LivableStreets Alliance: Transportation Infrastructure and Displacement

Alexander Heger, Raviv Zait,
Kwan Wing Tuet, Siddharth Bookinkere

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LivableStreets

Connecting People + Places

- 501(c)(3) nonprofit located in Cambridge, Massachusetts

- Mission:
  - **Advocate for transportation solutions** that are safe, affordable, and enjoyable by **dismantling geographical and social barriers** that divide communities

- Focus areas:
  - Bike lanes and greenways in Metro Boston

Problem Statement

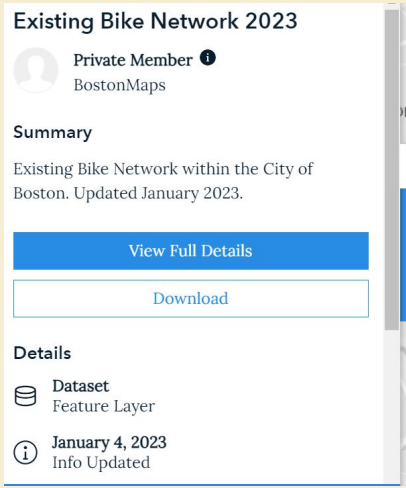
- Projects met with resistance by communities
  - Fear that bike lanes and greenways displace through increased costs

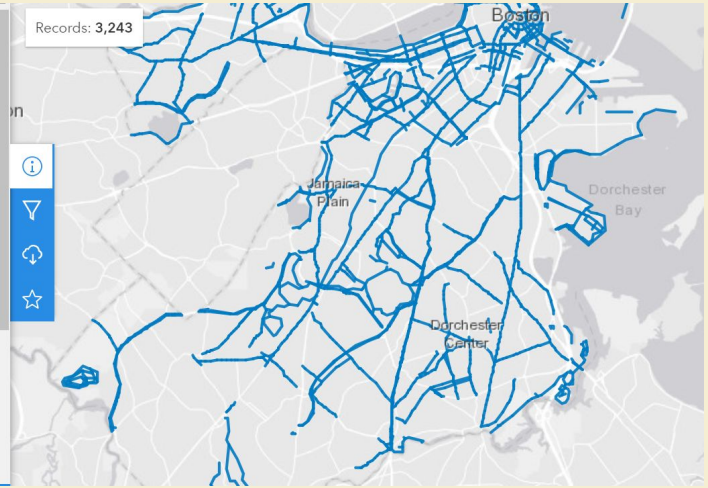
- LivableStreets seeks to understand if a **causal relationship** exists **between transportation infrastructure and displacement**

Data Collection

- American Community Survey 5-Year Estimates
    - Detailed tables for **Roxbury, Dorchester, Forest Hills**
- Bike lane infrastructure data from Boston Maps project

Variable	**Selected Census Table**
Income	S1901 - Income in the Past 12 Months (in 2021 Inflation-Adjusted Dollars)
Race	DP05 - ACS Demographic and Housing Estimates
Home Ownership	B25026 - Total Population in Occupied Housing Units by Tenure by Year Householder Moved into Unit
Property Value	DP04 - Selected Housing Characteristics

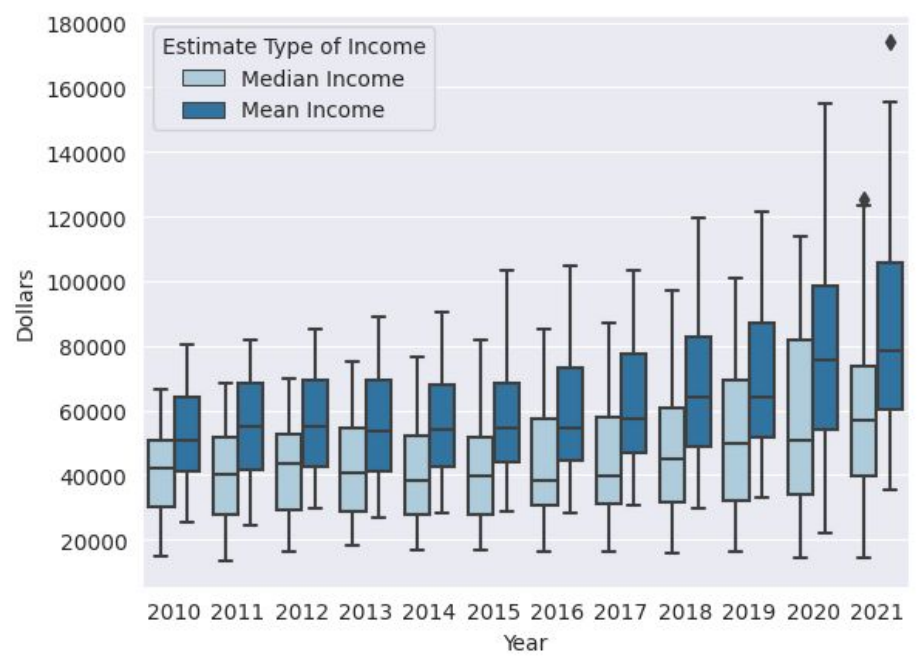




Demographic Information

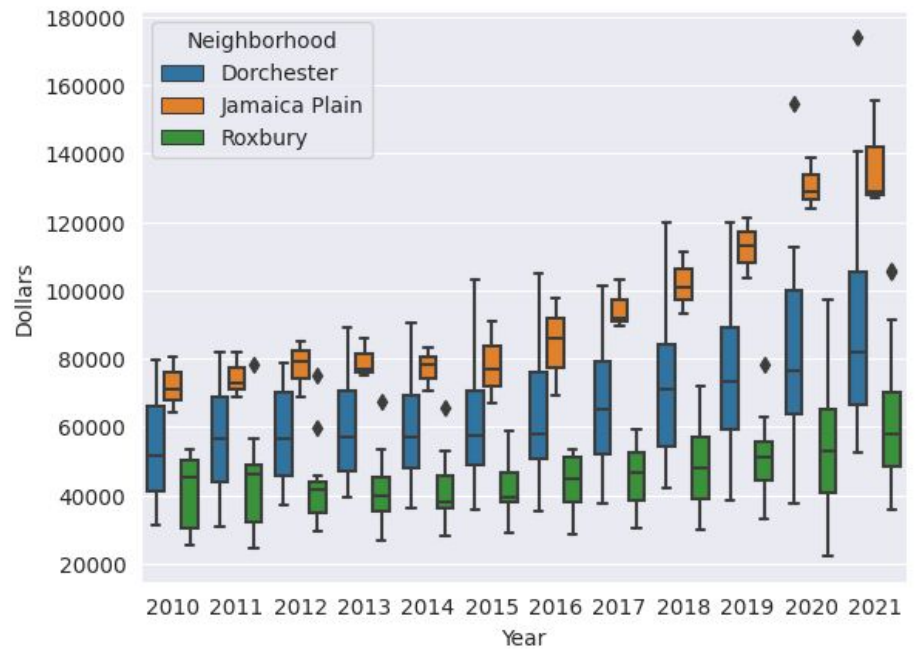
Increasing Gap of Income Inequality

Mean & Median Income for ALL Neighborhoods



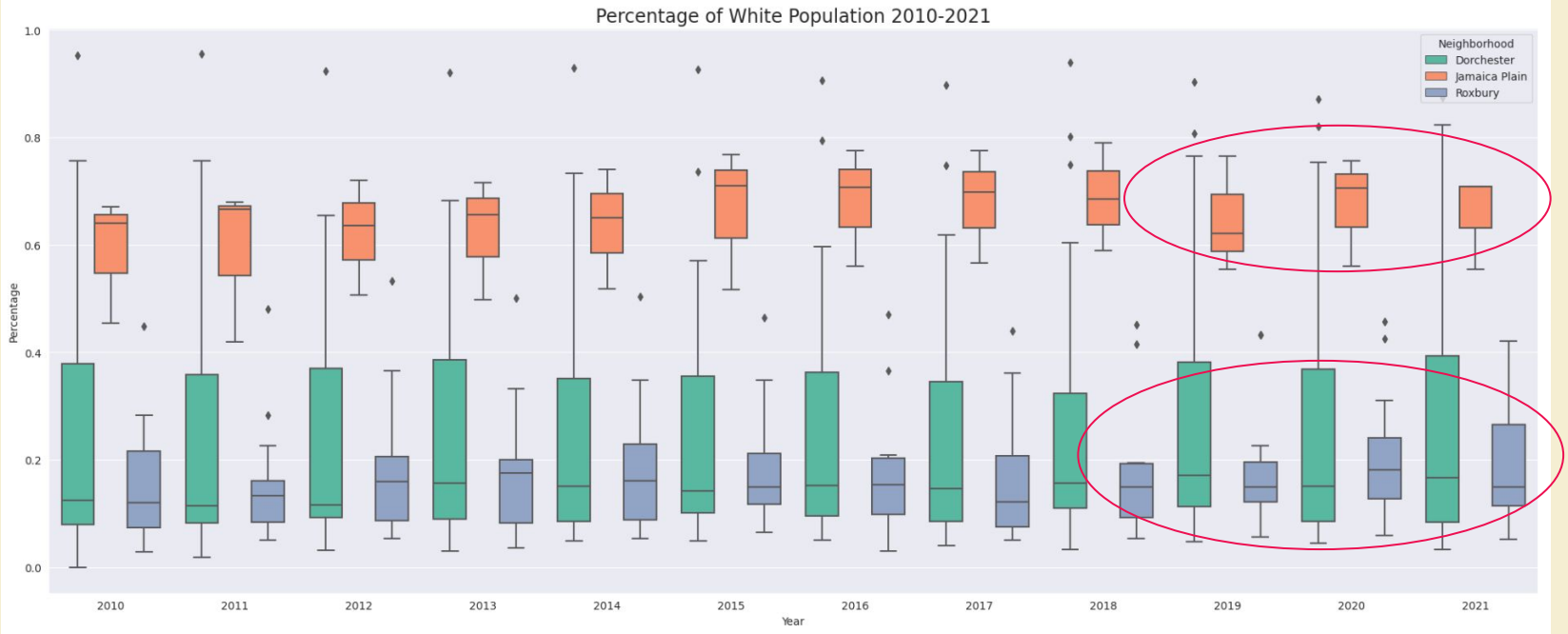
- **Increasing gap between median & mean**

Average Income by Neighborhood



- **Strong increasing trend in JP and Dorchester**
- **Larger income variation in Dorchester**

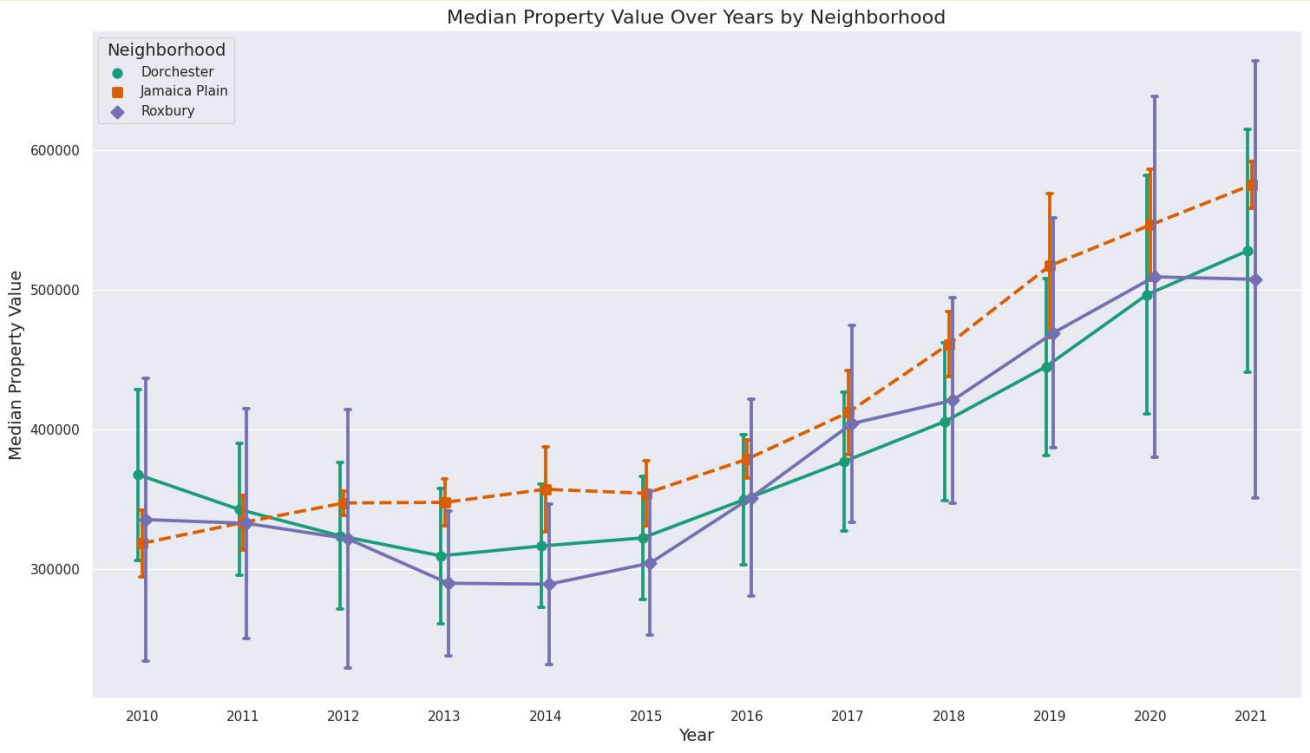
Disparity of Race Distribution



Neighborhood-Specific Pattern:

- **JP**: Much higher concentration of white residents
- **Dorchester**: Right-skewed pattern
- **Roxbury**: Consistently low white populations
- **Dorchester & Roxbury**: Both of them have relatively lower white population compared to JP

Property Value in Dorchester & Roxbury



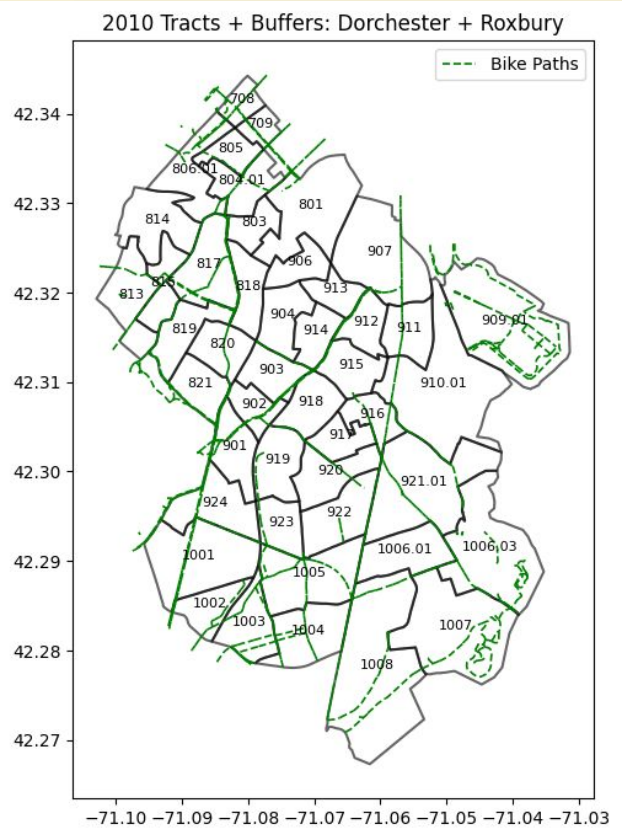
Not only do Dorchester and Roxbury have similar distribution of **race**, they also have comparable **property value.**

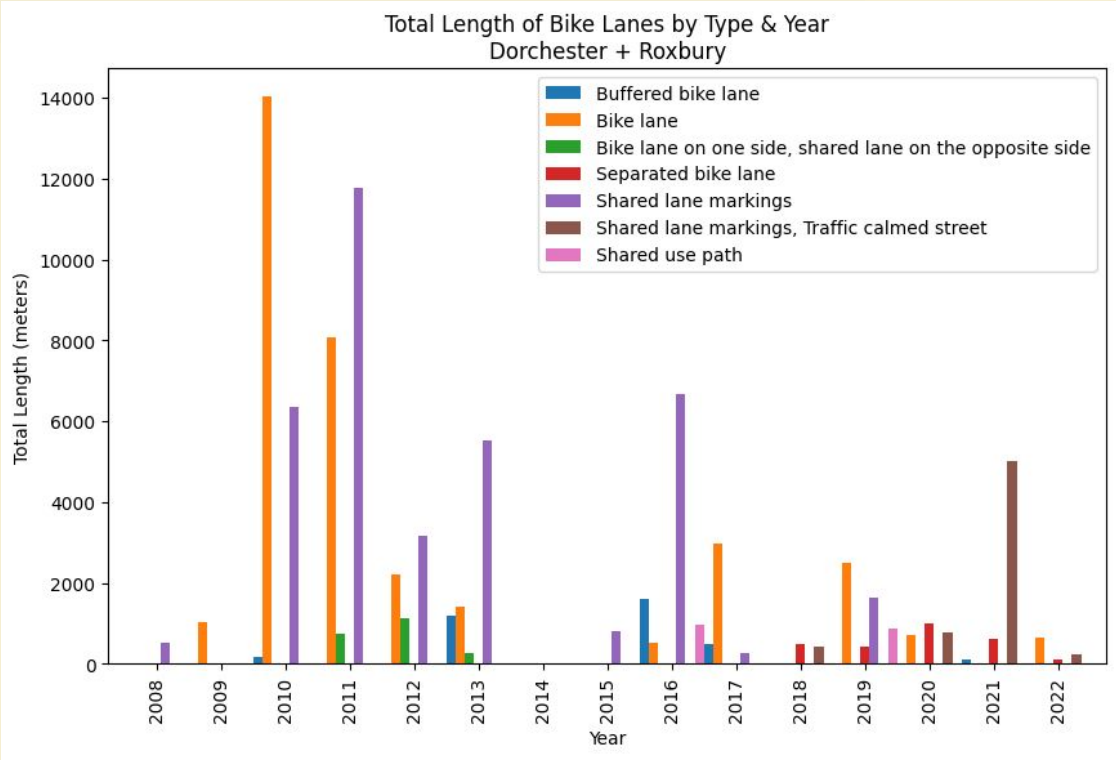
>>> Validating our use of data from both Dorchester & Roxbury for statistical analysis

Bike Lane Development

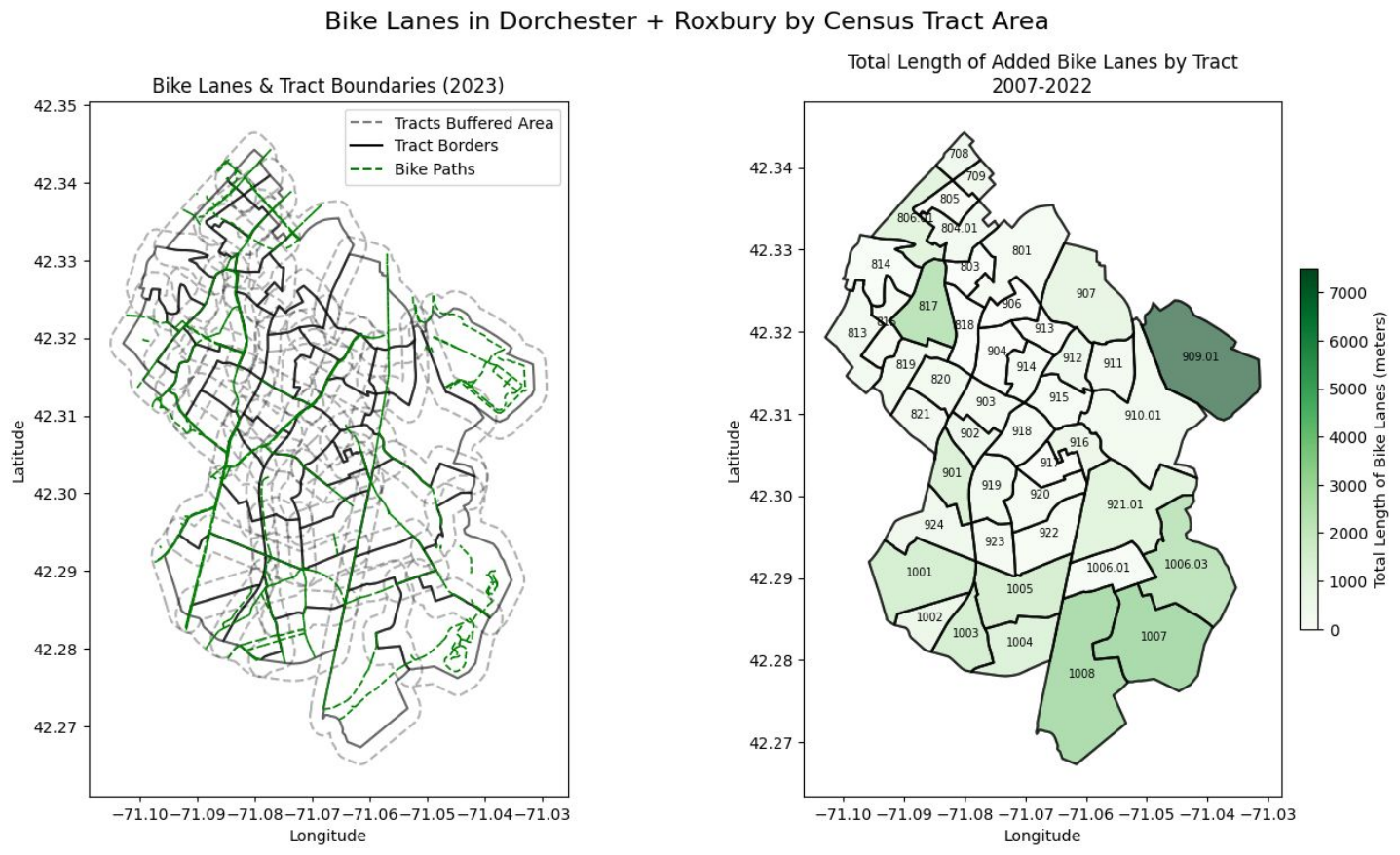
Bike Lane Lengths & Locations

Where were new lanes built? Which kinds of lanes were these?





Bike Lane Lengths & Locations



Correlation with Demographic Information

Bike lanes are not built at random geographic locations, but in areas with:

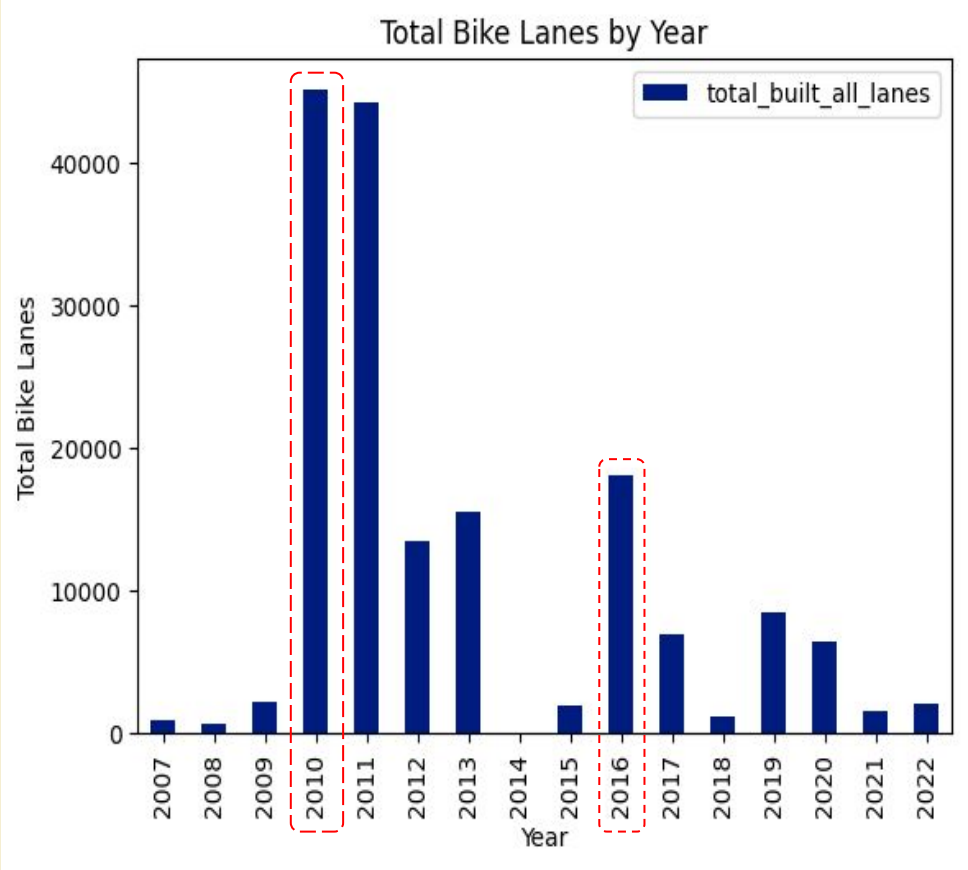
- Lower income
- Smaller white population
- Lower median age
- Fewer homeowners

Are new bike lanes also **driving down** socioeconomic factors?

	Median Income	Total Bike Lanes Length	% White Population	Median Age	% Home Owners
Median Income	1.00	-0.14	0.62	0.52	0.76
Total Bike Lanes Length	-0.14	1.00	-0.06	-0.11	-0.06
% White Population	0.62	-0.06	1.00	0.22	0.41
Median Age	0.52	-0.11	0.22	1.00	0.59
% Home Owners	0.76	-0.06	0.41	0.59	1.00

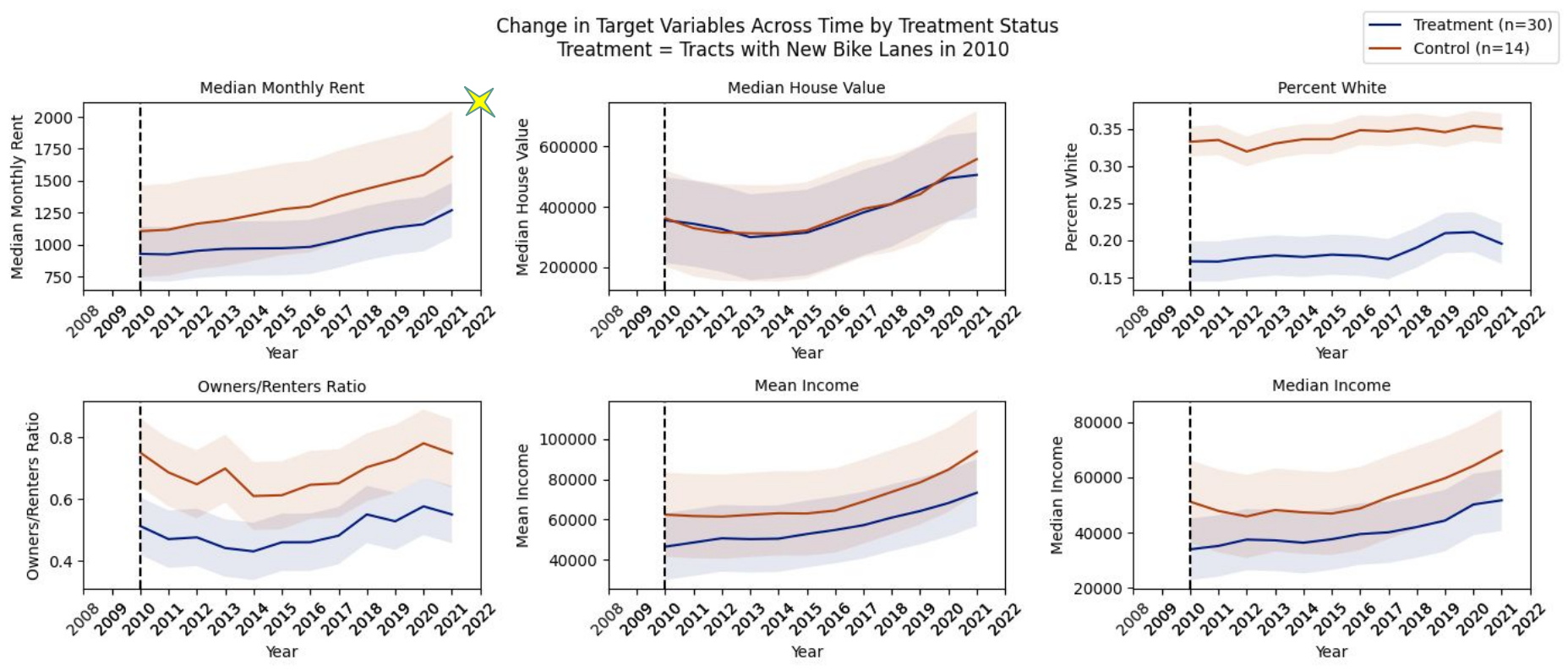
Causal Analysis

Approach to Causal Analysis

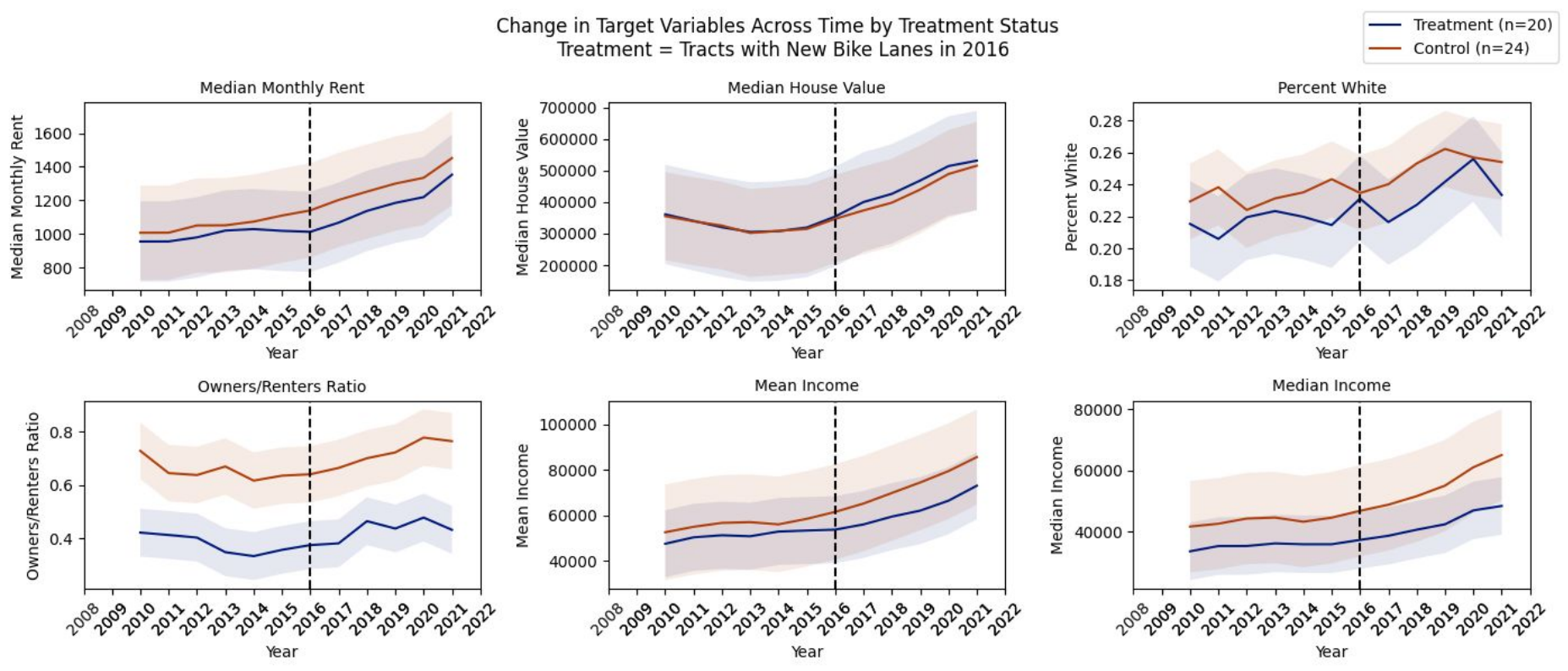


- **Challenge:**: Bike lanes are built continuously
- **Approach:** Use two "peak" years of change
  - **2010** – many new lanes built, very few previous lanes
  - **2016** – local maximum; far enough from 2010; allows before vs. after analysis: "Diff-in-Diff"

2010


Change in Target Variables Across Time by Treatment Status
Treatment = Tracts with New Bike Lanes in 2010
Treatment (n=30)
Control (n=14)
Median Monthly Rent
Median Monthly Rent
Median House Value
Median House Value
Percent White
Percent White
Owners/Renters Ratio
Owners/Renters Ratio
Mean Income
Mean Income
Median Income
Median Income
Year

2016 Bike Lanes - Visual Inspection



Regression Results - Dorchester & Roxbury

Estimating: $Target = \beta_0 + \beta_1 * Treatment + \beta_2 * Year + \beta_3 * Treatment * Year + \beta_4 * Tract + \varepsilon$

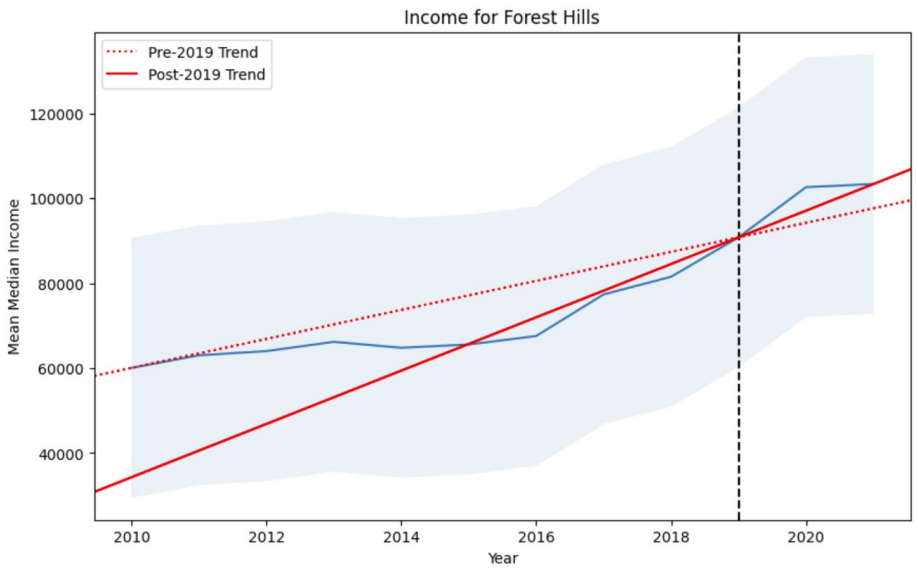
Target variable data includes 5-years before/after change

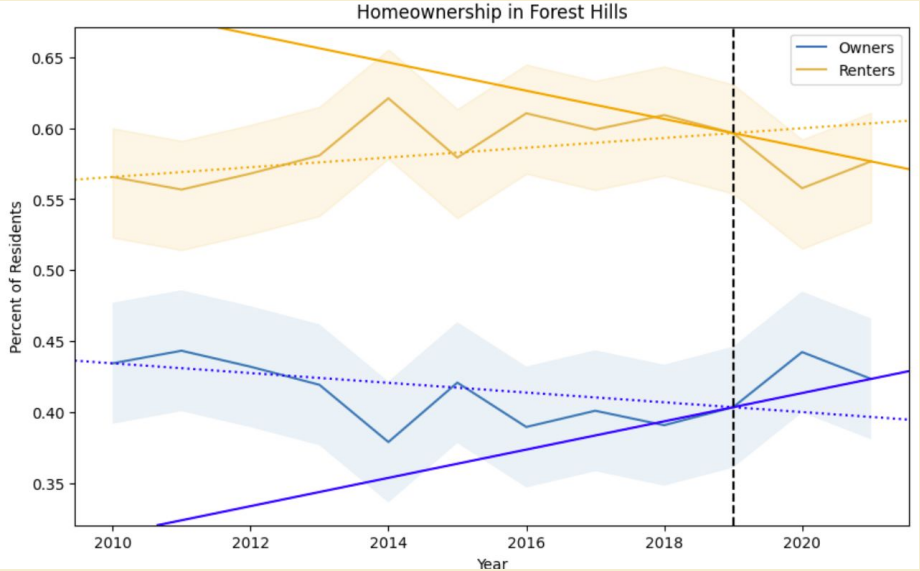
	2010 Bike Lanes			2016 Bike Lanes		
Target Variable	**R^2**	**Coefficient**	**P-value**	**R^2**	**Coefficient**	**P-value**
Median Income	0.922	-0.211	0.999	0.89	-1449.12	0.09
Median House Value	0.506	-4245.183	0.143	0.76	-4921.33	0.44
Median Monthly Rent	0.908	-26.364	0.000	0.87	22.07	0.16
% White Population	0.983	-0.003	0.101	0.97	0.00	0.78
Owners/Renters Ratio	0.919	0.008	0.261	0.90	-0.01	0.74

- Only significant coefficient is in 2010 Median Monthly Rent: tracts with new bike lanes experienced a (slight) slower increase in their rents, on average.
- Cannot reject the null hypothesis that new bike lanes do not encourage displacement factors

Greenway Comparison

Forest Hills Pre- and Post-Casey Arborway





- Slightly steeper increase following 2019
- Nearly identical effect in Property Value
- Same trends in Dorchester, Roxbury

- Post-2019 saw more homeowners, fewer renters
- Similar effect in Roxbury, Dorchester ratios remained the same

Regression Results - Forest Hills

Estimating: $Target = \beta_0 + \beta_1 * Treatment + \beta_2 * Year + \beta_3 * Treatment * Year + \beta_4 * Tract + \varepsilon$

Target variable data includes 2-years before/after change

Target Variable	R^2	Coefficient	P-value
Median Income	0.946	1.72e7	0.110
Median House Value	0.801	5.54e7	0.489
Median Monthly Rent	0.774	2.08e5	0.638
% Black Population	0.874	109.6	0.255
Owners/Renters Ratio	0.826	308.6	0.439

- N=12: 3 Census Tracts * 4 years
  - Finding causation with such a small sample is nearly impossible
  - Reason for high coefficients and standard errors

Limitations & Conclusions

Limitations

- **Scope and statistical power** – continue this work at broader scale
- **Generalizability** – our analysis stands for the neighborhoods and factors we analyzed
- **Identification and time horizon –** possibility of non-linear effects, duration of influence outside our period of analysis
- **COVID-19 pandemic** – we likely do not yet know the full impact on these communities

Key Takeaways

- With the data we used, **we cannot conclude that bike lane infrastructure *causes* displacement**

- Bike lane development is *correlated* with lower income, property value, and percentage of white residents
  - LivableStreets is advocating for bike lanes in the right neighborhoods

- Opposing bike lane or greenway development on the basis of displacement is not based in fact (at least in these communities)

Further Analysis

Explore other indicators of displacement

Census Data may not tell the whole story

Repeat analysis in 5-10 years

Larger sample(s), time for effects of COVID-19 pandemic to stabilize

Compare Boston to other U.S. cities

Displacement occurs across the U.S., how do other cities compare?

Questions?

LivableStreets

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https://www.livablestreets.info/