Childhood Asthma and Air Pollution Surveillance

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Purposes of the surveillance system:

• To enable rapid retrieval of specific information regarding air pollution and asthma hospitalizations:
  – What was the asthma rate in location $x$ during time $t$?
  – How many ozone exceedances were there in location $x$ during time $t$?
  – How do this year’s asthma rates compare with those from 5 years ago?

• To generate hypotheses and shape research questions:
  – What is the usual lag time between high ozone concentrations and increased asthma hospitalizations?
  – Are increases in asthma hospitalizations seen for moderate levels of ozone?

• To aid in shaping intervention and prevention strategies:
  – What locations could benefit the most from a greater awareness of asthma risk?
These questions may be answered through:

• Automatically generated reports containing summary statistics, tables, graphs and maps.

• Specific data queries generated by project staff.

• Summary information posted on a public web site.
Limitations of the surveillance system:

• Cannot determine cause and effect relationships
  – System can only be used to guide follow-up epidemiologic investigations

• Many parts of the state will have sparse data
  – Particularly true for rare conditions such as certain birth defects

• Exposure assessment methods have limitations
  – Air pollution measures rely on interpolation methods
  – No information on indoor air quality
Health Data

• ICD9 code 493.0-493.9

• Age of diagnosis 0-17 years

• Date of hospital admission
Air pollution data

- Ozone, PM$_{10}$, PM$_{2.5}$, sulfur dioxide, nitrogen oxides, and carbon monoxide

- Measurements at regular time intervals (e.g. ozone measured hourly)

- Measurements at air monitors in NYS, adjacent states and Canada
4 km grid cells
1.3 km grid cells
Data visualization examples

• The examples that follow represent proven methods that may be reasonably implemented into an automated system.

• Data are derived from the public-use version of the SPARCS file, but should be treated as inexact and imprecise for the purposes of this presentation.
Data visualization examples

• Tabular reports
• Raw disease rate maps
• Smoothed disease rate maps
• Temporal graphs
• Time-comparison maps
• Interpolated air pollution maps
• Air pollution animations
• Disease cluster maps (space-time clusters, emergent clusters)
• Disease/air pollution co-occurrence maps
Before Proceeding with Your Query

<table>
<thead>
<tr>
<th>Review Regulations</th>
<th>Review Regulations Regarding Access to SPARCS Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Review Other Pertinent Information</strong></td>
<td>Information on the <a href="#">Quality and Limitations</a> of the SPARCS data used in these queries. It is important to note that because the data is periodically updated, it will change.</td>
</tr>
<tr>
<td></td>
<td>Description of the <a href="#">SPARCS Data Elements</a></td>
</tr>
<tr>
<td></td>
<td><a href="#">Derivation of Data Records</a></td>
</tr>
</tbody>
</table>

These queries include discharge data for New York State residents only. The SPARCS Annual Report series is for all discharges and therefore will report slightly higher discharges in total than those reported here.
Table 3. County Specific Hospitalization Counts and Hospitalization Rates
(Per 100000 Residents For: 1996 2000)
(Note: See Query Limit Table For Rate and Resident Specificity)

<table>
<thead>
<tr>
<th>Location</th>
<th>1996</th>
<th>2000</th>
<th>Average</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>County</td>
<td>Rate</td>
<td>Counts</td>
<td>Rate</td>
<td>Counts</td>
</tr>
<tr>
<td>ALLEGANY</td>
<td>225.07</td>
<td>26</td>
<td>138.31</td>
<td>16</td>
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<tr>
<td>CATTARAUGUS</td>
<td>362.48</td>
<td>74</td>
<td>176.88</td>
<td>36</td>
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<tr>
<td>CHAUTAUQUA</td>
<td>177.44</td>
<td>56</td>
<td>104.84</td>
<td>33</td>
</tr>
<tr>
<td>ERIE</td>
<td>293.35</td>
<td>592</td>
<td>178.91</td>
<td>362</td>
</tr>
<tr>
<td>GENESEE</td>
<td>268.67</td>
<td>39</td>
<td>116.20</td>
<td>17</td>
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<tr>
<td>NIAGARA</td>
<td>273.30</td>
<td>136</td>
<td>129.77</td>
<td>65</td>
</tr>
<tr>
<td>ORLEANS</td>
<td>175.71</td>
<td>19</td>
<td>90.01</td>
<td>10</td>
</tr>
<tr>
<td>WYOMING</td>
<td>116.22</td>
<td>12</td>
<td>38.11</td>
<td>4</td>
</tr>
</tbody>
</table>
This map uses realistic though simulated data.
Childhood Asthma Hospitalization Rates
1996-2000

- 1,200 +
- 800 - 1,200
- 400 - 800
- 200 - 400
- 0 - 200

Per 100,000

This map uses realistic though simulated data.
Smoothed Map of
Standardized Incidence Ratios of
Low Birth Weight Births by Zip code,
1994-1995

Based on grid points capturing a minimum of 250 births
Temporal Trends in Childhood Asthma Rates

![Temporal Trends in Childhood Asthma Rates](chart)

- **Bronx**
- **Albany**
- **NYS**

Rate per 100,000 children
New York City Asthma Hospitalization Rate
(Under 18 Years of Age) Per 100,000 Population

One Day Hospitalization Rate:
- 0-1
- 1-2
- 2-3
- 3-4
- 4-5
- 5+

Year:
- 1998
- 1999
- 2000
- 2001
New York City Ozone

Daily 8 Hr Maximum Ozone Concentration (ppb)

1998
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday

1999
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday

2000
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday

2001
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday

1 Hr Average Peak Concentration (ppb)
- Missing
- 0-60
- 61-79
- 80-99
- 100-110
- 111-124
- 125+

Statewide average decrease 22%

- Increase of more than 5%
- Within 5% or 2 cases
- Decrease between 5% and 22%
- Decrease of more than 22%

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Ozone Predictions (ppb) in New York State

Predicted Value

- High: 105.7
- Low: 66.9

Grid Cell Size = 4km
July 4, 2003 8:00 am EDT
Areas of elevated incidence for entire 1996-2000 period

1. Bronx/Harlem
2. Gloversville/Johnstown (Fulton Co.)
3. Salamanca (Cattaraugus Co.)
4. Buffalo

This map uses realistic though simulated data.
Emergent clusters

Asthma Rate Per 100,000 Population (age 0-14 Years)
Vs
Peak 8 Hours Ozone Levels (ppm)