LUNG CANCER, AIR POLLUTION AND ENVIRONMENTAL INJUSTICE IN OHIO: WHO IS EXPOSED?

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Introduction

- In 2016, Ohio was the 2nd most polluted state in the U.S.
- Power plants in Ohio emit approximately 12% of all U.S. industrial pollution
- Particulates found in industrial air pollution are known to cause lung cancer

![Diagram of air pollution impacts on lung cancer incidence]

- Toxic facility siting is not random but tends to occur more often in poorer and nonwhite communities
- African Americans individuals of lower socioeconomic status (SES) have higher rates of lung cancer than non-Hispanic Whites and those of higher SES
- Greater exposure to industrial air pollution may lead to higher risk of lung and all-site cancer among nonwhite and low SES populations in Ohio

Methods

**Data sets.**
- Rate of cancer deaths and Cancer incidence data (2015) - Behavioral Risk Factor Surveillance System, CDC Website
- Total Toxics data (2011) - The EPA’s Toxic Release Inventory,
- 2011-2015 ACS 5-Yr Estimates: Median Income, Race/Ethnicity

**Dependent Variables**
- Rate of Lung Cancer Deaths

**Explanatory Variables**
- Median Income
- Race/Ethnicity
- Total amount of Toxics

**Age (Covariate)**
- The study uses (1) Pairwise correlation to check for existence of a linear relationship among the explanatory variables
- (2) Linear regression model to predict the relationship between the dependent and independent variables.
- Maps and table(s) to display the results

Results

- Southern Ohio exhibits a low median income level and higher rates of lung cancer
- Descriptively, total toxic released shows a different spatial pattern than income or race/ethnicity

<table>
<thead>
<tr>
<th>Associations between lung cancer mortality, race/ethnicity &amp; income</th>
<th>Independent Variables</th>
<th>Coefficient</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Americans</td>
<td>-1.252</td>
<td>0.137</td>
<td></td>
</tr>
<tr>
<td>American Indians</td>
<td>-7.991</td>
<td>0.562</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>2.516</td>
<td>0.110</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>-1.172</td>
<td>0.008**</td>
<td></td>
</tr>
<tr>
<td>Median Income</td>
<td>-0.007</td>
<td>0.009**</td>
<td></td>
</tr>
<tr>
<td>Total amount of toxics</td>
<td>5.2e-07</td>
<td>0.055</td>
<td></td>
</tr>
</tbody>
</table>

- Lower median household income is associated with higher lung cancer mortality
- Greater levels of toxic release are associated with lung cancer mortality in Ohio
- Latinos have lower lung cancer mortality rates than non-Hispanic Whites

Discussion & Conclusions

- Persons of lower income are more likely to die from lung cancer than high income earners
- Hispanics cluster in highly polluted regions, but do not have higher rates of lung cancer mortality
- Exposure to industrial air toxins is a determinant of lung cancer in Ohio
- Level of toxic emissions into the air is more important for predicting lung cancer than spatial clustering of toxic facilities
- Industrial facilities in Ohio are more clustered in areas with high concentrations of racial/ethnic minority groups
- The results of this study are consistent with several previous environmental justice studies that reveal the disproportionate exposure of race/ethnic minority groups and persons with low SES, to air pollution
- Policy implication: health education campaigns should inform the public of lung cancer risk due to toxic air emissions and promote cancer screening

Future Directions

- Although the variables form a noticeable pattern at the county level, disaggregating into smaller geographies (census tracts) will yield more refined results. Given that census tracts contain approximately 2,500-8,000 people displaying homogenous population characterististics, it will be easier to monitor the intensity of air pollution and cancer burden among the different racial/ethnic groups
- Examine the relationship between the aforementioned variables at the census tract level
- Examine and control for tobacco consumption in southern Ohio as a primary predictor of lung cancer incidence and mortality
- Measure all-site cancer incidence and mortality to evaluate overall cancer risk by race/ethnicity & household income
- Account potential effects from water contamination in addition to air

General distribution of racial/ethnic groups in relation to TRI Facilities and cancer incidence rate

References

7. The American Lung Cancer Association Website.