

GIS Research

# Heat Vulnerability in DC from an Equity Perspective: Block and Parcel Level Strategies for Dealing with Urban Heat Islands

May 12, 2023  
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# Overview of the research

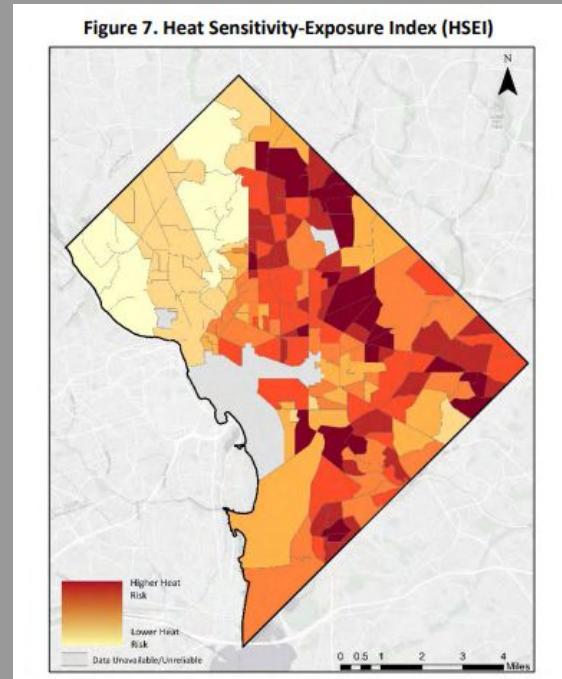
## **Research description**

An urban equity analysis to mitigate the needs of communities of color and communities with greater health risks exposed to heat due to climate change in Washington, DC, and strategic implementation on the block and parcel level.

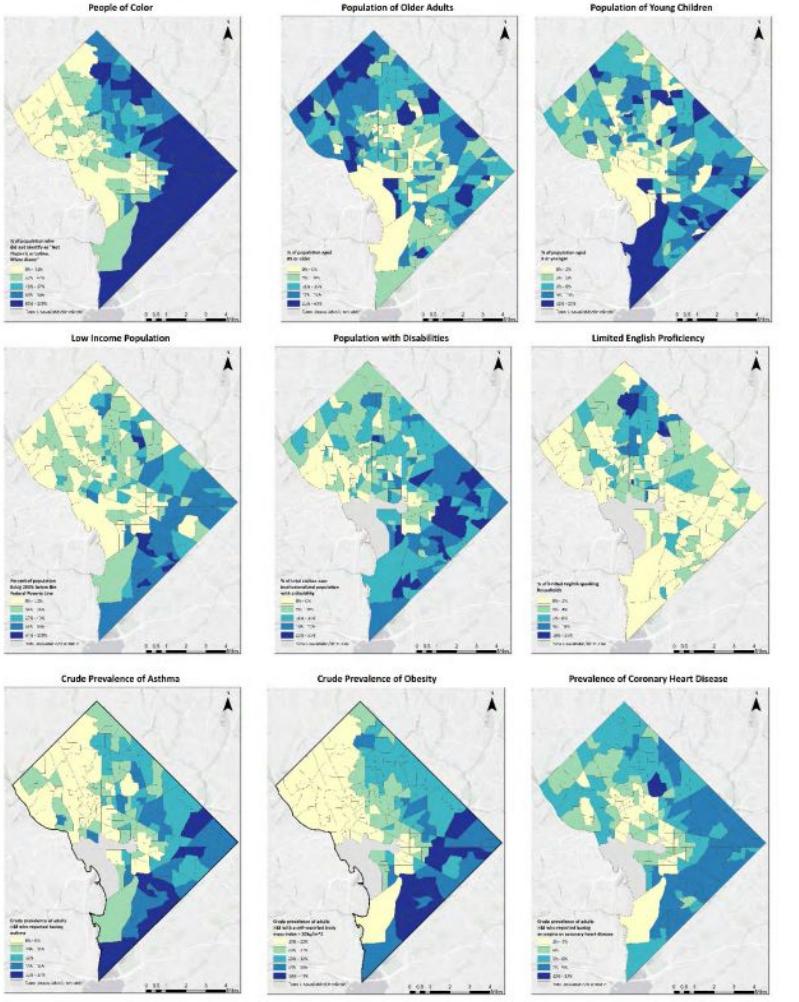
# Previous work done by DC DOEE: Heat Sensitivity and Exposure Index

## Quick Facts

- Census tract level analysis is done by Department of Energy and Environment, under Climate Ready Project in May 2022. They investigated multiple factors and created heat sensitivity and exposure maps.
- A very informative report of the research is given here:  
[https://doee.dc.gov/sites/default/files/dc/sites/ddoe/service\\_content/attachments/Methodology%20Report\\_Update%2005.11.22web\\_0.pdf](https://doee.dc.gov/sites/default/files/dc/sites/ddoe/service_content/attachments/Methodology%20Report_Update%2005.11.22web_0.pdf)



DC Heat Sensitivity & Exposure Map



## SENSITIVITY Factors that DOEE implemented in the model

- People Of Color
- Elderly Population
- Child Population
- Low-income Population
- Disabled Population
- Pop. with limited English proficiency
- Population with Asthma
- Population with Obesity
- Population with Coronary Heart Disease

Figure 3. Map of ambient air temperature exposure in DC

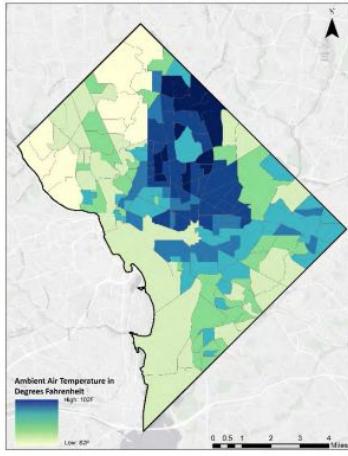
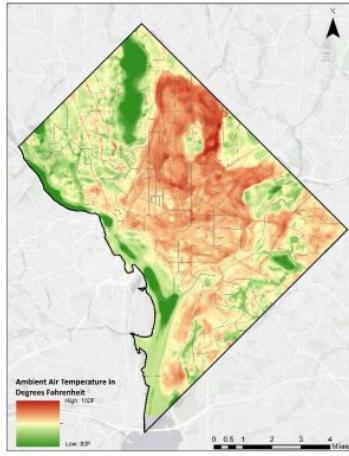


Figure 4. Maps of impervious surface cover in DC

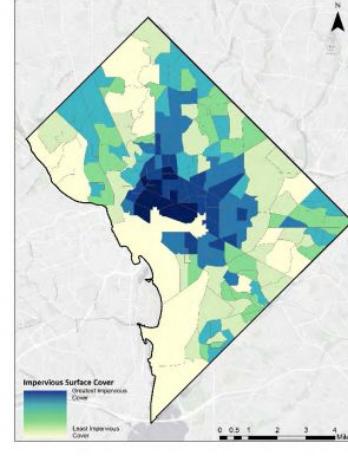
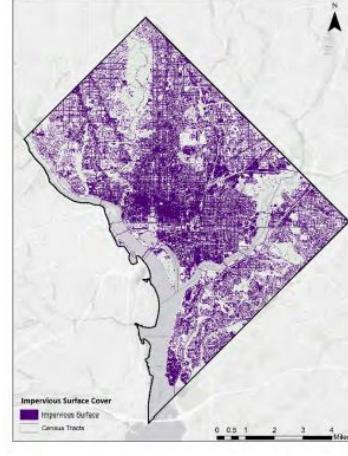
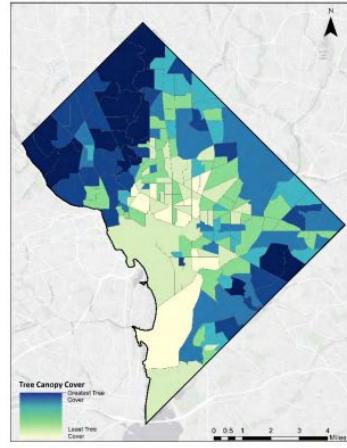
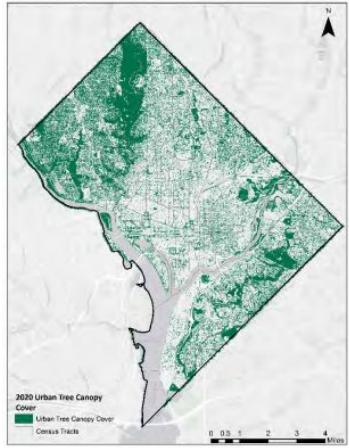


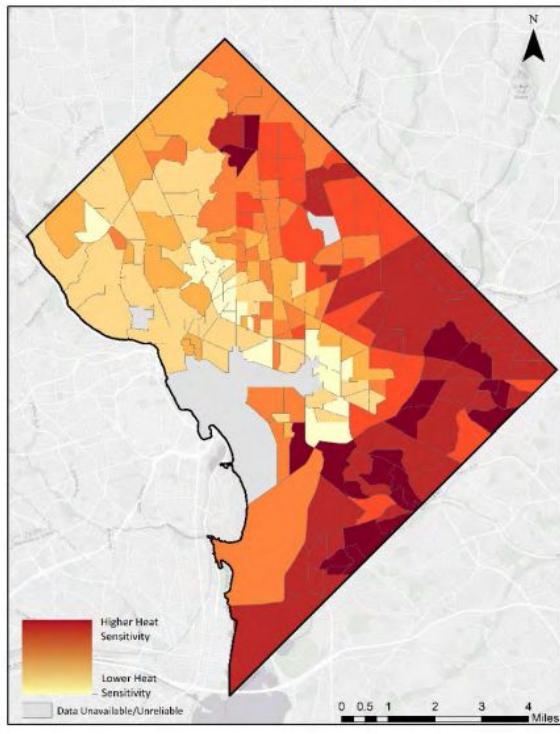
Figure 5. Maps of urban tree canopy cover



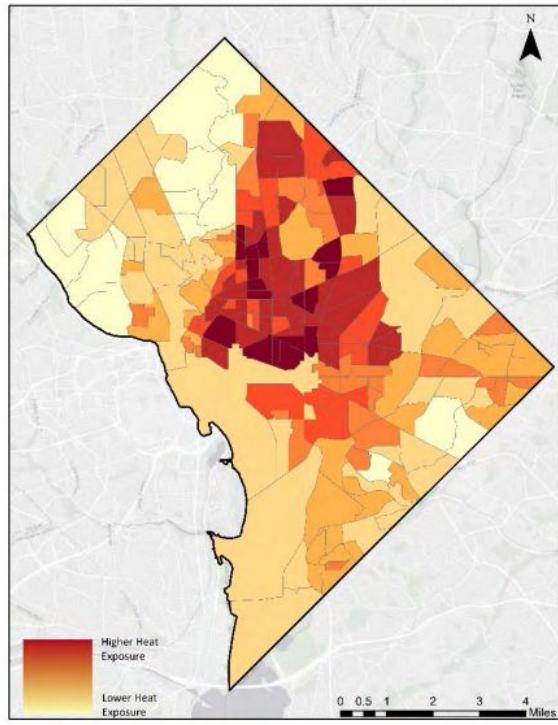
## EXPOSURE factors that DOEE implemented in the model

- Ambient air temperature
- Impervious surface cover
- Urban Tree Canopy cover

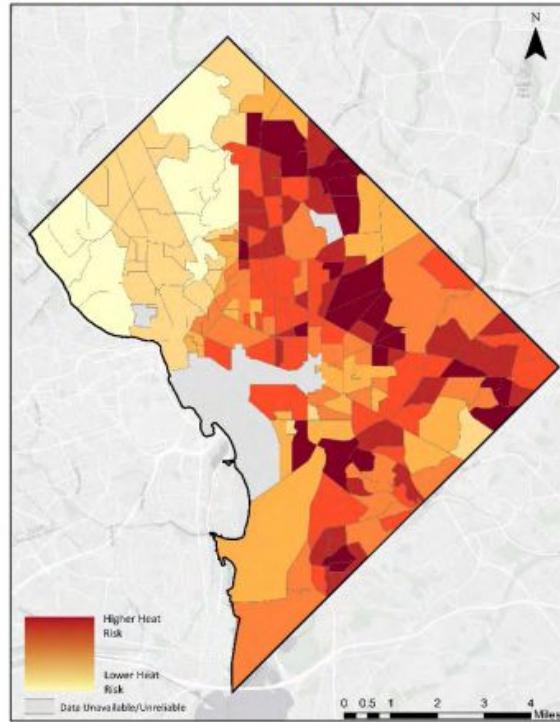
**Figure 2. Heat Sensitivity Index Map**



**Figure 6. Heat Exposure Index (HEI).**



**Figure 7. Heat Sensitivity-Exposure Index (HSEI)**



# Methods

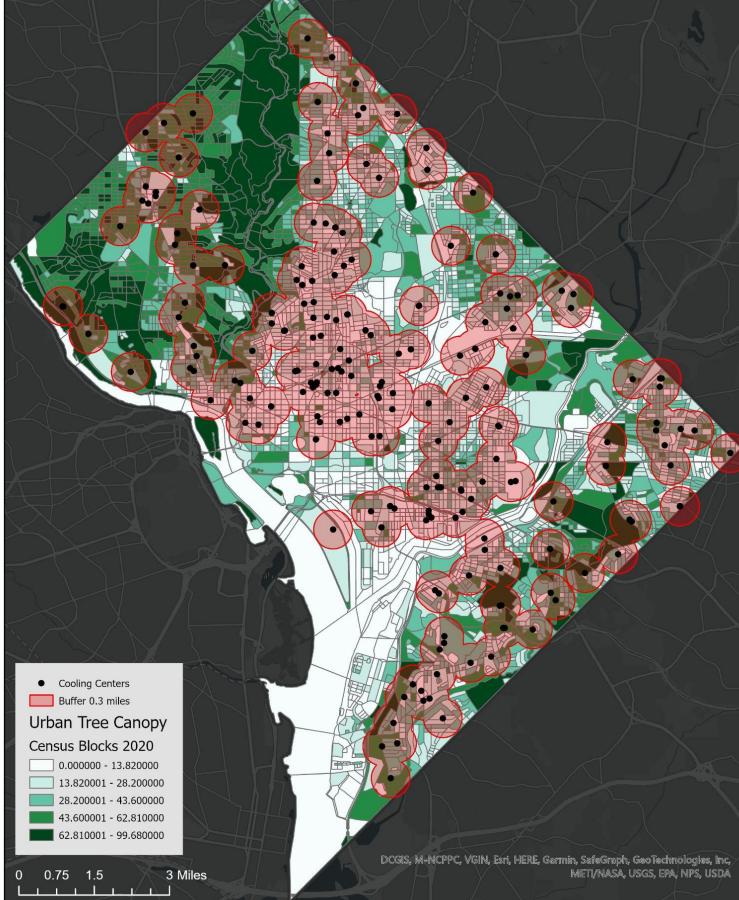
## Spatial Analysis: Vulnerable Areas

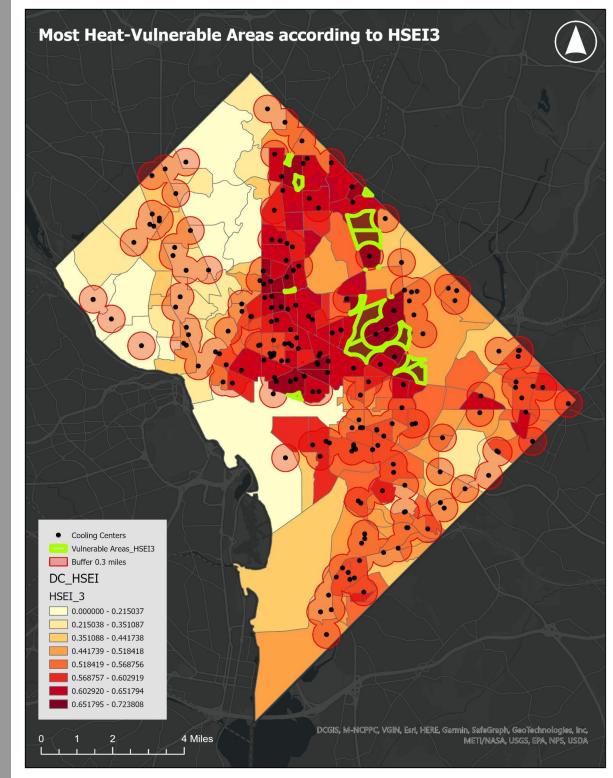
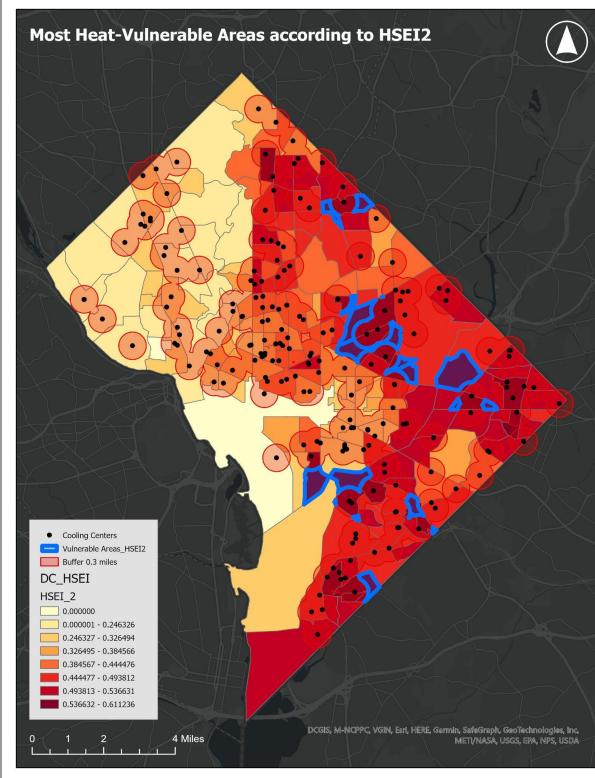
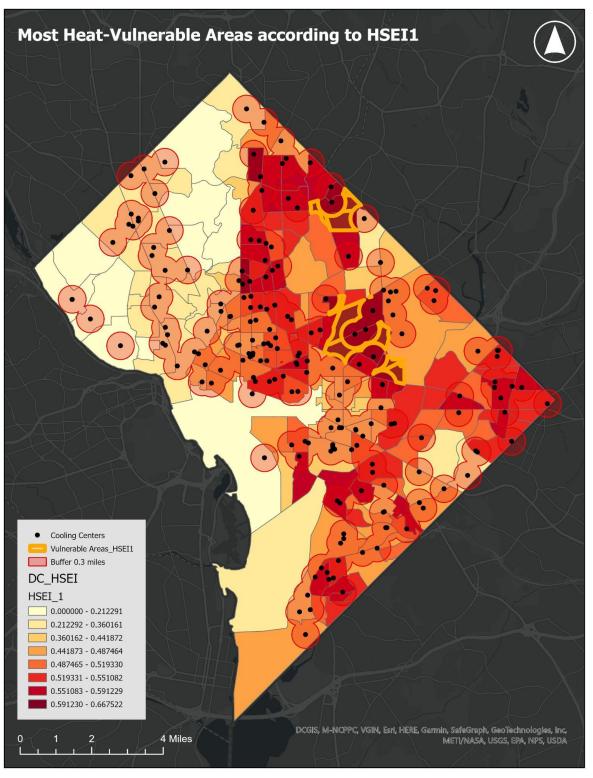
- Make a spatial analysis to define vulnerable areas where people are more exposed or sensitive to heat.
- Find the buffer zone of current cooling centers for vulnerable people with a buffer limit of 7-8 minutes walk.
- In the areas that are not served by cooling centers and with high HSEI, define the areas which are the most exposed to heat, or with population more vulnerable to heat.

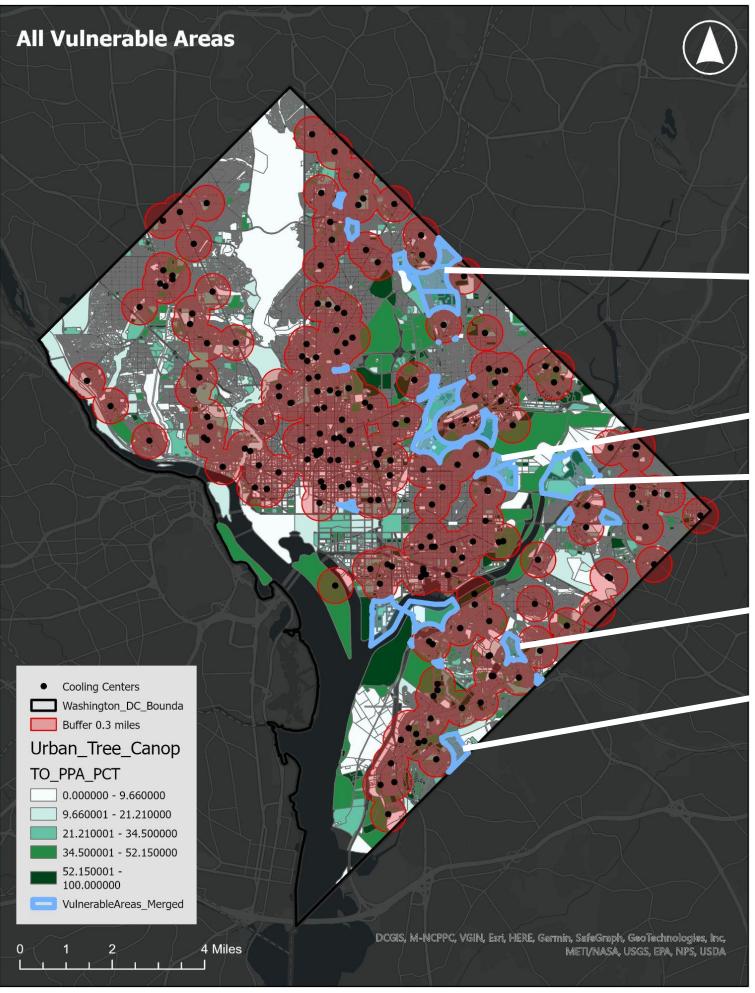
## Implementation / Recommendation

- Implement these defined areas for block/parcel level analysis of tree canopy, possible planting area and zoning/land use.
- Detail the neighbourhoods to find out where we can increase the tree canopy.
- Check the zoning regulations to see different residential types and decide on planting strategies.
- Recommend for implementing reflective roofs and heat-reducing surfaces where possible
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## Percentage of Tree Canopy on Block Level







# Vulnerable Areas

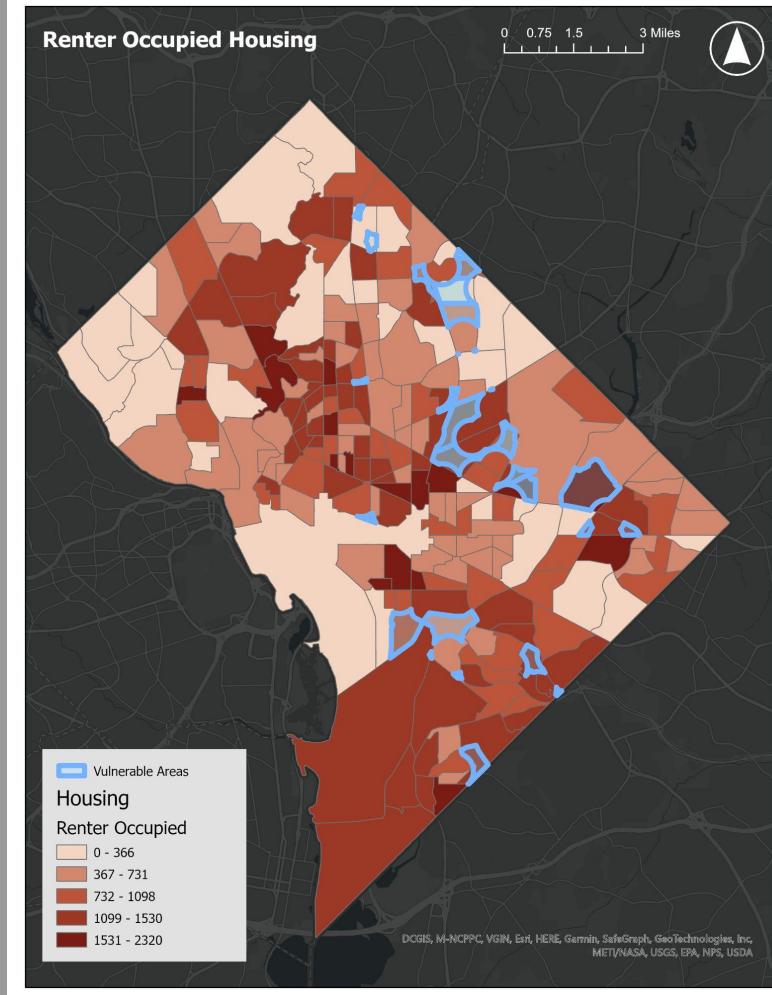
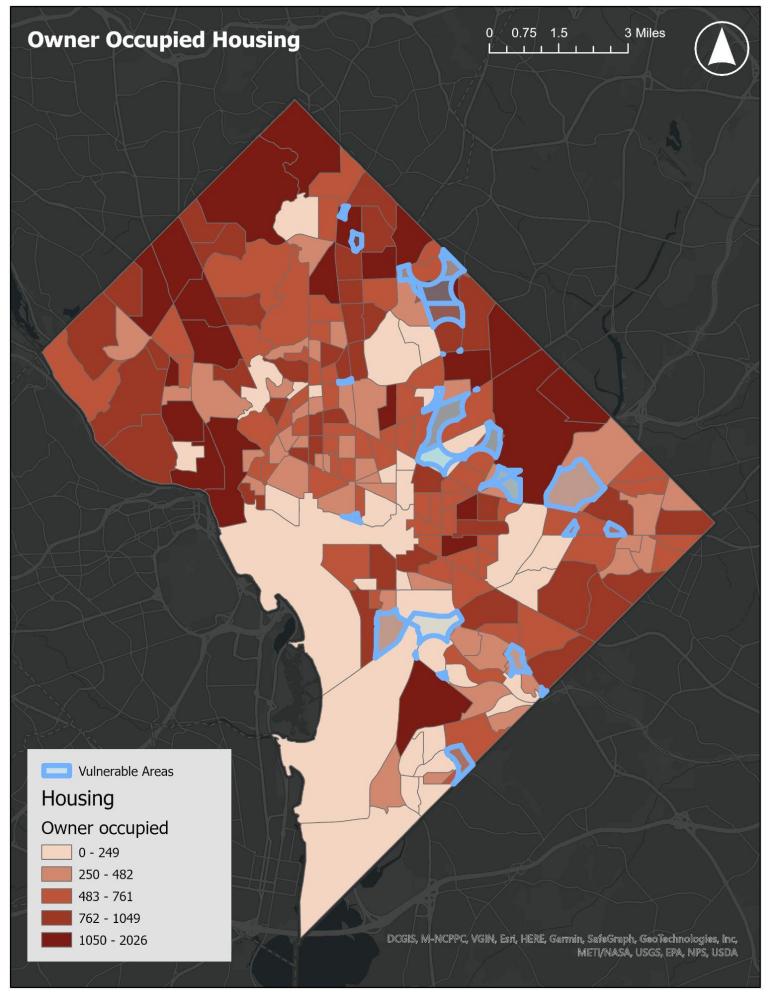
Queens Chapel / Michigan Park

Carver/Langston

Mayfair

Skyland

Washington Highlands



## Disabled Population

0 0.75 1.5 3 Miles



### Vulnerable Areas

#### Disabled

##### P\_Disabili

0.000000 - 5.900000
5.900001 - 9.900000
9.900001 - 14.700000
14.700001 - 21.500000
21.500001 - 35.000000

DGGS, M-NCPPC, VGIN, Esri, HERE, Germin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA

## Elderly Population

0 0.75 1.5 3 Miles



### Vulnerable Areas

#### Elderly

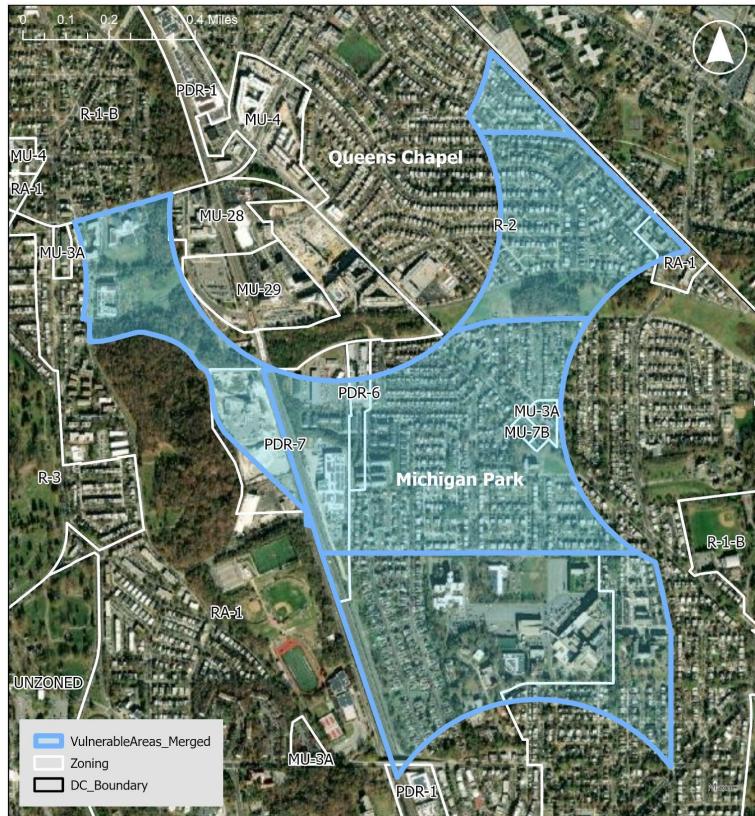
##### P\_Elderly

0.000000 - 5.600000
5.600001 - 10.400000
10.400001 - 15.900000
15.900001 - 24.000000
24.000001 - 39.500000

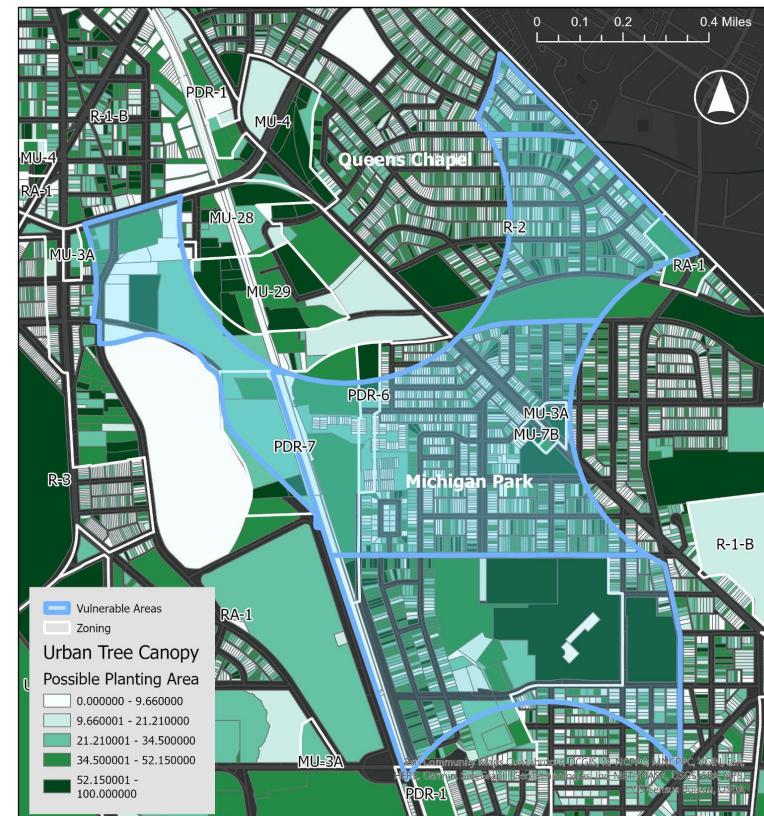
DGGS, M-NCPPC, VGIN, Esri, HERE, Germin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA

# Implementations / Recommendations

Queens Chapel - Michigan Park



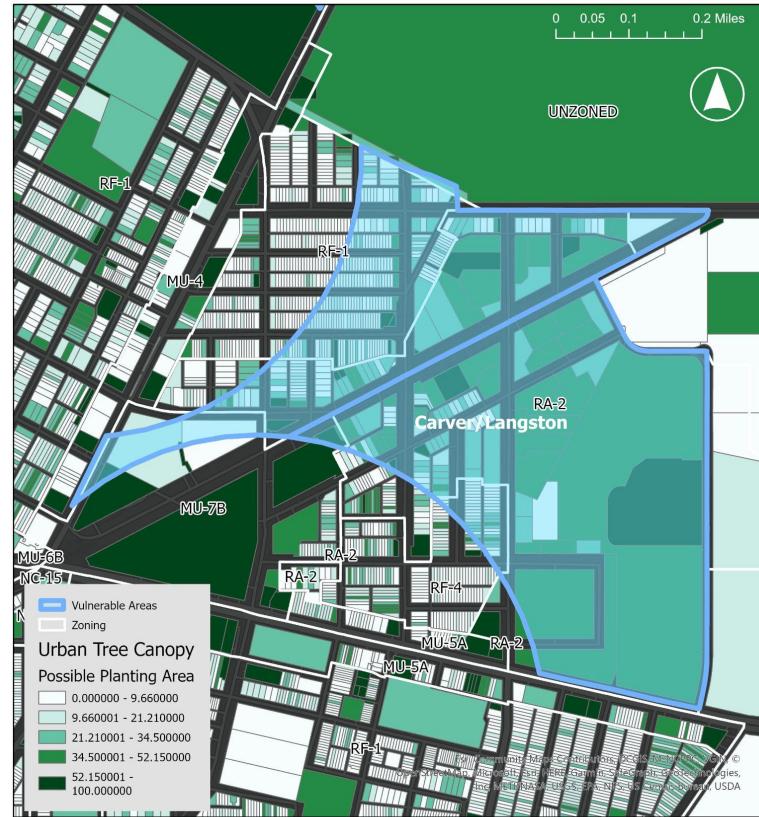
Queens Chapel - Michigan Park  
Possible Planting Area



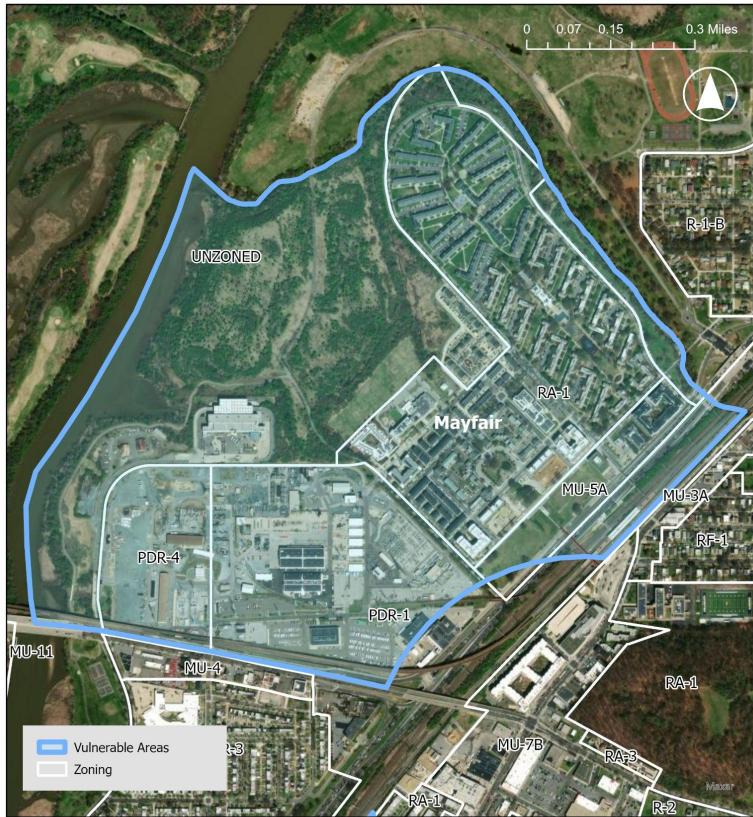
Carver/Langston



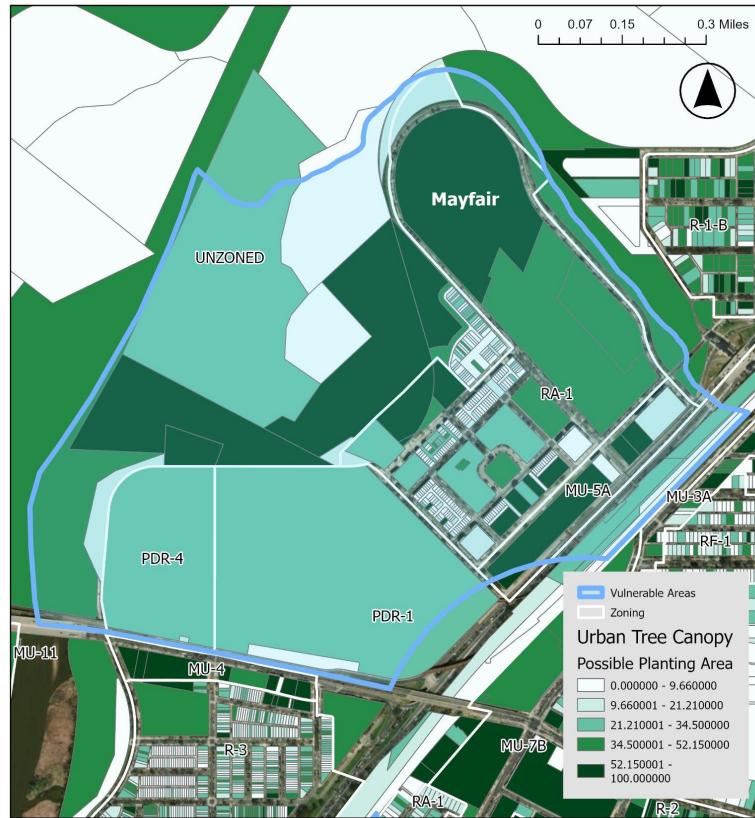
Carver/Langston  
Possible Planting Area



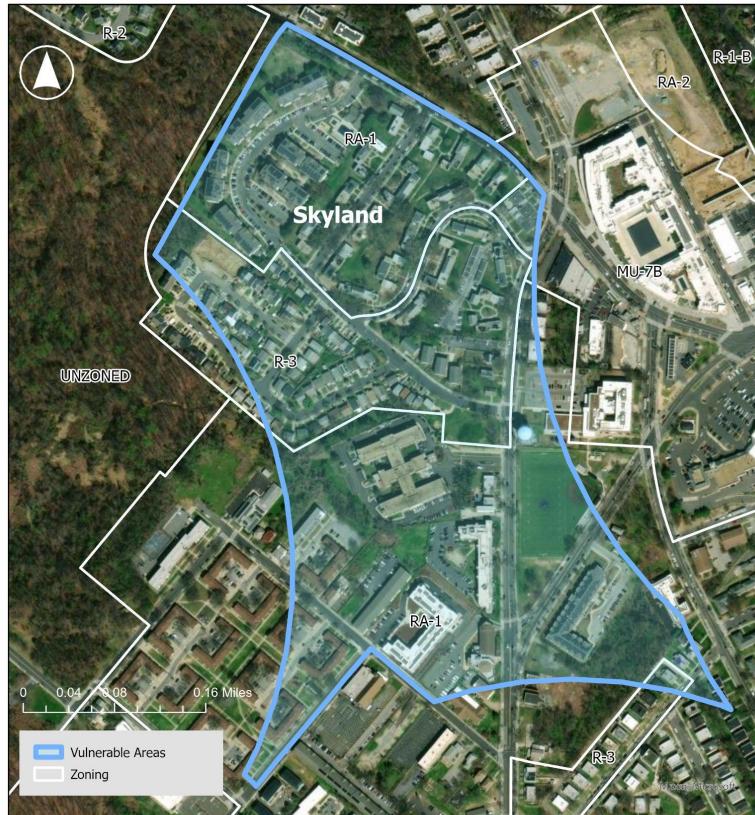
Mayfair



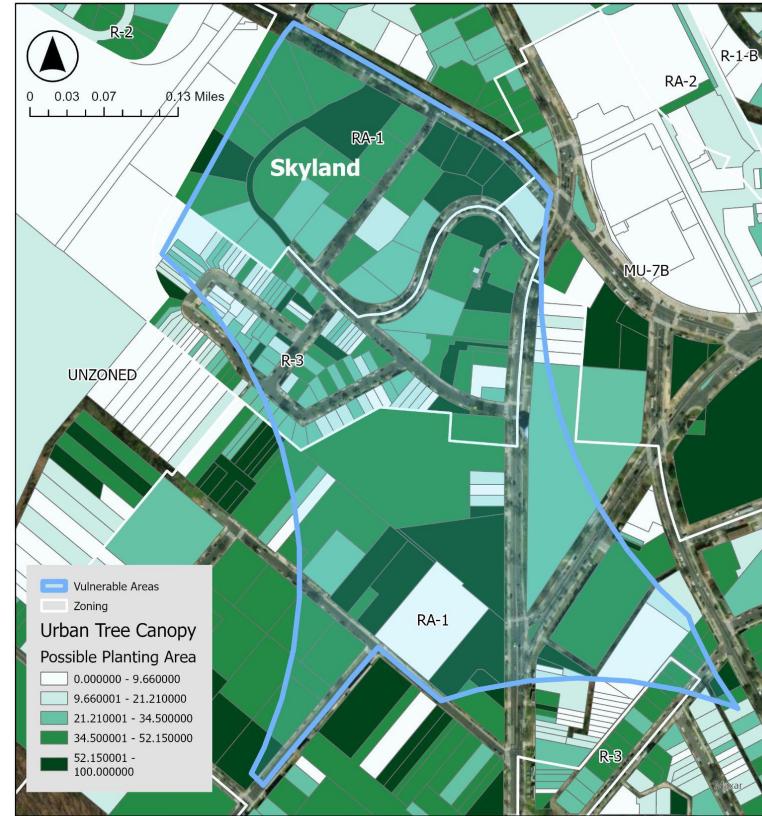
Mayfair  
Possible Planting Areas



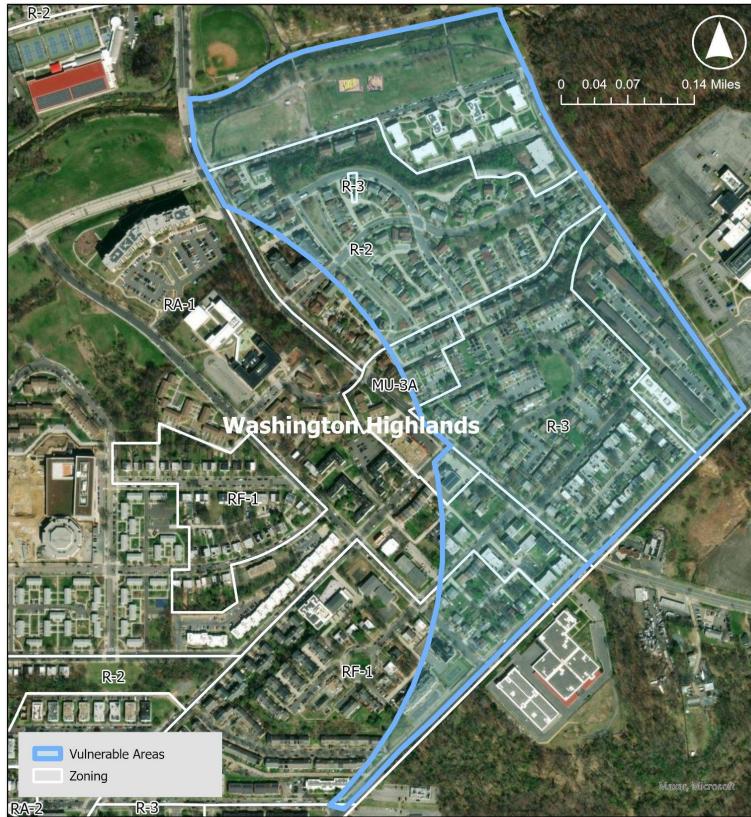
## Skyland Possible Planting Areas



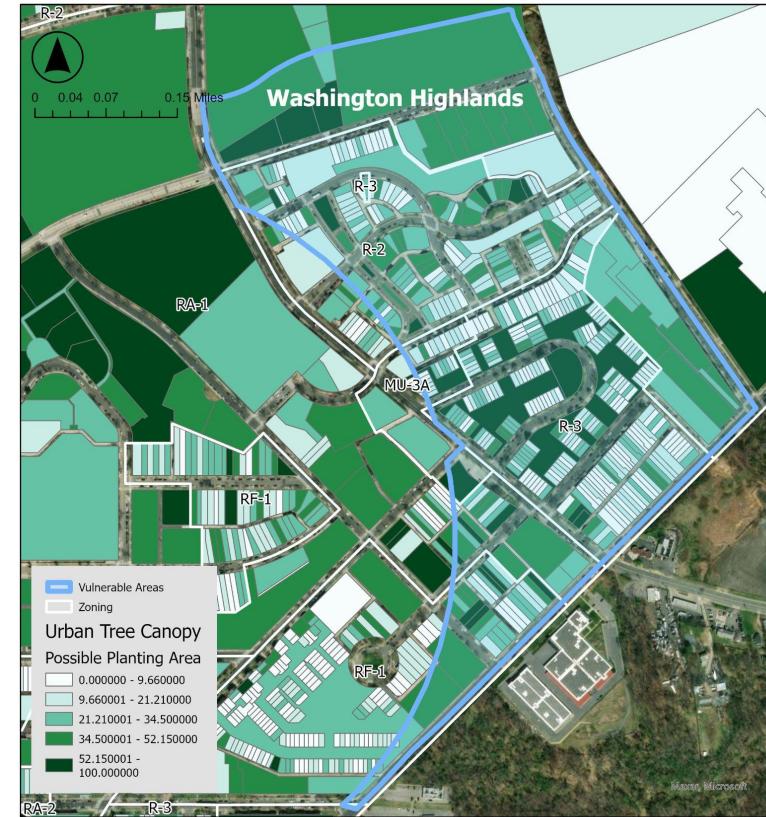
## Skyland Possible Planting Areas



Washington Highlands  
Possible Planting Areas



Washington Highlands  
Possible Planting Areas



# Conclusion

- By implementing granular parcel-level solutions and considering the specific needs of communities of color and those with higher health risks, this study aims to promote resilience and equity within the city.
- Five vulnerable areas: Queens Chapel/Michigan Park, Carver/Langston, Mayfair, Skyland, and Washington Highlands.
- For each area, tailored recommendations are provided
  - encouraging **tree planting** by homeowners, condo managements
  - establishing **additional transportation** options for the elderly and disabled populations,
  - implementing **cooling and air purifying systems** in areas with high asthma prevalence.