



**PLACE-BASED  
INDICATORS  
PROJECT**

*Designing Standard Measures  
of Community Impact*

**Welcome!**

*We will begin shortly.*

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# Using Data to Explore the Impact of Green Space on Communities

*Reflections from the*

*Green Space Data Challenge*

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# The Place-Based Indicators Project

- Place-based indicators help us answer important questions about our communities
- At the Place-Based Indicators Project, we aim to:
  - Point people towards high quality indicators which already exist
  - Outline processes for developing new indicators when they do not already exist

# The Green Space Data Challenge

- How can green space data provide actionable information about our communities?
- Categories
  - Community Health
  - Community Safety
  - Specific Populations
  - Physical Environment



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**Green Space Data Challenge**

# **Uncovering Inequities in Green Space**

**Modeling an Environmental-Social Green Space Index  
to Improve Community Health and Equity**

**Team Member: Jia Xu, Yingtong Zhong, Tianyu Shi, Yimin Sheng**

# Motivation

## Motivations

- The challenges of polluted air and water and overcrowded cities pose a significant threat to the health and well-being of urban communities.
- Green spaces play a crucial role in promoting community cohesion and well-being, increasing property values, and delivering positive environmental, social, and financial outcomes
- Measuring the impact of green spaces on communities solely by their greenery overlooks their potential to enhance fitness and wellness in urban areas.

## Project Objectives

1. Model the **Environmental-Social Green Space (ESGS) Index** for each county in the U.S. as a cross-group demonstration and measurement.
2. **Examine the relationship between ESGS and specific demographic groups** so as to provide key insights and recommendations to improve environmental and social justice for disadvantaged groups.

## Environmental Social Green Space



**Fitness**



**Greenery**



**Wellness**



# Research Design

## Innovative Research Design

- Merged county-level data from **4** data sources, **13** features are identified
- Differential Evolution Algorithm are used to construct the ESGS index that integrates fitness, greenery, and wellness sub-level indexes

## Prioritizing Equity

- Analyze the ESGS index in **8** different demographic groups to ensure that green space impact on community health is equitable

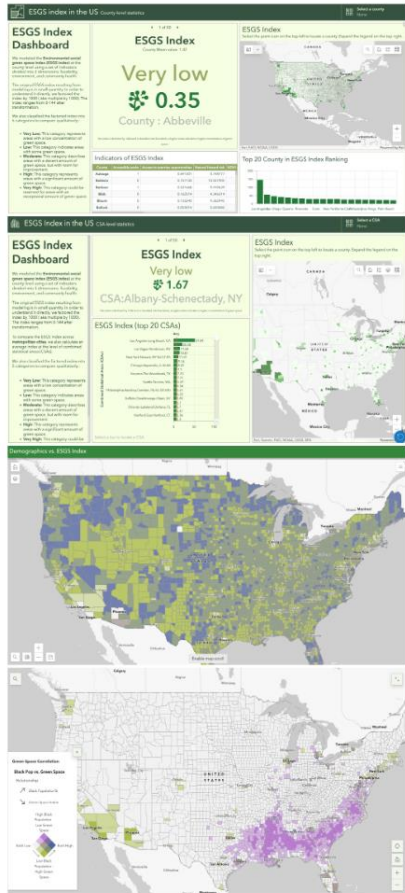
## Rigorous Validation

- Regression analysis and sensitivity analysis are used to validate the constructed index and ensure its accuracy and reliability



# Results

## ArcGIS Visualization



## Insights

### Insight 1

Metropolitan cities are privileged in enjoying ESGS compared to other areas

### Insight 2

#### ESGS distribution reveals demographic inequities

- In West's inner counties, ESGS inequities magnify with the aging population.
- ESGS equity challenges in Southern counties with the high Black population.
- Limited green space options compound challenges for impoverished populations mainly in Southern inner counties.
- Southern inner counties face challenges with violent crime and limited ESGS.

## Recommendations



More accessible and age-friendly park and recreational facilities



Policy on encouraging access to green spaces



Governments should improve green space safety and security

## Key Takeaway

Addressing geographic and demographic disparities in ESGS is crucial for promoting environmental-social justice and green space equity.



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**Q & A**

**Team Member: Jia Xu, Yingtong Zhong, Tianyu Shi, Yimin Sheng**

# To Combat Gun Violence, Green the Neighborhood

Zhaowen Guo  
Shuang Wu  
Chenyue Cao  
Yiwen Wang

University of Washington & Georgetown University



GEORGETOWN UNIVERSITY

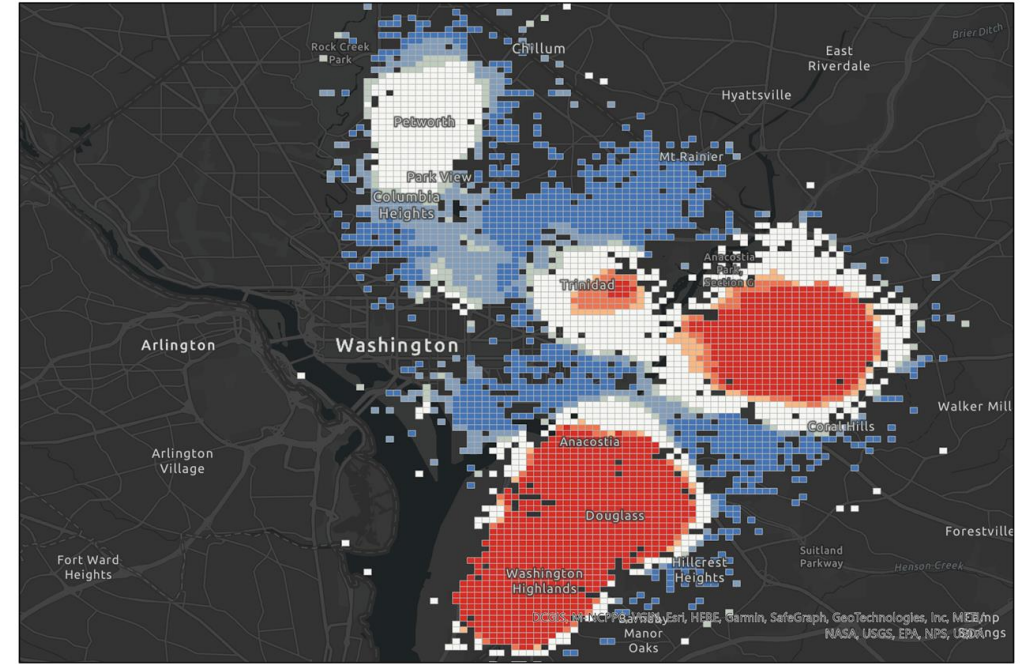
**W**  
UNIVERSITY of  
WASHINGTON

## ACCESS TO GREEN SPACE

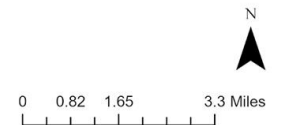
Distribution of tree equity scores across census blocks in the US



## Gun Shots Hot and Cold Spot in DC

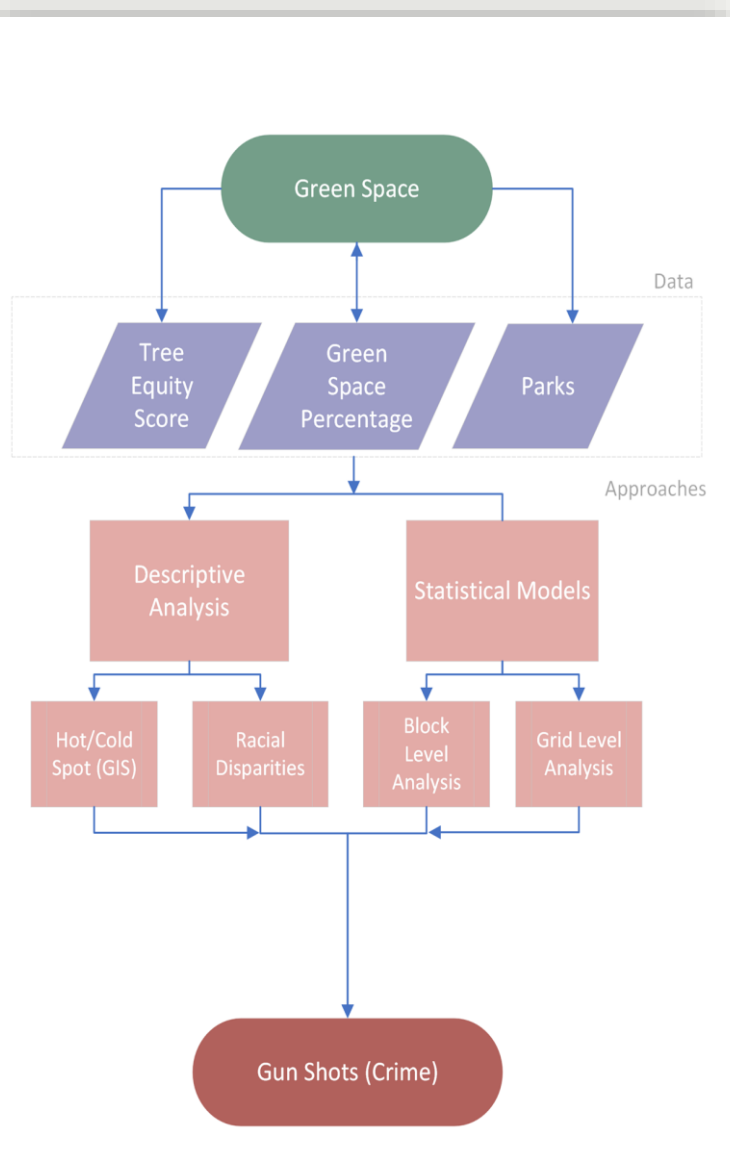


Gun Shots Hot and Cold Spot in DC

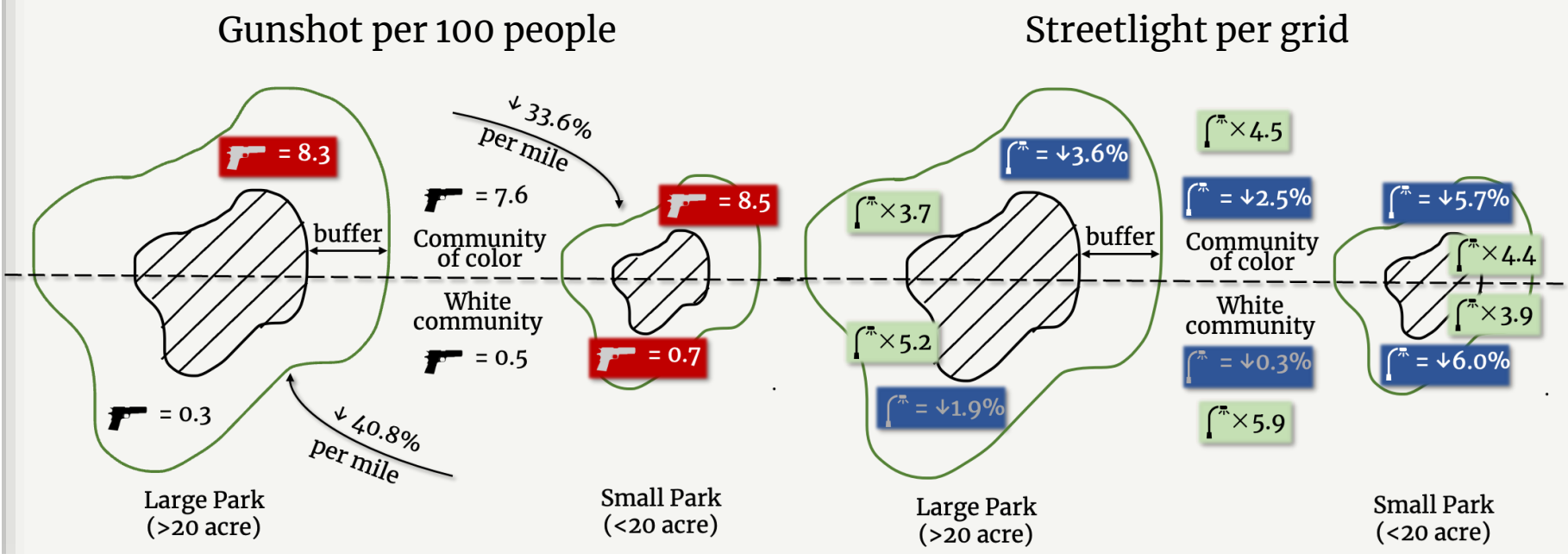
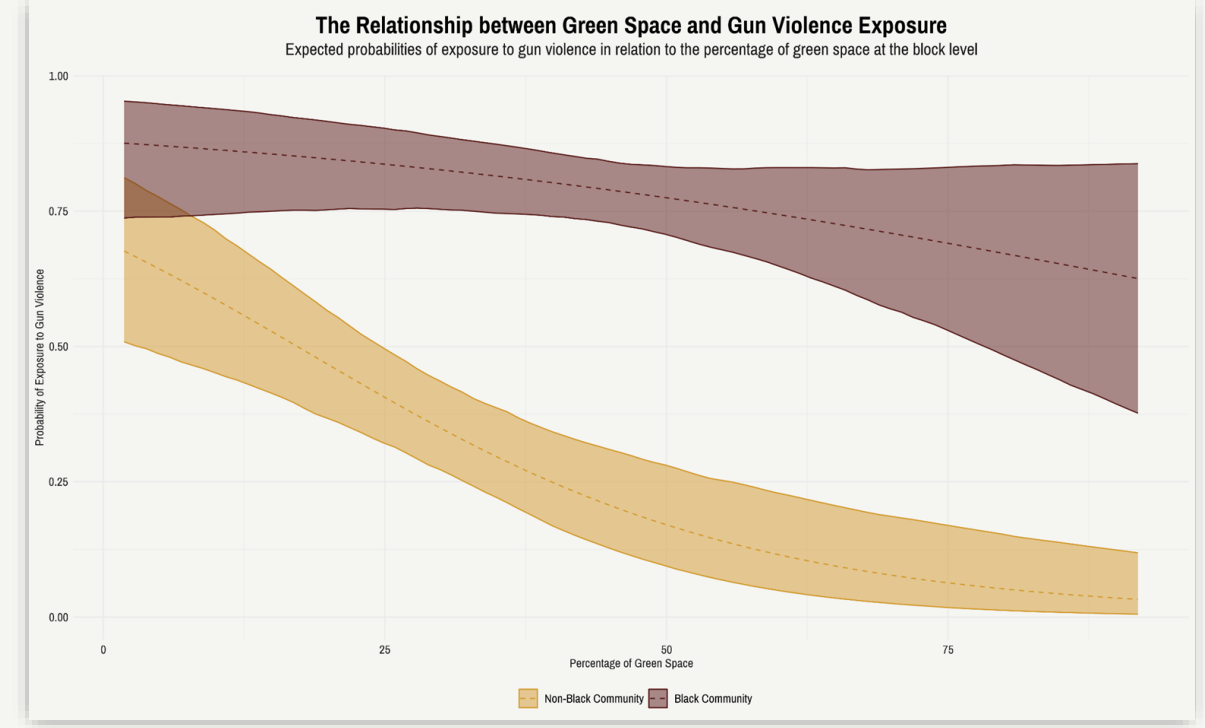


## Research Questions:

1. How does green space affect gun violence in Washington DC, especially on subgroups of the population who have been historically marginalized?
2. What attributes of green space matter in reducing gun violence?



Data Processing Flow Chart



## Conclusion

- Increasing green spaces is associated with reduced crime rates, but this effect is trivial for communities of color
- Sizes of green spaces matter in reducing gun violence for different communities

## Policy Recommendations

- Install additional street lights in parks and surrounding areas to enhance public safety
- Invest in more neighborhood parks for communities of color to provide easier access to safe green spaces



## Acknowledgements

We would like to express our gratitude to the Massive Data Institute Green Space Data Challenge organizers and judges for the support and guidance through the initiation and development of this project.





# A PROJECT ON ENVIRONMENTAL JUSTICE

By Yifan Bian, Kangdong Han

# A General Introduction

## Research Question

Whether non-white people have less green spaces resource than white people in the Washington, D.C. metropolitan area?

## Data

EnviroAtlas: Washington, DC

## Structure

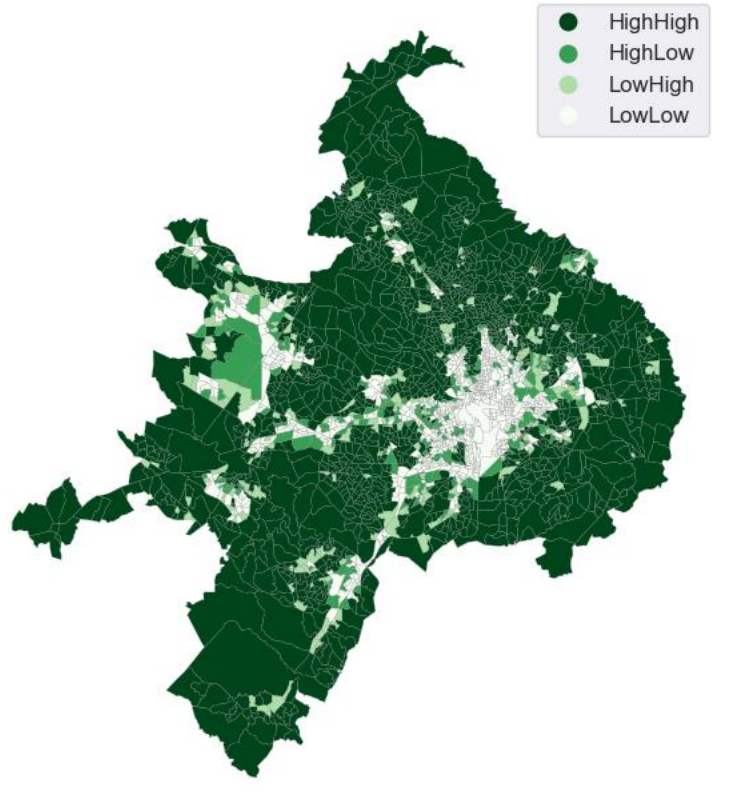
Distribution -- Correlation -- Implication

## Methods

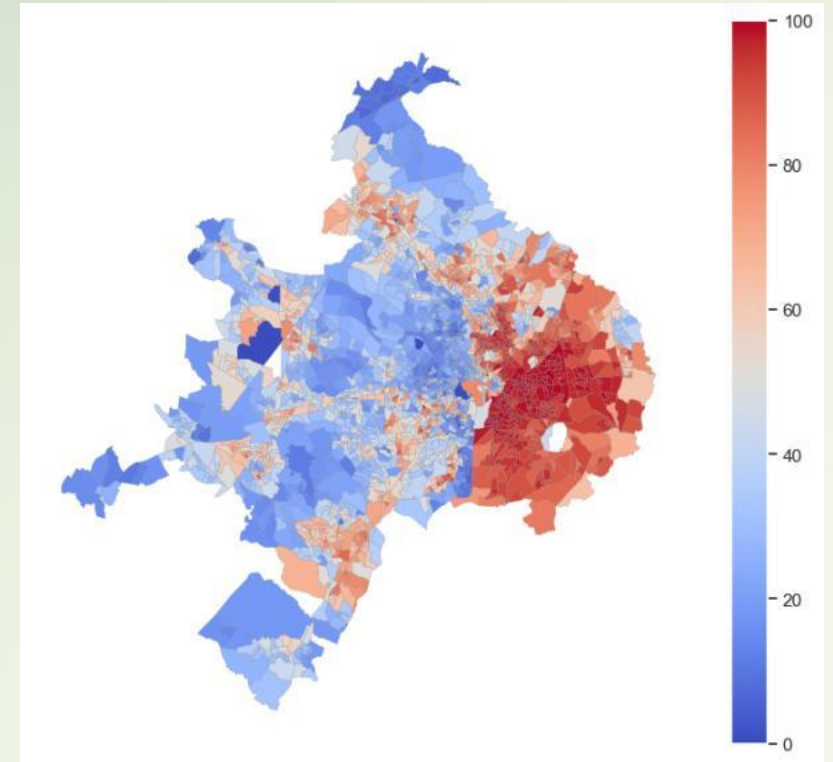
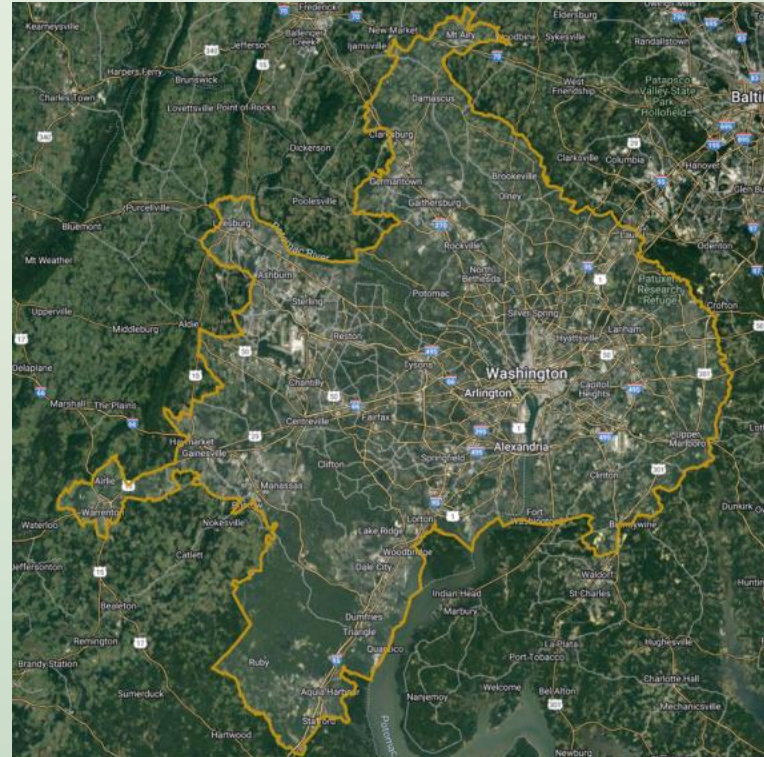
Model: Autocorrelation, Geographically Weighted Regression  
Python Library: Geopandas, PySAL, gmplot, GoogleMap API, Seaborn



# Distributional Analysis



Green Space Rate (Autocorrelation & Satellite map)

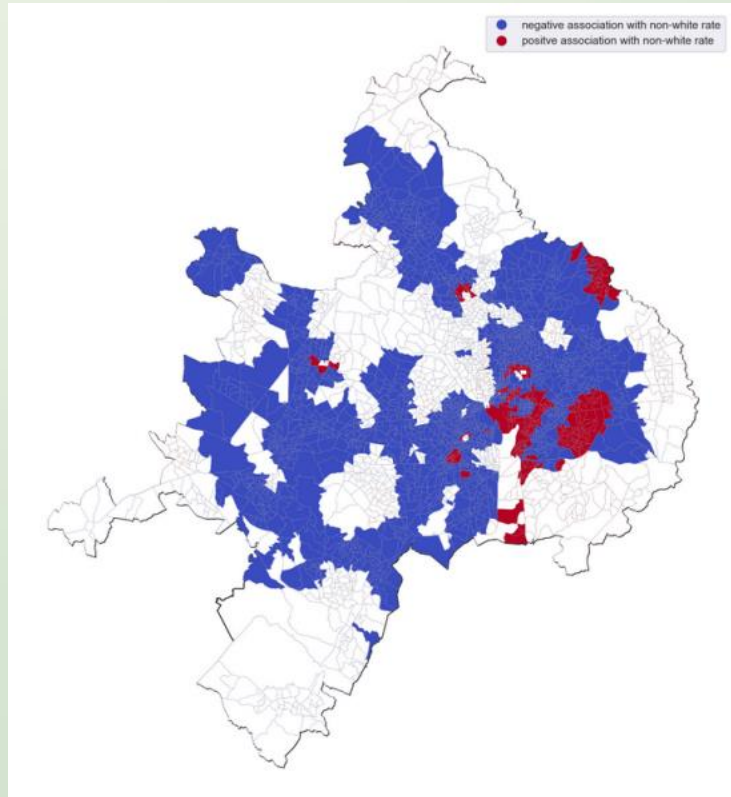


Non-white Resident Rate

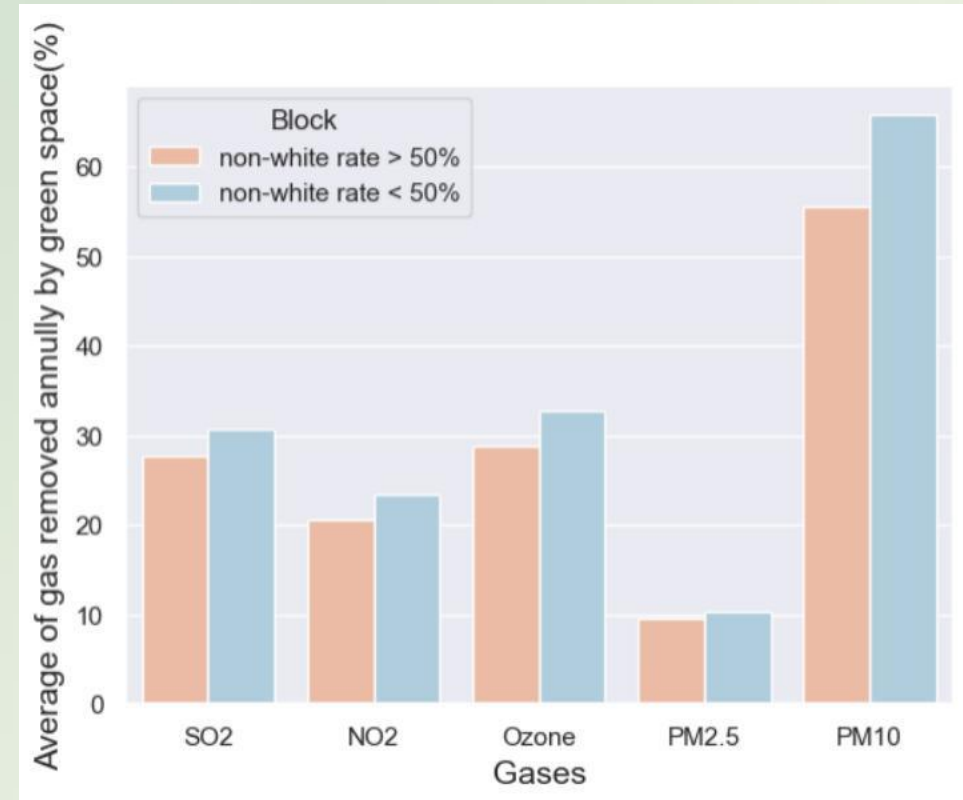




# Correlation and Implication



The relationship between green space rate and non-white rate



The average percentage gases removed annually by green space



# Grading Baltimore's Greenspace

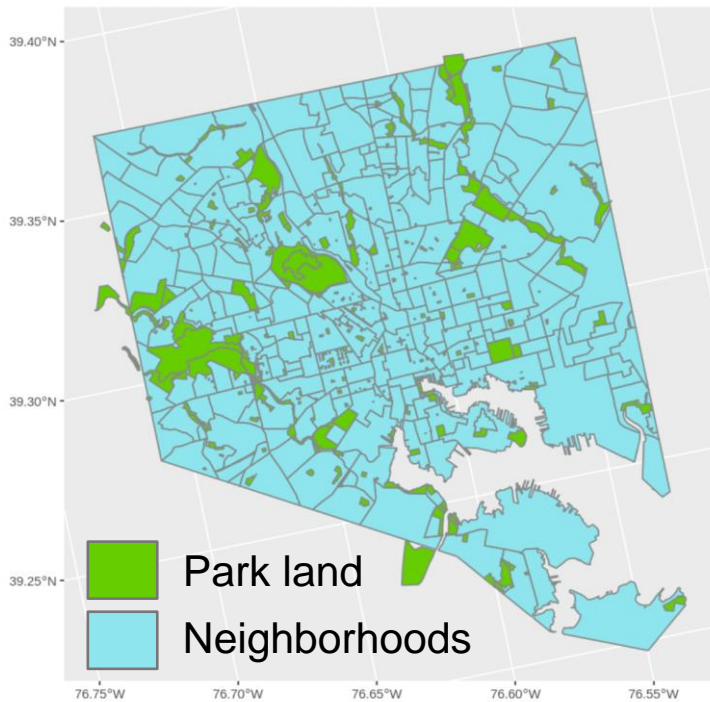
## *Physical Environment*



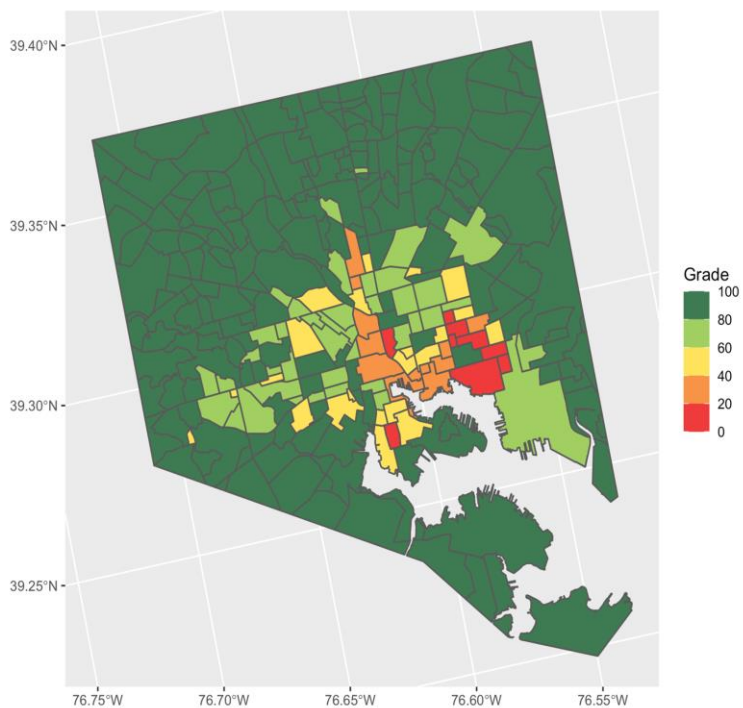
University of Maryland  
CENTER FOR ENVIRONMENTAL SCIENCE  
INTEGRATION AND APPLICATION NETWORK

**IAN Science Communicators:**  
Lili Badri,  
Veronica Malabanan Lucchese,  
Joseph Edgerton





**Baltimore contains about 8% parkland**



**Central neighborhoods have less greenspace per capita**

**Word cloud captures overall positive opinion of Baltimore parks**

# Greenspace scoring has potential

Baltimore's greenspace per capita scored lower for neighborhoods towards the city center

Currently, there are not specific targets for greenspace per capita and further research is needed

Dissemination of information to guide action on greenspace and environmental justice issues



# Attention researchers!

We are now accepting abstracts  
for a special issue of *Cityscape*

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**Thank You**

*Please take a moment to fill out our survey.*

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