Airways Research Group - Investigation of Lung Health and Air Quality in Southern Saskatchewan

Airways Research Group

Air Quality in Saskatchewan. Saskatoon, Saskatchewan. January 17, 2014
Airways Research Group

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- Dr. Scott Bell - Dept. of Geography, University of Saskatchewan
- Mr. Terry Gibson – Southeast Saskatchewan Airshed Association
- Mr. Murray Hilderman – Saskatchewan Ministry of Environment

ARG Project Manager: Ms. Johanne Asselin
ARG Group Expertise

- Experts
  - Environmental Epidemiology
  - Industrial Hygiene
  - Occupational Medicine
  - Respiratory Clinicians
  - Lung Immunology
  - Mass Spectrometry
  - Global Information Systems & mapping

- Organizations
  - University of Saskatchewan
  - Lung Association of Saskatchewan
  - Southeast Saskatchewan Airshed Association
  - Saskatchewan Ministry of Environment
  - SaskPower
Background

- Airborne contaminants can dramatically affect respiratory and cardiovascular health.
Hypothesis

- Air quality can contribute to respiratory health outcomes.
Objectives

- To examine the levels and composition of airborne particulate matter in Estevan and Swift Current;

- To characterize the respiratory health of older populations of these communities;

- To determine whether episodic increases in respiratory issues are related to increases in the levels, and/or changes in the composition, of airborne particulate matter.
Methods

Assessments

- **Participants**
  - Twice daily peak flow monitoring (FEV1)
  - Twice daily diary of respiratory symptom levels

- **Environment**
  - Continuous measures of particulate matter, SO$_2$ and NO$_2$
  - Weekly high volume filter samples of air particulate (2.5 µm and 10 µm cut-size)
Participants

Environment

High Volume Sampler
(one at each location)

Continuous Monitoring

SWIFT CURRENT
Saskatchewan Ministry of Environment
PM, SO2 and NO2

ESTEVAN
SaskPower
PM, SO2 and NO2
Dust Analysis of High Volume Samples

Where there are noticeable episodic increases in respiratory activity, we will analyze the filters collected around the same time points as the respiratory episodes for:

- Inflammatory Activity
- Bacterial Endotoxin
- Proteins
- Total Carbon
- Elemental Analysis

\[ \text{Assays of biological activity} \]

\[ \text{Physical characterization of dust contents} \]
RESULTS - Phase Dates

4 Phases to the Study

• Phase 1
  ▫ 1 month: November 2012

• Phase 2
  ▫ 2 months: April and May 2013

• Phase 3
  ▫ 2 months: October and November 2013

• Phase 4
  ▫ 2 months: April and May 2014
Participant Numbers

<table>
<thead>
<tr>
<th>Period</th>
<th>Estevan</th>
<th>Swift</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 2012</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>April – May 2013</td>
<td>31</td>
<td>28</td>
</tr>
<tr>
<td>October – November 2013</td>
<td>40</td>
<td>42</td>
</tr>
<tr>
<td>April – May 2014</td>
<td></td>
<td>Still to be collected</td>
</tr>
</tbody>
</table>

# Phase 1 - Demographics

<table>
<thead>
<tr>
<th>Sex</th>
<th>Estevan</th>
<th>Swift Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>Male</td>
<td>12 (41.4%)</td>
<td>8 (26.6%)</td>
</tr>
<tr>
<td>Female</td>
<td>17 (58.6%)</td>
<td>22 (73.4%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Estevan</th>
<th>Swift Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>51-60</td>
<td>8 (27.6%)</td>
<td>18 (60.0%)</td>
</tr>
<tr>
<td>61-70</td>
<td>10 (34.5%)</td>
<td>11 (36.7%)</td>
</tr>
<tr>
<td>71-80</td>
<td>9 (31.0%)</td>
<td>1 (3.3%)</td>
</tr>
<tr>
<td>81-85</td>
<td>2 (6.9%)</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>30</td>
</tr>
</tbody>
</table>

**Mean age**
- Estevan 66.8 years
- Swift Current 59.2 years
Phase 1 - Questionnaire Results

<table>
<thead>
<tr>
<th>Do you have any respiratory conditions</th>
<th>Estevan</th>
<th>Swift Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>5 (17.2%)</td>
<td>6 (20%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Has a doctor ever diagnosed you with asthma</th>
<th>Estevan</th>
<th>Swift Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4 (13.8%)</td>
<td>5 (17.2%)</td>
</tr>
<tr>
<td>No</td>
<td>25 (86.2%)</td>
<td>24 (82.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>
**Phase 1 - Smoking Results**

<table>
<thead>
<tr>
<th>Do you smoke cigarettes now?</th>
<th>Estevan</th>
<th>Swift Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>No</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

Have you smoked more than 20 packs of cigarettes in your lifetime?

<table>
<thead>
<tr>
<th></th>
<th>Estevan</th>
<th>Swift Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>
Daily Symptom Disturbance and Environmental Measures (phase I)

Estevan Symptom Disturbance and Environmental
Comparison of Daily Symptom Disturbance and Environmental Measures (phase I)

Estevan

- SO2 24 hour
- NO2 24 hour
- 2.5 ug 24 hour
- Symptom Disturbance

Swift Current

- SO2 24 hour
- Nox 24 hour
- FPM 24 hour
- Symptom Disturbance
Next Steps in data analysis

• Strategies:
  ▫ Are there any associations between respiratory outcomes and airborne dust contaminants.
  ▪ Are there temporal associations between spikes in air contaminant levels and respiratory outcomes?
  ▪ Are their associations between individual constituents within the dust samples collected and spikes in respiratory symptoms within the communities? (Do they differ between high and low contaminant timeframes?)
Thank you

• Questions?
## Phase 1 - Air Pollution Annoyance

How much are you annoyed by outdoor air pollution?

<table>
<thead>
<tr>
<th></th>
<th>Estevan</th>
<th>Swift Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>6-10</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estevan</td>
<td>4.07</td>
<td>3.72</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Swift</td>
<td>2.29</td>
<td>2.37</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

10 = Intolerable Annoyance

0 = Does not annoy at all
Daily Symptom Disturbance and Environmental Measures (phase I)

Swift Current Symptom Disturbance with Environmental

SO2 24 hour
Nox 24 hour
FPM 24 hour
Symptom Disturbance