SHORT-TERM PM$_{2.5}$ AND CARDIOVASCULAR ADMISSIONS IN NY STATE: ASSESSING SENSITIVITY OF EXPOSURE MODEL CHOICE

MIKE HE
zh2263@cumc.columbia.edu

HAQAST5
JANUARY 4, 2018
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

- Multi-pollutant air pollution analysis over NY State, 2002-2012
- Today: PM$_{2.5}$ and cardiovascular 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 cardiovascular admissions from NYS DOH
  • On average, 7 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 (4 df per year)
Results

AQS
10.3 ± 2.5 μg/m³

CMAQ
8.5 ± 2.9 μg/m³

Fused
9.8 ± 1.4 μg/m³

CDC
11.4 ± 0.7 μg/m³

Emory
8.2 ± 1.6 μg/m³

Correlation 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></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMAQ</td>
<td>0.64</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fused</td>
<td>0.89</td>
<td>0.75</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDC</td>
<td>0.68</td>
<td>0.48</td>
<td>0.73</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Emory</td>
<td>0.90</td>
<td>0.64</td>
<td>0.91</td>
<td>0.71</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Results
Conclusions

• Significant, positive associations between PM$_{2.5}$ and cardiovascular admissions for all (but one) model

• Some fluctuation in effect estimates depending on analysis type
  • Differences could be due to measurement error
  • However, conclusion remains the same!

• Results are preliminary; next steps:
  • Sensitivity analyses
  • Missingness patterns
  • Other air pollutants/outcomes
  • Different time-metrics
Acknowledgments

Collaborators:

MARIANTHI-ANNA KIOUMOURTZOGLOU
PATRICK KINNEY
ARLENE FIORE
XIAOMENG JIN
VIVIAN DO
SILIANG LIU
TABASSUM INSAF
ADRIAN MICHALSKI

Funding:

NIEHS Individual Fellowship F31 ES029372
NIH Institutional Research T32 ES023770
NIEHS Center Core P30 ES009089
NASA HAQAST Grant (#NNX16AQ20G)
NASA HAQAST5 Travel Award
NYSERDA Grant (#91268)

1Columbia University
2Boston University
3NYS Dept. of Health
Thank You!