ASSOCIATIONS BETWEEN AMBIENT AIR POLLUTION CONCENTRATIONS AND RESPIRATORY EMERGENCY DEPARTMENT VISITS AMONG ALL AGE GROUPS IN THE U.S.

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Background

Heather Strosnider, who works at CDC’s Environmental Public Health Tracking Program, has collected daily, county-level emergency department (ED) data from 17 states during various years (2001-2012):

• 40 million respiratory ED visits
• All ages
<table>
<thead>
<tr>
<th></th>
<th>ICD-9-CM</th>
<th>All</th>
<th>0-&lt;19</th>
<th>19-&lt;65</th>
<th>65+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All</strong></td>
<td>460 – 519</td>
<td>40.0</td>
<td>16.1</td>
<td>16.4</td>
<td>5.9</td>
</tr>
<tr>
<td><strong>ARI</strong></td>
<td>460 – 466.0</td>
<td>18.1</td>
<td>9.5</td>
<td>7.2</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Asthma</strong></td>
<td>493</td>
<td>5.8</td>
<td>2.3</td>
<td>2.7</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>COPD</strong></td>
<td>491,492,496</td>
<td>2.4</td>
<td>NA</td>
<td>0.9</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Pneumonia</strong></td>
<td>480 – 486</td>
<td>4.7</td>
<td>1.3</td>
<td>1.4</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Rate of Respiratory ED Visits per 10,000 Population by State and Year

- CA
- CO
- FL
- IA
- IL
- LA
- MA
- ME
- MN
- MO
- NC
- NH
- NM
- NY
- SC
- UT
- VT


Rate

- 700
- 600
- 500
- 400
- 300
- 200

HAQAST project

Project goal: Develop a fusion model (NASA earth observations, WRF-CMAQ, ground observations) to be used in conjunction with emergency department data to perform epidemiologic analyses
Methods

Random Forests

An ensemble learning method that provides multivariate, non-parametric, non-linear regression and classification based on a training dataset and generates predictions with high accuracy and interpretability

- 10-fold cross validation
- Importance measures for predictor variables
  - Increase of mean square errors (MSE) of predictors
  - Increase in node purities
Our results achieve an overall cross validation (CV) $R^2$ value of 0.80. Mean prediction error (MPE) and root mean squared prediction error (RMSPE) for daily predictions are 1.78 and 2.83 $\mu g/m^3$, respectively.
Rate ratios and 95% CI per 10 µg/m³ increase in lag 0-6 PM$_{2.5}$ concentrations (controlling for ozone)
Team members

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