Public transit cuts during COVID-19 compound social vulnerability in sprawled cities

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Introduction

- This study examines the equity impacts of public transit service cuts during COVID-19 and their association with urban sprawl.

- We evaluated transit service cuts considering accessibility to food and health care services across 22 US cities in 2020.

Data

- Transit data: Static GTFS dataset.

- Point of Interests (POIs) data: SafeGraph.

- Socio-economic information: ACS 2014-18 and Smart Location Database.

- Sprawl index: National Cancer Institute (NCI).

Method

- Measured accessibility as 30-minute and 45-minute isochrones around food or health care locations in both peak and off-peak hours.

- Compared changes in accessibility in three study phases: Pre-lockdown (Jan – Feb), Lockdown (Mar – June), Post-lockdown (Nov – Dec).

- Estimated multilevel binary logit models during the peak and off-peak hours of lockdown and post-lockdown phase compared to the pre-lockdown phase.
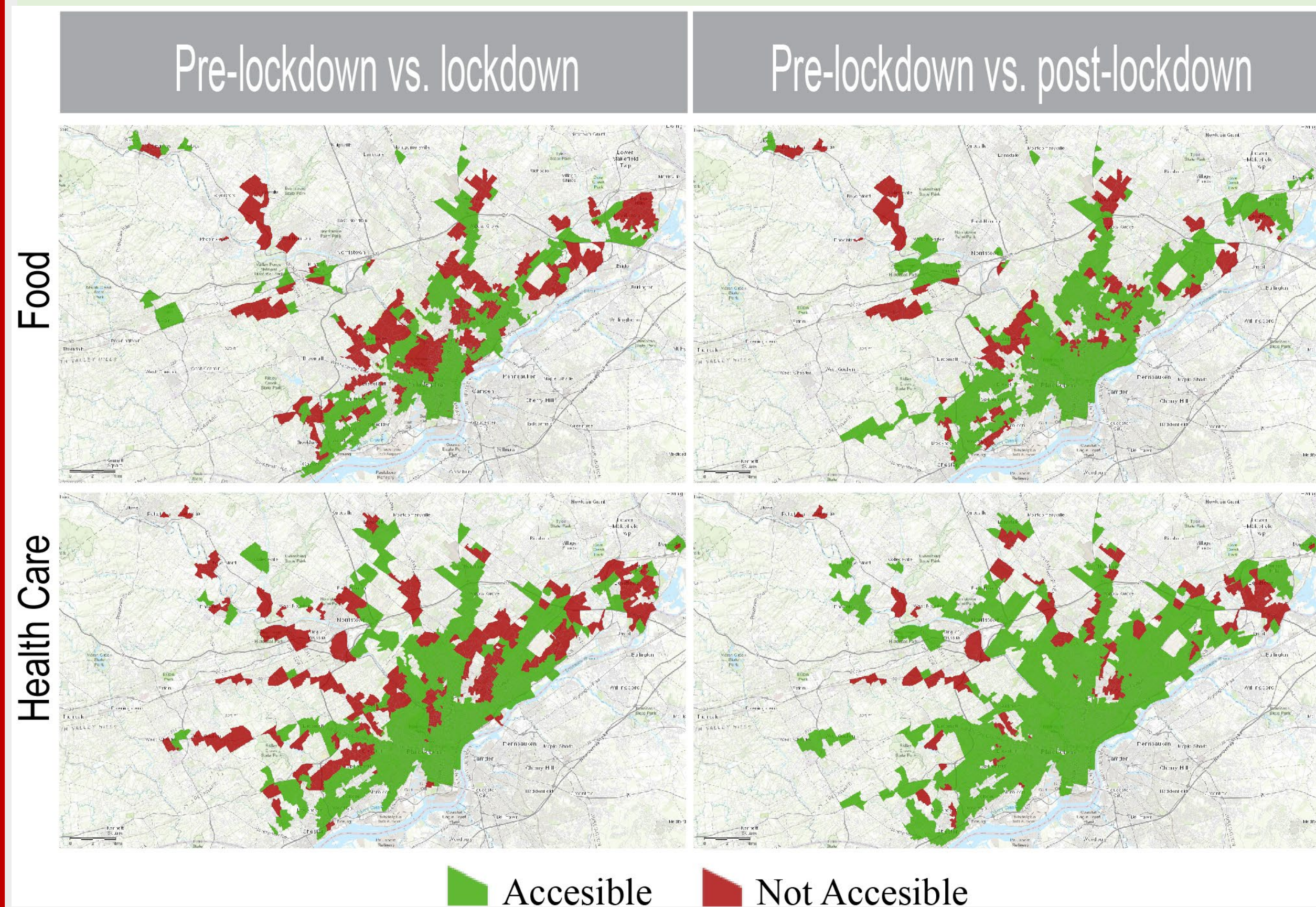

Figure 1: An example of reduced accessibility during peak hours of lockdown and post-lockdown phase in Philadelphia, PA. Webmap for other cities
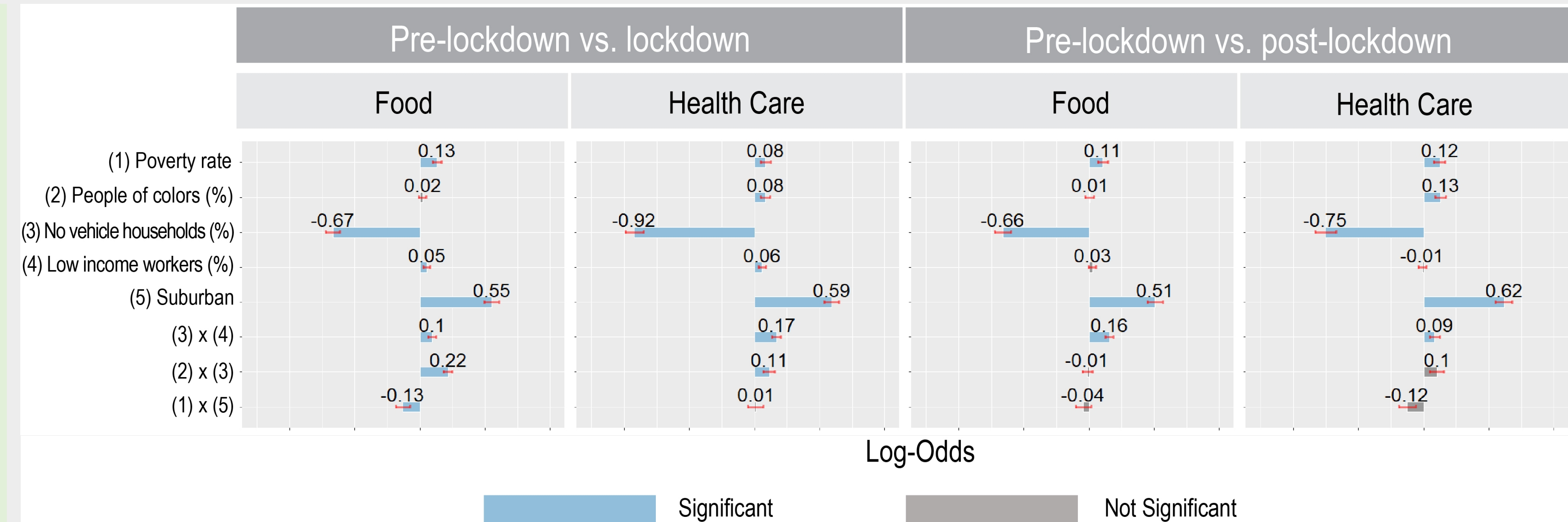

Figure 2: Probabilities of having accessibility reduction to food and health care

Findings

- **Accessibility reduced significantly for vulnerable populations,** especially in the economically disadvantaged areas and suburban areas.

- **Social vulnerabilities intensified in the areas with multiple disadvantages.** We found a higher likelihood of transit service cut in areas with:
  - A high low-income workers (%) and a high no vehicle households (%)
  - A high people of colors (%) and a high no vehicle households (%)

- **Few cities are recovering where rest of them are not, indicating the differences in their transit service resilience.**
  - Cities with a higher transit service cut in the lockdown phase exhibited recovery pattern in the post-lockdown phase
  - Similar findings for both peak and off-peak hours.

- **Reduced accessibility positively correlates with urban sprawl.** This pattern is more pronounced considering the influence of urban sprawl on reducing health care access than food.

- **Similar findings from 30-minutes and 45-minutes isochrones, ensuring the robustness of model results.** Please visit this weblink to examine the detail accessibility measures.
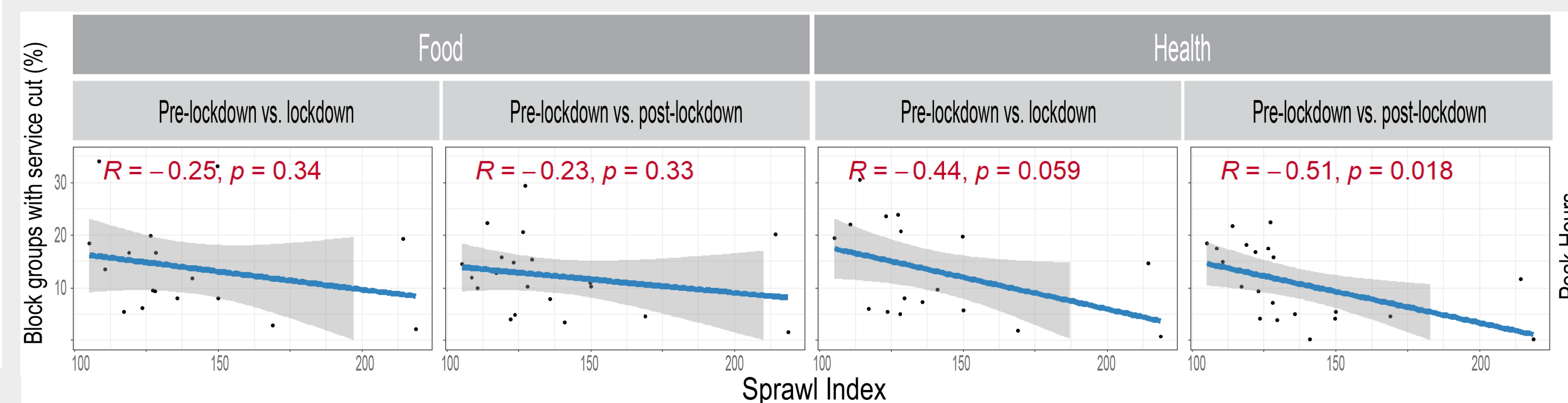

Figure 5: Correlations between urban sprawl and accessibility during peak hours. Lower values of sprawl index indicate more sprawled cities.
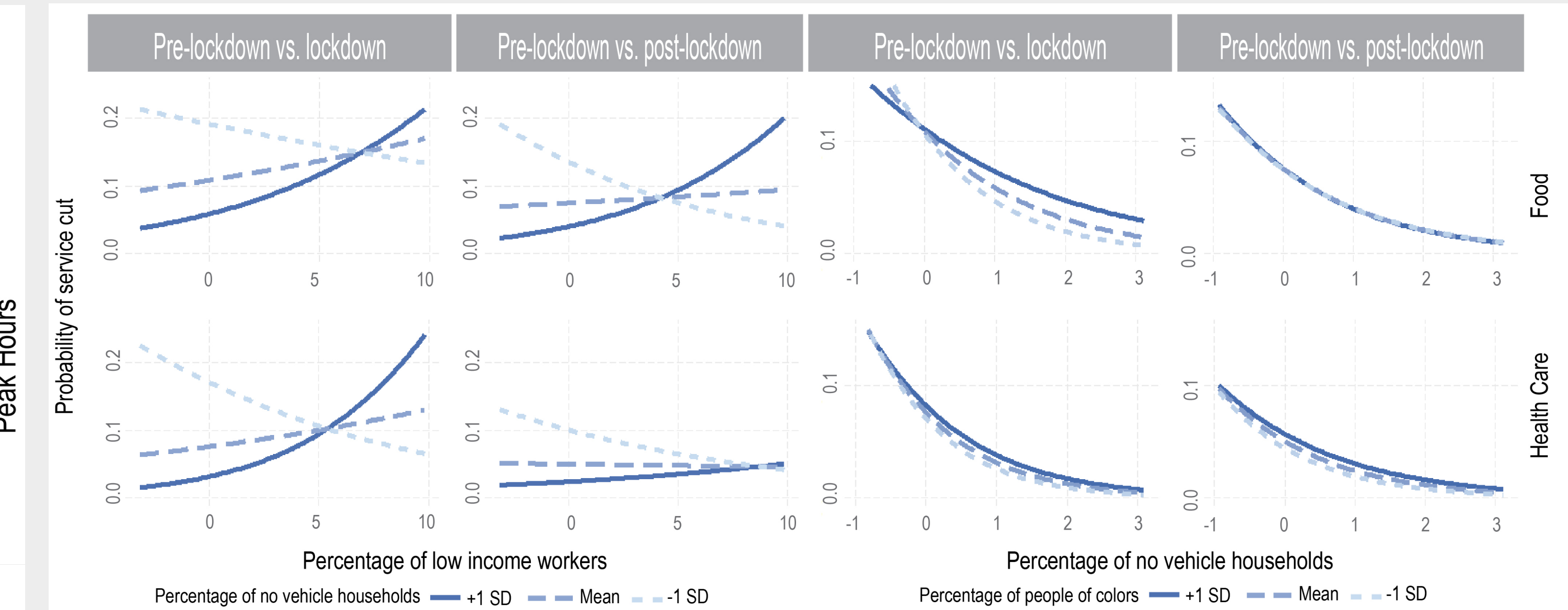

Figure 3: The compounding effects of social vulnerability and reduced accessibility during COVID-19 (peak hours)
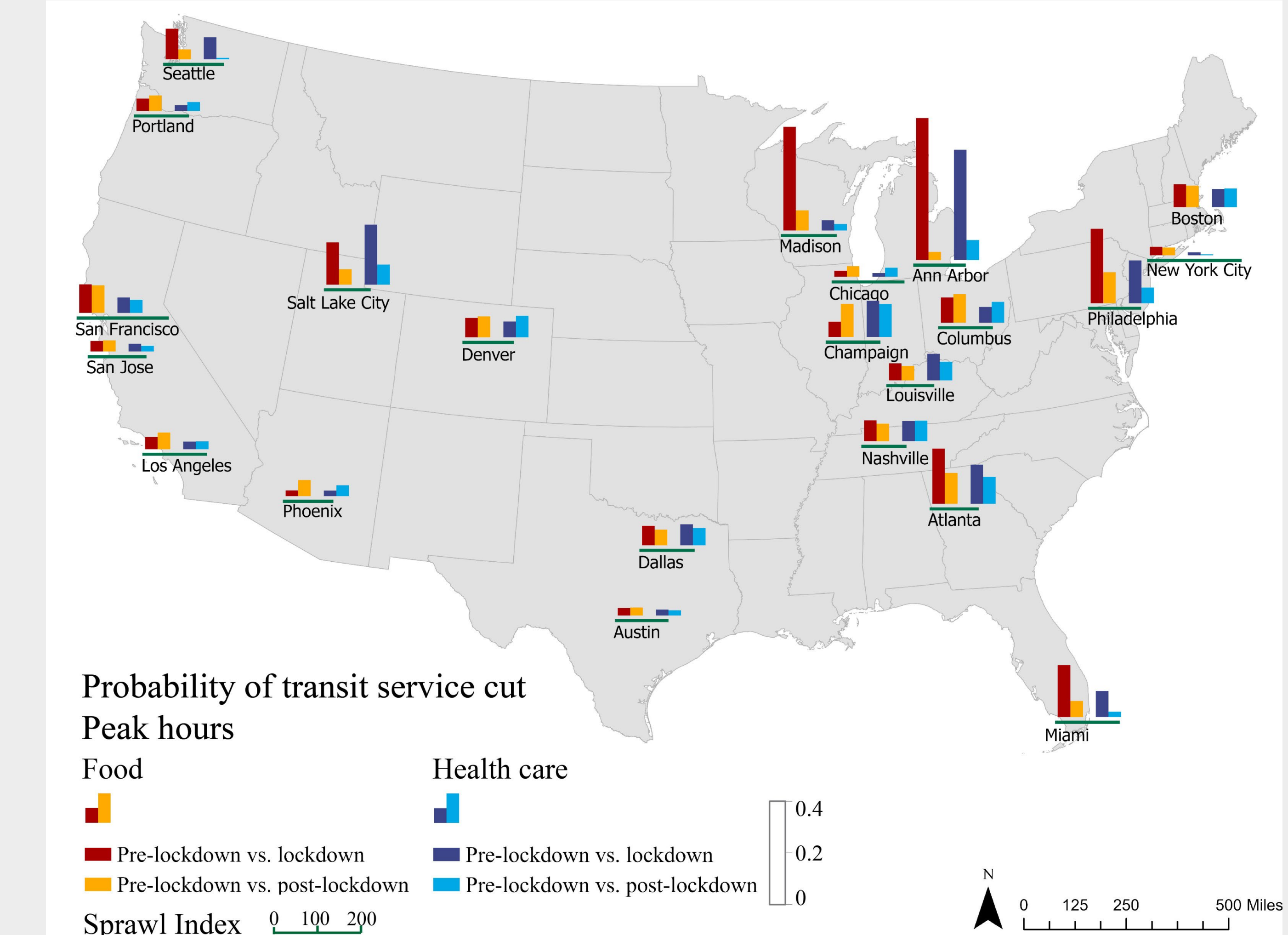

Figure 4: Comparisons of reduced accessibility in 22 US cities during COVID-19 (peak hours)

Significance & Policy Implications

Our study:

- Highlights socio-economic disparities of accessibility to essential services such as food and health care.

- Provides an overview of the resilience and vulnerability of transit services especially during disruption.

- Strengthens evidence for supporting urban densification policies.

- Leverages the lessons to prioritize inclusive public transit system for the cities with greater vulnerability for future disruptions.