Neighborhood Vulnerability and COVID-19 Vaccination Coverage in Philadelphia, PA

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Introduction

- During the COVID-19 pandemic, Black and Hispanic residents of Philadelphia, PA, have had disproportionately higher rates of cases, hospitalizations, and deaths.
- Disadvantaged communities, comprising of larger proportions of racial and ethnic minorities due to structural racism, have lower COVID-19 vaccination rates compared to those with largely white residents.
- Our objective was to evaluate differences in neighborhood vulnerability by COVID-19 vaccination coverage at the census tract level in Philadelphia and to compare the performance of two statistical place-based measures of disadvantage ("disadvantage indices").

Methods

- Neighborhood vulnerability was characterized using:
  1. CDC Social Vulnerability Index (SVI) using 2018 American Community Survey data
  2. COVID-19 Community Vulnerability Index (CCVI) downloaded in January 2022
- The percent of the population with 1+ COVID-19 vaccine doses (03/27/22) was obtained at the census tract level through *OpenDataPhilly*.
- Kruskal-Wallis tests were used to evaluate differences in median vulnerability score between census tracts with similar vaccination coverage.

Using **disadvantage indices** can aid with both **routine and emergency public health programming**, beyond COVID-19, and can help guide resource allocation (vaccines, treatment) to neighborhoods that may have a disproportionately greater need, mitigating existing **health disparities**.

Results

- The majority (85%) of census tracts in Philadelphia have COVID-19 vaccination coverage (1+ doses) above 50%.
- Kruskal-Wallis tests showed a statistically significant difference in the median vulnerability score ($p < 0.001$ for both SVI and CCVI, separately) between census tracts with similar vaccination coverage.
- Except for census tracts with <20% coverage, which had lower vulnerability scores (<60th percentile), tracts with higher coverage rates had lower overall vulnerability scores for both SVI and CCVI.

Figure 2. Vulnerability Score by Vaccination Coverage Percentage in Philadelphia
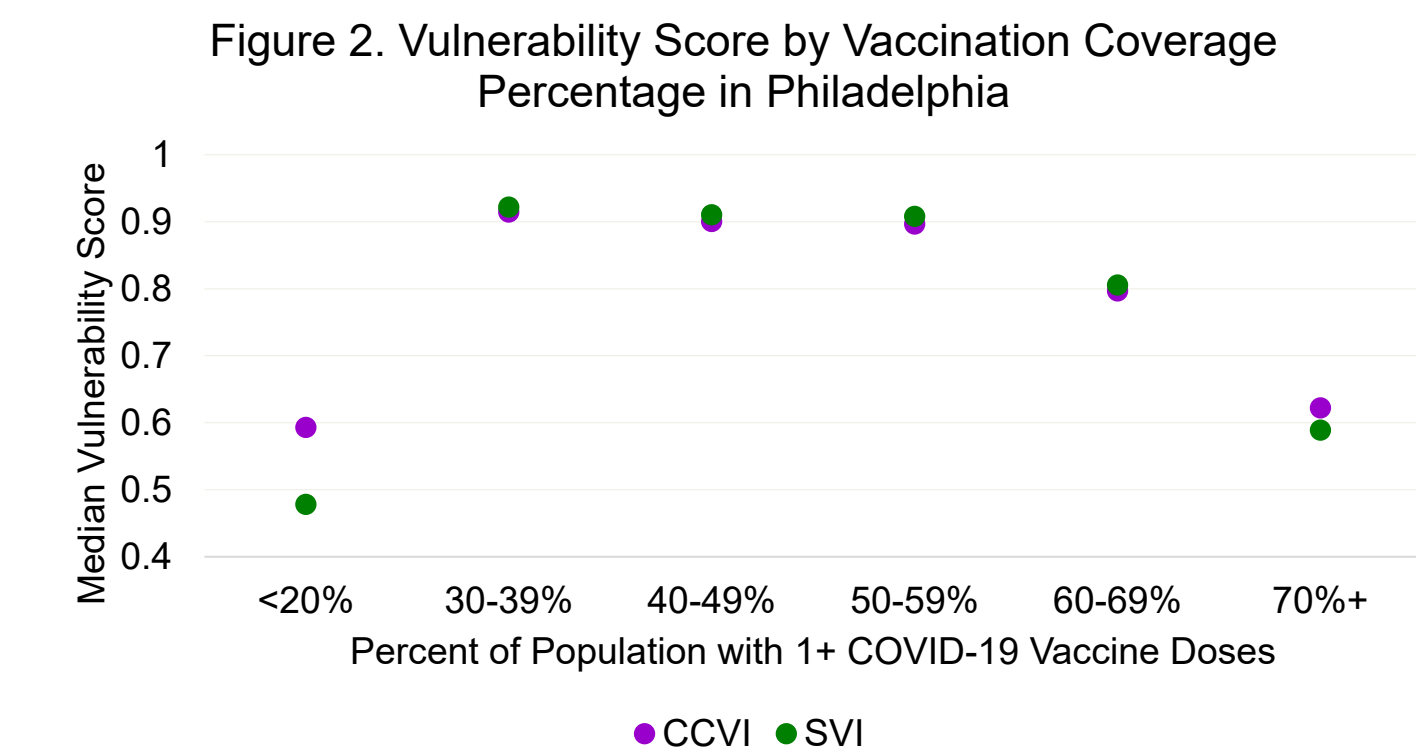
- SVI and CCVI were highly correlated (Pearson's correlation coefficient [95% CI] = 0.94 [0.93-0.95], $p < 0.001$).

Discussion

- Our finding of lower vaccination rates among census tracts with higher vulnerability suggests that these communities should be prioritized for COVID-19 vaccination outreach.
- These pockets of low vaccine coverage can create hotspots of disease, prolong community transmission, and exacerbate existing disparities.
- The significant correlation between SVI and CCVI suggest similar performance between these indices in characterizing vulnerability.
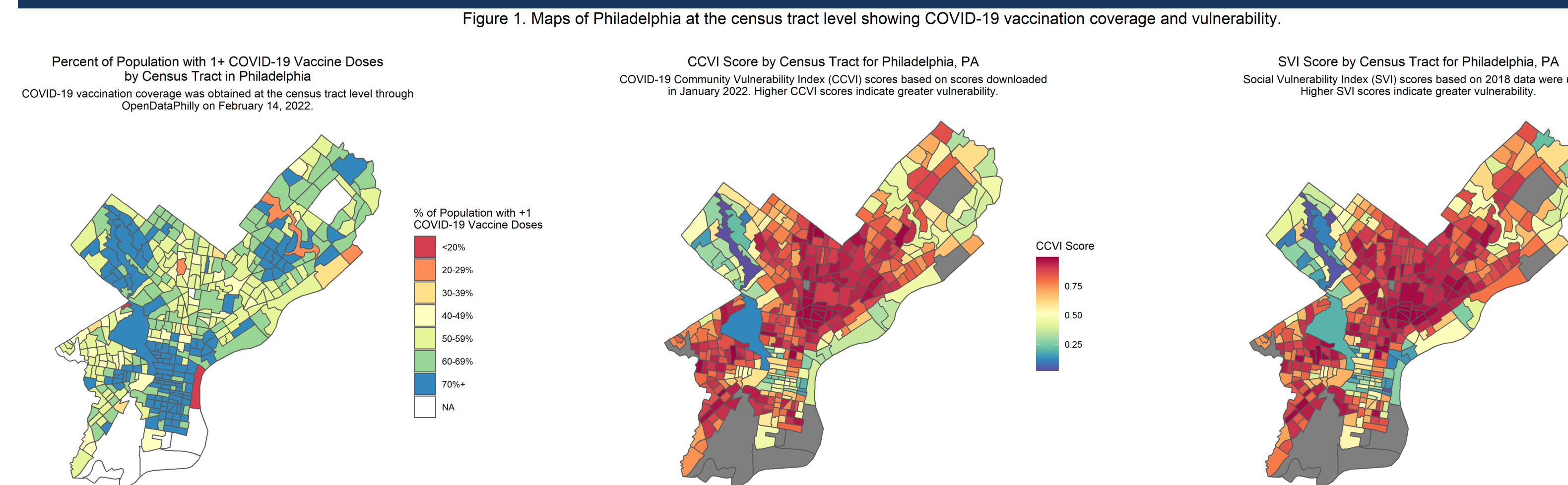
Figure 1. Maps of Philadelphia at the census tract level showing COVID-19 vaccination coverage and vulnerability.

Percent of Population with 1+ COVID-19 Vaccine Doses by Census Tract in Philadelphia
COVID-19 vaccination coverage was obtained at the census tract level through OpenDataPhilly on February 14, 2022.

% of Population with +1 COVID-19 Vaccine Doses
<20%
20-29%
30-39%
40-49%
50-59%
60-69%
70%+
NA

CCVI Score by Census Tract for Philadelphia, PA
COVID-19 Community Vulnerability Index (CCVI) scores based on scores downloaded in January 2022. Higher CCVI scores indicate greater vulnerability.

SVI Score by Census Tract for Philadelphia, PA
Social Vulnerability Index (SVI) scores based on 2018 data were used. Higher SVI scores indicate greater vulnerability.

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