

High Impact Prioritization of Bikeshare Program Investment to Improve Underserved Communities' Access to Jobs and Essential Services

Research Question

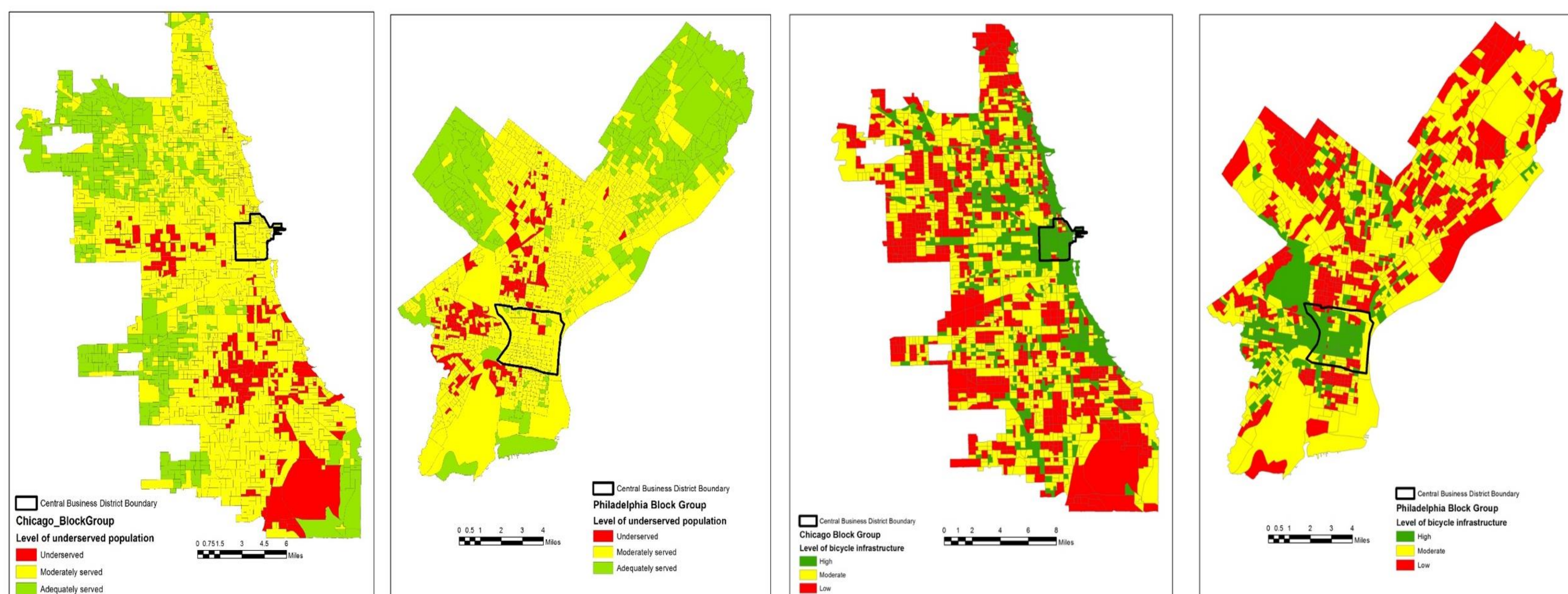
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Results

- Current bikeshare systems have not captured high levels of ridership from underserved populations. There is some evidence that current bikeshare systems have specifically targeted certain populations to ensure sufficiently high demand for profitability. Far less attention has been paid to bikeshare programs' potential to provide greater access to jobs and essential services for underserved communities.
- This research tries to first, examine whether bikeshare systems have targeted specific populations and second, to quantitatively assess the potential for bikeshare systems to provide greater accessibility for underserved communities.

Methods and Data

- Case study cities (Chicago and Philadelphia)



- Identifying underserved population (Adequately served/Moderately served/Underserved)
- Bicycle infrastructure (High/Moderate/Low level of bicycle lane density)
- Accessibility analyses (High/Moderate/Low level)

$$A_i = \sum_{j=1}^N O_j e^{-\beta t_{ij}}$$

where A_i is the accessibility of block group i , O_j is the opportunities available at block group j , and N is the total number of blocks that block group i has access to within a specific time threshold.

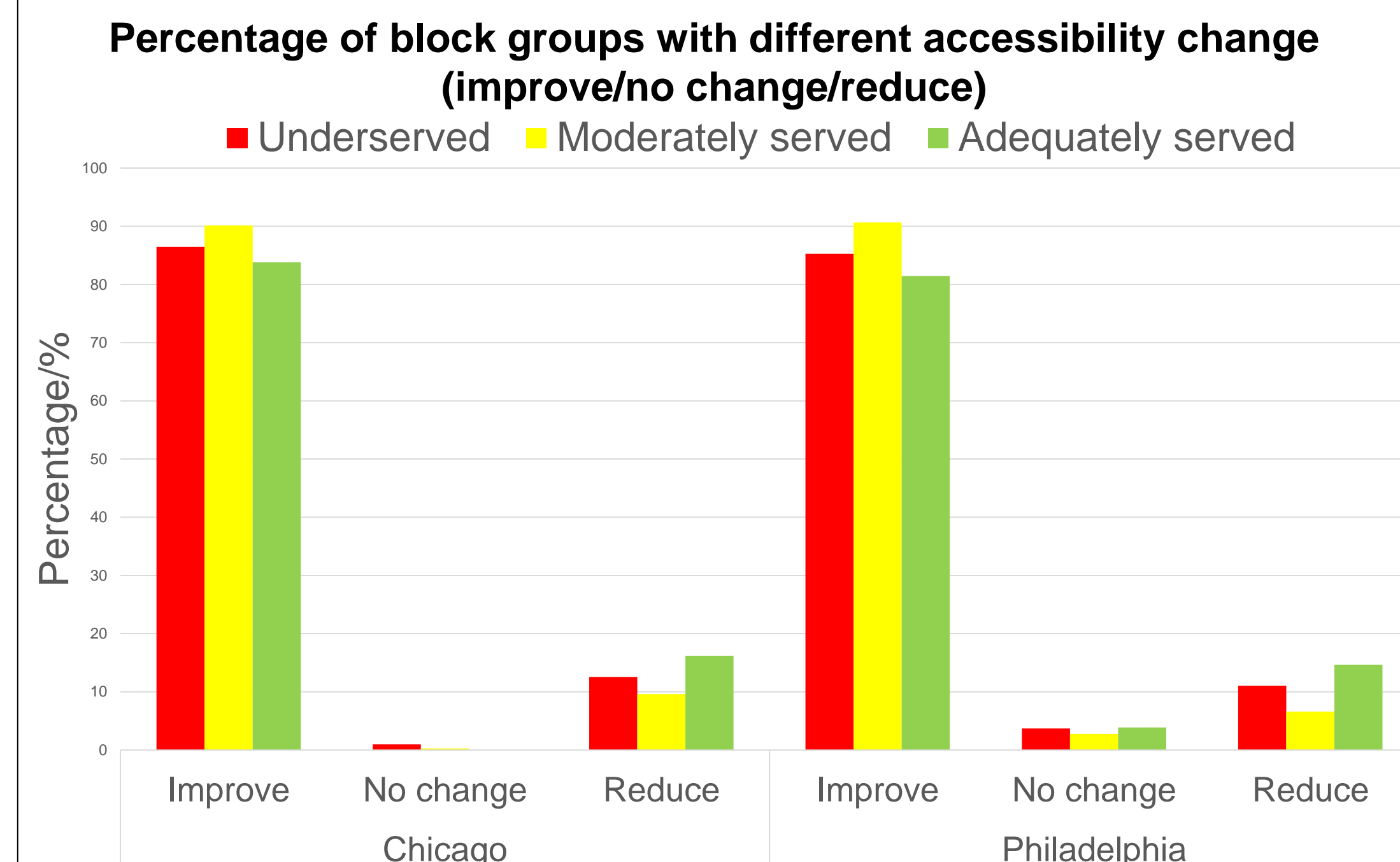
- Identifying priority areas

A: Very high priority for bikeshare stations
B: High priority for bikeshare stations
C: Intermediate priority for bikeshare stations
D: High priority bikeshare and bike infrastructure combined need area

Data	Level	Value
Percentage of minority race/households owning or renting 0-1 vehicle ²	High	$P^3 > \text{Mean} + 0.5 \times \text{Sd}^4$
	Moderate	$\text{Mean} - 0.5 \times \text{Sd} \leq P \leq \text{Mean} + 0.5 \times \text{Sd}$
	Low	$P < \text{Mean} - 0.5 \times \text{Sd}$
Level of served populations	Data	Chicago Philadelphia
	Underserved	Income: below the poverty line Percentage 1 ¹ : High > 60.9% > 70.9% Percentage 2 ² : High > 77.9% > 84.9%
Moderately served	Income	Everything else
	Percentage 1 Percentage 2	
Adequately served	Income: above the poverty line	> \$ 25,000 per year
	Percentage 1: Low	< 22.4% < 35.7%
	Percentage 2: Low	< 59.1% < 67.8%

Category	Level of served populations			Level of bike infrastructures			Potential for increased Job and essential service access		
	Underserved	Moderately served	Adequately served	High	Moderate	Low	High	Moderate	Low
A	✓			✓			✓		
B	✓			✓	✓			✓	
C		✓		✓	✓		✓	✓	
D	✓	✓				✓	✓	✓	✓

Accessibility Analyses



Increase in the number of jobs at different levels of served population and bicycle infrastructure

Level of bicycle infrastructure	High		Moderate		Low	
	Chicago	Philadelphia	Chicago	Philadelphia	Chicago	Philadelphia
City						
Underserved	4384%	4176%	2105%	1662%	1754%	1081%
Moderately served	4267%	2473%	2149%	1418%	1783%	1701%
Adequately served	1455%	1887%	2045%	2857%	1507%	2261%

Increase in the number of services at different levels of served population and bicycle infrastructure

Level of bicycle infrastructure	High		Moderate		Low	
	Chicago	Philadelphia	Chicago	Philadelphia	Chicago	Philadelphia
City						
Underserved	1645%	1044%	1345%	818%	632%	501%
Moderately served	1859%	1335%	1113%	847%	862%	548%
Adequately served	1316%	1589%	1036%	694%	632%	537%

Priority areas for bikeshare stations in underserved communities and Current bikeshare station locations

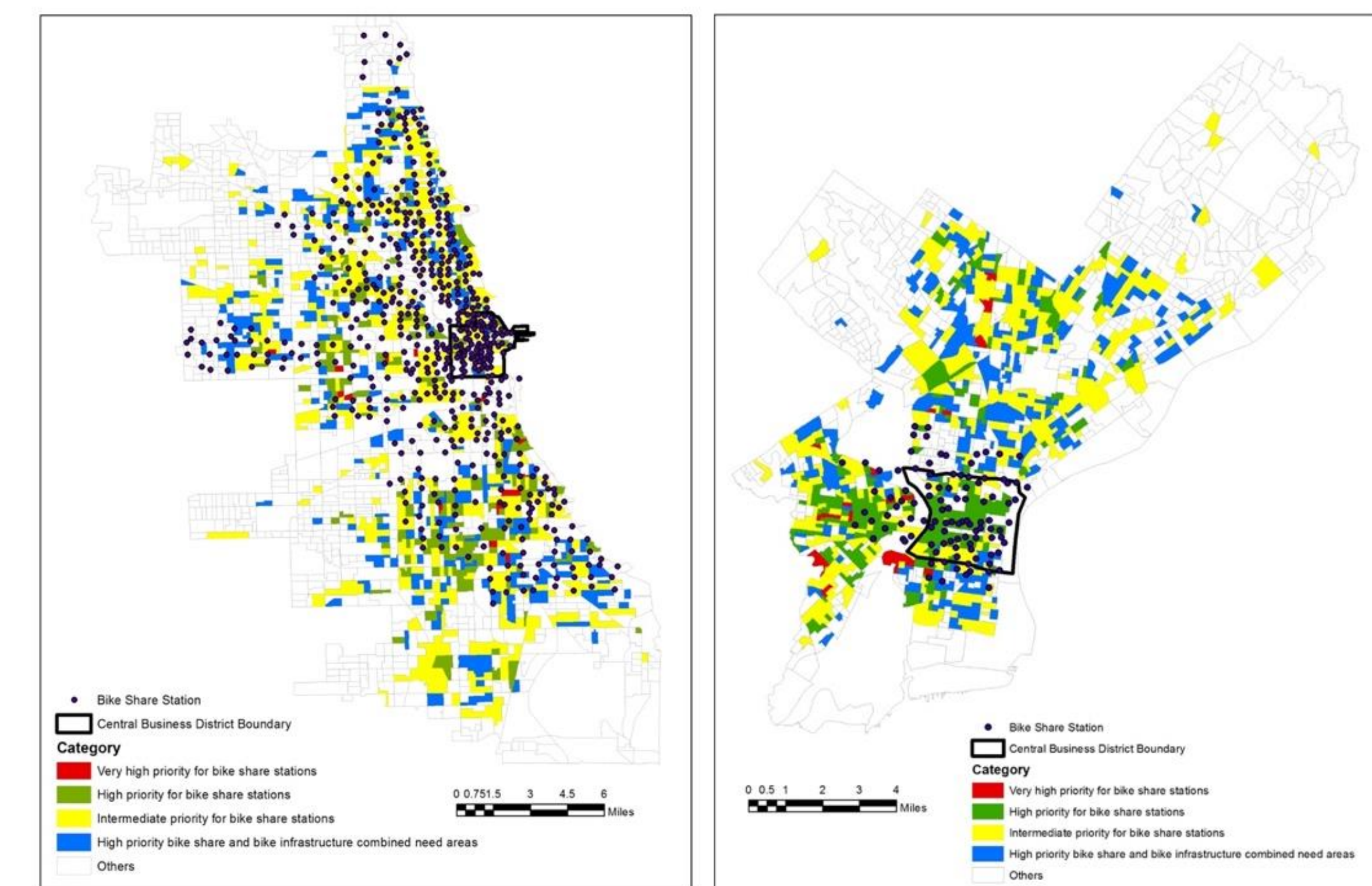
Distribution of block groups in four categories in Chicago and Philadelphia

Category	Chicago	Philadelphia
A	15 (0.7%)	20 (1.5%)
B	208 (9.1%)	174 (13.0%)
C	561 (24.5%)	326 (24.5%)
D	403 (17.6%)	285 (21.3%)
Others	1102 (48.1%)	531 (39.7%)
Total number of block groups	2289	1336

Distribution of bikeshare stations in four different categories in Chicago and Philadelphia

Category	Chicago	Philadelphia
A	2 (0.3%)	1 (1.0%)
B	70 (12.0%)	33 (31.4%)
C	181 (31.2%)	24 (22.9%)
D	58 (10.0%)	6 (5.7%)
Others	270 (46.5%)	41 (39.0%)
Total number	581	105

A: Very high priority for bikeshare stations
B: High priority for bikeshare stations
C: Intermediate priority for bikeshare stations
D: High priority bikeshare and bike infrastructure combined need area



Conclusions

- Not enough bikeshare stations are placed in underserved areas in Chicago and Philadelphia, despite the great need for bikeshare in these communities.
- The index developed in this study can prioritize high bikeshare investment area to eliminate access barrier and indicate potential accessibility improvement for underserved populations. Furthermore, our results show that the presence of bikeshare systems brings greater accessibility improvements in underserved communities when compared to well-served areas.
- However, as our study implies, a bikeshare system at its developing stage (like Indego in Philadelphia) with a small scale can also make a significant reduction in access barriers for underserved communities.
- If we could have more detailed data of bikeshare trips in underserved areas, we could prove the existence of accessibility improvements with real trip data.

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