Associations between Social Determinants of Health, Air Pollution and COVID-19 Mortality among hospitalized patients in New York City

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BACKGROUND

- Neighborhood disadvantage, which is closely associated with race, is a predictor of poor COVID-19 clinical outcomes.1
- During the first wave, up to 32% of hospitalized patients in NYC died.2
- COVID-19 outcomes are worse among low-income Black and Hispanic communities.1
- Urban air pollution increases the risk for COVID-19 mortality.3

OBJECTIVE

To investigate the association between individual and neighborhood SDoH indicators, air pollution exposure and COVID-19 mortality among in-patients in NYC by using latent class analysis.

METHODS

Latent class analysis (LCA) of retrospective cohort data was performed to determine the association between patterns of SDoH, SES disadvantage and mortality.

Eligibility Criteria

- Patients hospitalized between 3/1/2020 to 8/30/2020
- Adults ≥18 y.o. with a +SARS CoV-2 PCR nasal swab

Predictors

- Census block SES indicators were obtained from the 2012 – 2016 American Community Survey
- Patients’ residential addresses were geocoded to census blocks with a 1km radial buffer
- Poverty level, education, nativity, per capita income and housing density
- Annual average concentrations of air pollutants were obtained from the Dec 2018 - Dec 2019 New York City Community Air Survey
- Fine particulate matter (PM2.5), black carbon (BC), nitrogen dioxide (NO2)
- Individual demographic (age, sex, self-reported race/ethnicity, insurance, borough, onset time) and clinical data (hospital facility, mortality) were extracted from electronic medical records.

OUTCOMES

- COVID-19 mortality
- COVID-19 outcomes
- COVID-19 clinical outcomes

RESULTS

Descriptive analysis of individual patient characteristics are summarized in Figure 1. Overall, this cohort was predominantly male (59.9%) and had a median age of 65 (IQR: 53,77) years old. Out of the 6542 patients studied, 2044 (31.2%) died.

Figure 1. Inpatient COVID-19 mortality by (A) hospital, (B) self-identified race/ethnicity and (C) insurance status. MSH (Mount Sinai Hospital), MSSL (Mount Sinai St. Luke’s), MSW (Mount Sinai West), MSQ (Mount Sinai Brooklyn), MQ (Mount Sinai Queens)

Figure 2. After considering LCA fit statistics, the 5 class model was determined to best describe underlying COVID-19 subphenotypes. Class descriptions are above.

Figure 3. Individual demographic characteristics of patients by latent class assignment. (A) Race/ethnicity (B) Hospital facility

Table 1. Associations between latent classes and COVID-19 mortality

<table>
<thead>
<tr>
<th>RR</th>
<th>95% CI</th>
<th>P</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td></td>
<td>1.22</td>
<td>(1.08, 1.39)</td>
</tr>
<tr>
<td>Highest</td>
<td>Disadvantage</td>
<td>1.37</td>
<td>(1.21, 1.55)</td>
</tr>
<tr>
<td>Moderate High</td>
<td>Disadvantage</td>
<td>1.43</td>
<td>(1.27, 1.61)</td>
</tr>
<tr>
<td>Moderate</td>
<td>Disadvantage</td>
<td>1.27</td>
<td>(1.12, 1.42)</td>
</tr>
</tbody>
</table>

DISCUSSION

- LCA successfully identified patterns of SDoH indicators among 5 distinct patient classes who had varying degrees of neighborhood disadvantage.
- Compared to the predominantly White, Manhattan patient sub-phenotype, sub-phenotypes representing patients from disadvantaged communities of color had higher mortality rates.
- Focused on the latent effects of multiple SDOH indicators, independent of COVID-19 outcomes.
- Included diverse patients from two large urban health systems.

LIMITATIONS

- Did not assess all severe COVID-19 cases in the community.
- Housing density was measured, not household crowding

CONCLUSIONS

- This study underscores the need to fully assess the intersectionality of SDoH indicators that contribute most to COVID-19 mortality (low calfita income, low education, foreign born status, Medicaid)

REFERENCES