operationalizable to be efficient, yet it can still be a very powerful tool.

Recommendations

- Implement policies that prioritize the development of green infrastructure and open spaces in environmental justice neighborhoods.
- Integrated models can be used as precedents for cumulative impact assessment in policy-making.
- Community engagement is to be grounded in realities and devise innovative, low-stakes action plans.
- Establish policies to ensure equitable funding and resource allocation for environmental remediation.
- Enhance collaboration between government agencies, communities, and other stakeholders.
- Formulate tangible and innovative issues that will get citizens involved, planners as advocates and mediators


Q&A

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