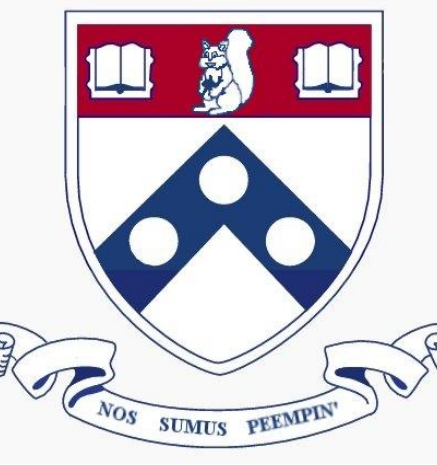# Growing Equity: A Geospatial Analysis of Street Tree Plantings in Philadelphia

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Abstract

Urban forests are all trees within a city that compose the tree canopy. Urban forests and street trees have many environmental, social, and economic benefits. Due to the unequal nature of existing tree canopy, there are environmental justice concerns with planting initiatives. This study uses GIS to analyze the distribution of new street tree plantings by the Tree Tenders program in Philadelphia using Census demographic data. **Neighborhoods with greater proportions of white residents, higher median income, higher educational attainment, and newer residents received a disproportionate number of trees.** The uneven built environment and the diverse needs of Philadelphia communities in relation to tree planting contributes to distributional inequities.

Background

Philadelphia has **20%** tree canopy cover city-wide. However, it ranges from <5% to >45% by neighborhood.

Philly's Tree Plan aims to increase tree canopy to **30%** in each neighborhood within 30 years.

"Grow the urban forest equitably"

Factors that influence participation in planting programs include existing canopy cover, what people value in trees, accessibility of the program, and the program's messaging.

PHS plants **1,500+** street trees annually.

Tree Tenders has a decentralized distribution model that operates via community groups.

Methods

**(1) Expected # of trees = City adoption rate × # of households**

(2) Odds ratio = Actual # of trees ÷ Expected # of trees

Odds ratios were calculated for each ZIP code in Philadelphia. An odds ratio of 2.1 means a ZIP code received 210% the expected number of trees if the trees were distributed equally. Census data for each ZIP code were used to find correlations with odds ratios.

Results

| Demographic Factor	Avg. Odds Ratio	Demographic Factor	Avg. Odds Ratio	Difference
Greatest % White	1.15	Least % White	0.28	0.87
Greatest % Black	0.48	Least % Black	1.29	0.81
Highest median income	2.48	Lowest median income	0.97	1.51
Greatest % high school degree only	0.29	Least % high school degree only	2.00	1.71
Greatest % graduate or professional degree	2.28	Least % graduate or professional degree	0.60	1.68
Greatest % moved in 2015 to 2018	1.95	Least % moved in 2015 to 2018	0.32	1.63
Highest home value	2.21	Lowest home value	0.86	1.35

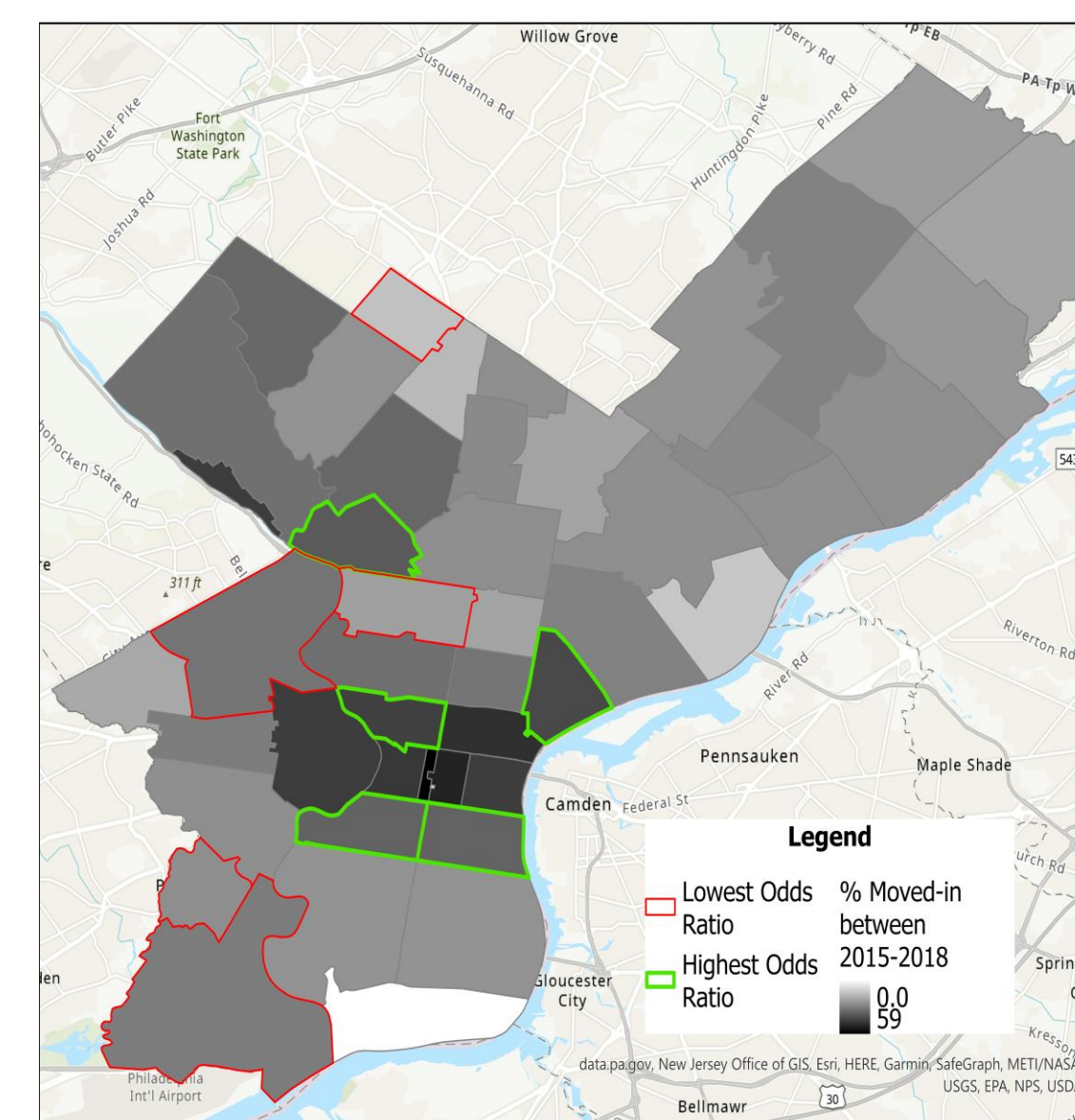Racial Disparities in Street Tree Planting
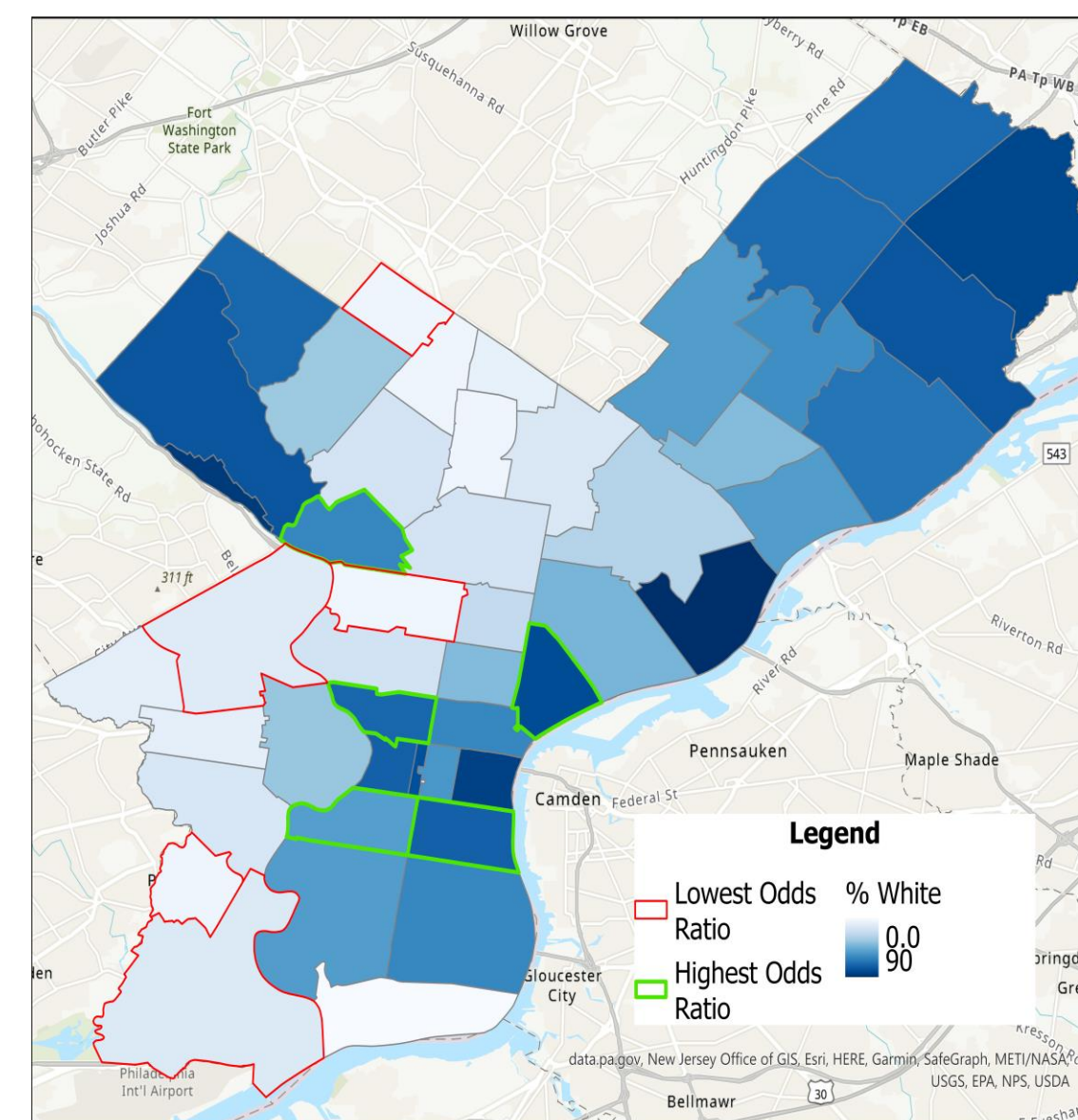
Income Disparities in Street Tree Planting
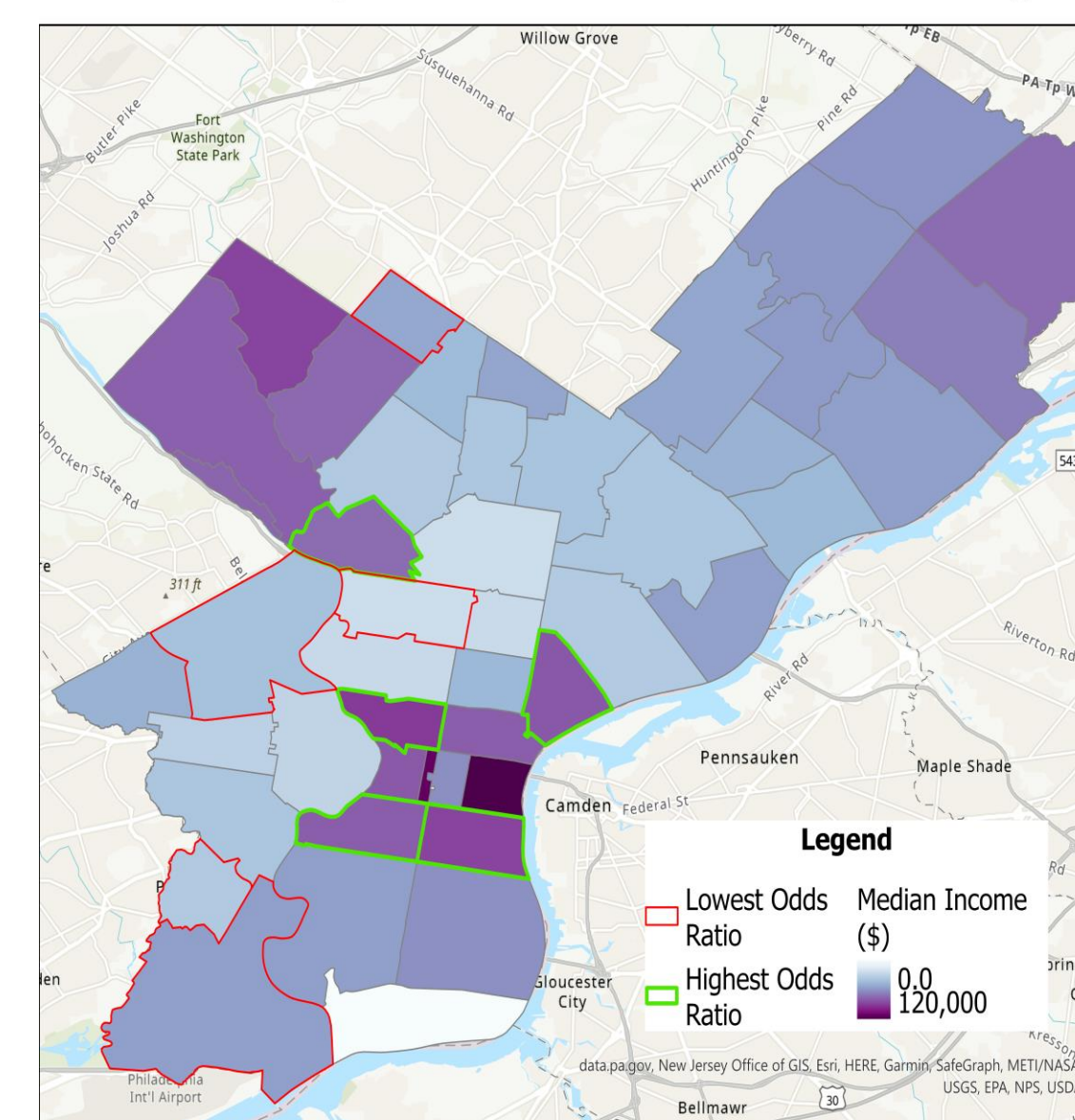
Educational Attainment Disparities in Street Tree Planting
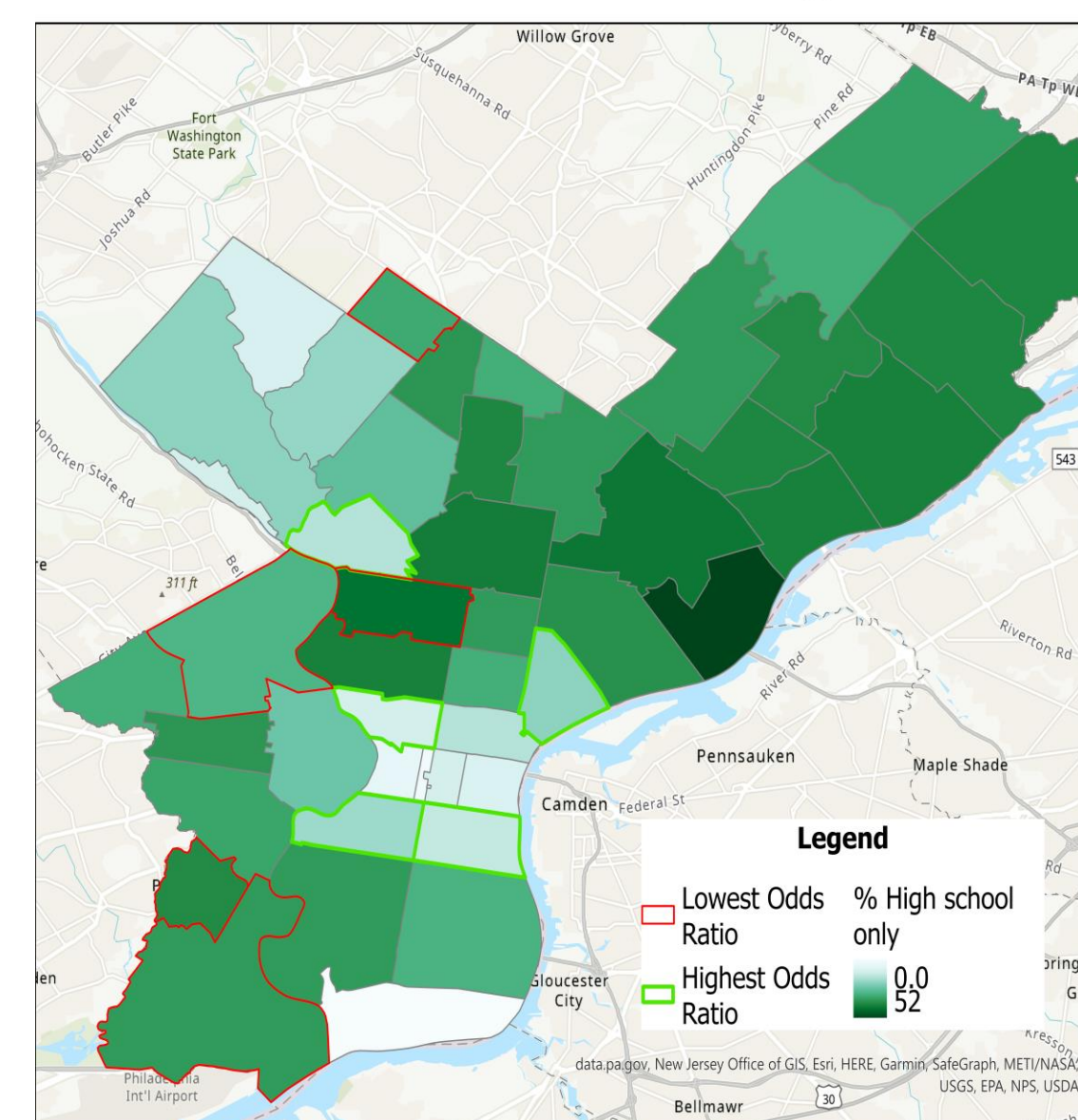
Recently-Moved Resident Disparities in Street Tree Planting

Figures 1–5: The factors that strongly predict disproportionate planting rates in a ZIP code. The table shows the average odds ratios of the top five and bottom five ZIP codes for each demographic factor. Maps created in ArcGIS.

Discussion

Planting patterns in Philadelphia reflect national patterns of participation in tree planting initiatives:

Higher income	Preexisting canopy cover	Recently-moved residents	Predominantly white

Black and Brown and low-income neighborhoods are concerned about...

- Financial costs of maturing trees
- Time and energy needed to organize around tree planting
- Gentrification
- Historic disinvestment in environmental amenities

Tree Tenders is aware of distributional inequities and has taken steps to address disparities.
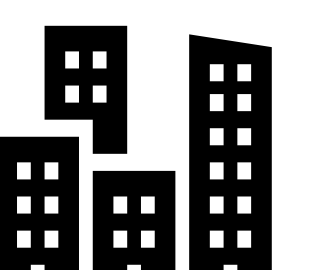
Conclusions

Factors that influence distributional inequities:

Distributional model   **Ability to organize**   **Built environment**

Further research should explore...

- Street characteristics of ZIP codes across Philadelphia
- Messaging approaches for reaching different communities
- Programmatic changes to decrease disparities

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