FINE PARTICULATE MATTER AND RESPIRATORY ADMISSIONS: AN ASSESSMENT OF SHORT-TERM EXPOSURE MODEL CHOICE SENSITIVITY FOR HEALTH STUDIES

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Introduction

• Air pollution and health – widely studied, effect well-documented
• Historically, time-series studies used monitoring data (e.g. AQS)
• Recently, increasing use of prediction models to reduce exposure measurement error and include populations in areas without monitors
• To date, most health studies uses predictions from a single model to assign exposures

• Multi-pollutant air pollution analysis over NY State, 2002-2012
• Today: PM$_{2.5}$ and respiratory admissions
  • Five exposure datasets
  • **Goal:** assess sensitivity of health effect estimates on the choice of different prediction models for exposure assessment
Methods

• Exposure assessment
  • Five daily county-average PM$_{2.5}$ datasets: AQS, CMAQ, AQS + CMAQ Fused, CDC WONDER, Emory model
  • Meteorological data from NASA

• Outcome assessment: daily inpatient respiratory admissions from NYS DOH
  • On average, 2 admissions per day

• Statistical analysis: Poisson regression models
  • Indicator variables for counties and day of week
  • Temperature (3 df), relative humidity (3 df), and long-term and seasonal trends (5 df per year)
Results

AQS
10.7±7.0 μg/m³

CMAQ
8.7±6.7 μg/m³

Fused
9.8±6.0 μg/m³

CDC
9.5±5.9 μg/m³

Emory
8.2±5.7 μg/m³

Comparison Matrix:

<table>
<thead>
<tr>
<th></th>
<th>AQS</th>
<th>CMAQ</th>
<th>Fused</th>
<th>CDC</th>
<th>Emory</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQS</td>
<td>1.00</td>
<td>0.52</td>
<td>0.89</td>
<td>0.83</td>
<td>0.90</td>
</tr>
<tr>
<td>CMAQ</td>
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<td>1.00</td>
<td>0.61</td>
<td>0.49</td>
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<tr>
<td>Fused</td>
<td>0.89</td>
<td>0.61</td>
<td>1.00</td>
<td>0.86</td>
<td>0.92</td>
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<tr>
<td>CDC</td>
<td>0.83</td>
<td>0.49</td>
<td>0.86</td>
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</tr>
<tr>
<td>Emory</td>
<td>0.90</td>
<td>0.52</td>
<td>0.92</td>
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</tr>
</tbody>
</table>
Results

PM$_{2.5}$ and Respiratory Hospitalization

Percent Increase (Per 10 µg/m$^3$)

Analysis Type: All Data, AQS Only, Complete Case

PM$_{2.5}$ Data Source: AQS, CMAQ, Fused, CDC, Emory
Conclusions

• Consistent positive associations between PM$_{2.5}$ and respiratory admissions for all models
  • Higher effect estimates than that of CVD, but wider CIs
• Some fluctuation in effect estimates depending on analysis type
  • Differences could be due to measurement error
  • Predictive accuracy of models varies in space and time in different ways
  • However, conclusion remains the same!
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