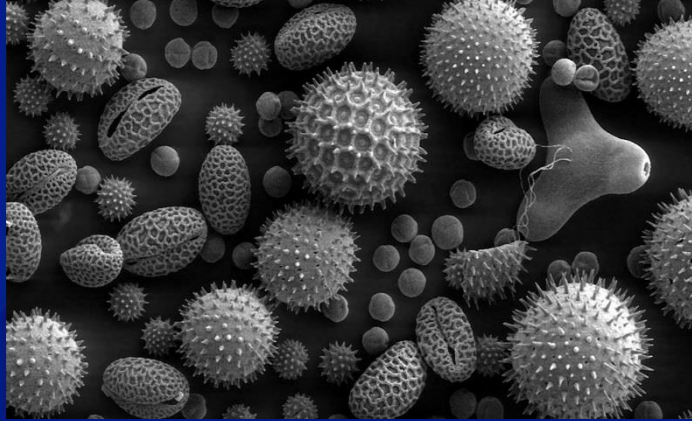


Climate Change, Pollen and Health



Shubhayu Saha

Climate and Health Program
Centers for Disease Control and Prevention

2016 CSTE Pollen Summit, CDC Atlanta

Meteorological
variation



Pollen
production

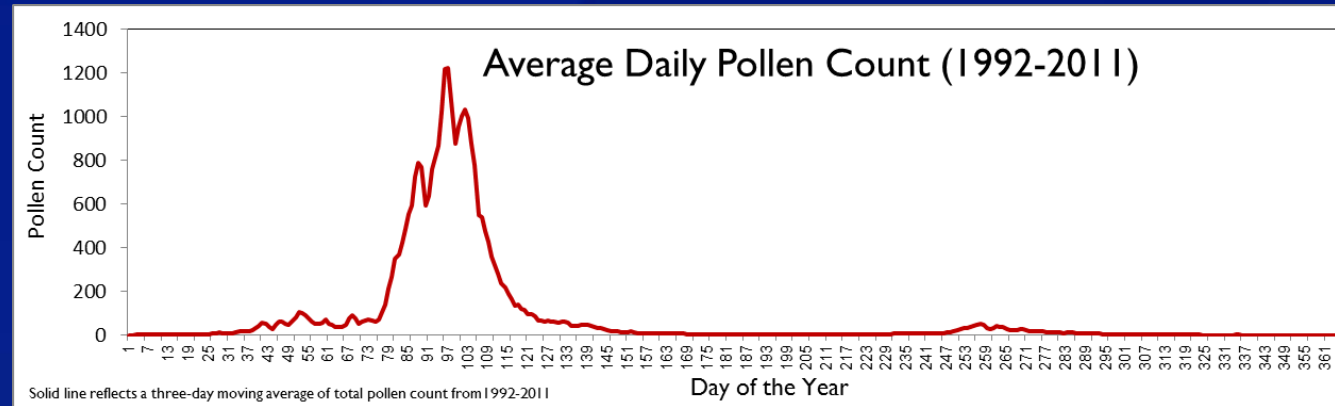


Health
impacts

Pollen data inventory

Station Location	Years of Coverage	Type of Data
Albuquerque, NM	2001-2014 (14 Years)	Taxa
Atlanta, GA	1991-2011 (21 Years)	Taxa
Baltimore, MD	1997-2012 (16 Years)	Grouped
Bangor, ME	2005-2002 (8 Years)	Grouped
Detroit, MI	2000-2008 (9 Years)	Taxa
Madison, WI	2004-2010 (7 Years)	Taxa
Minneapolis, MN	1993-2013 (21 Years)	Taxa
Raleigh, NC	1999-2012 (14 Years)	Grouped
Sarasota, FL	2001-2012 (12 Years)	Taxa

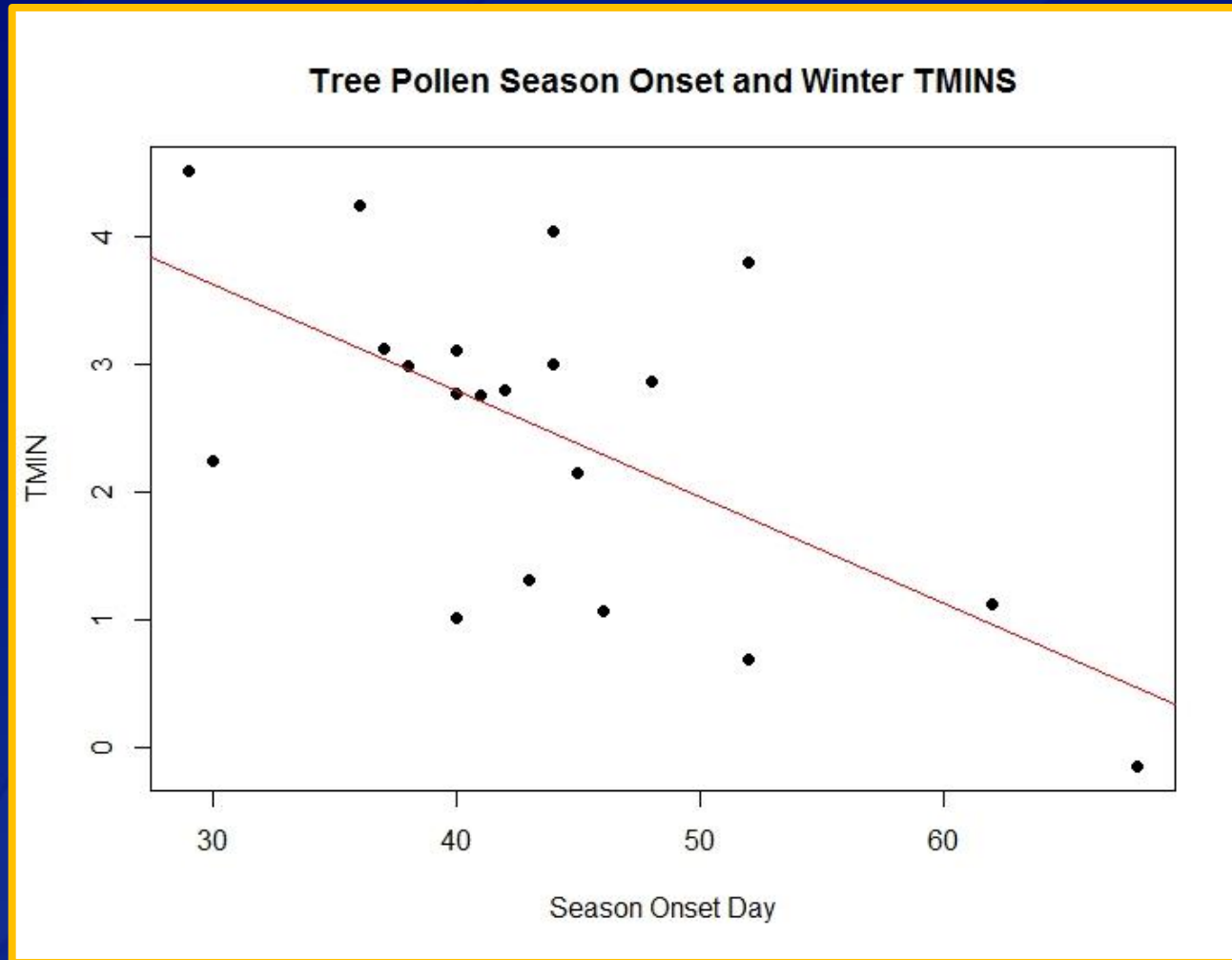
Characterizing pollen season



Used a cumulative percentage approach to define pollen season timing
(Ziska et al., 2011; Emberlin et al. , 2007)

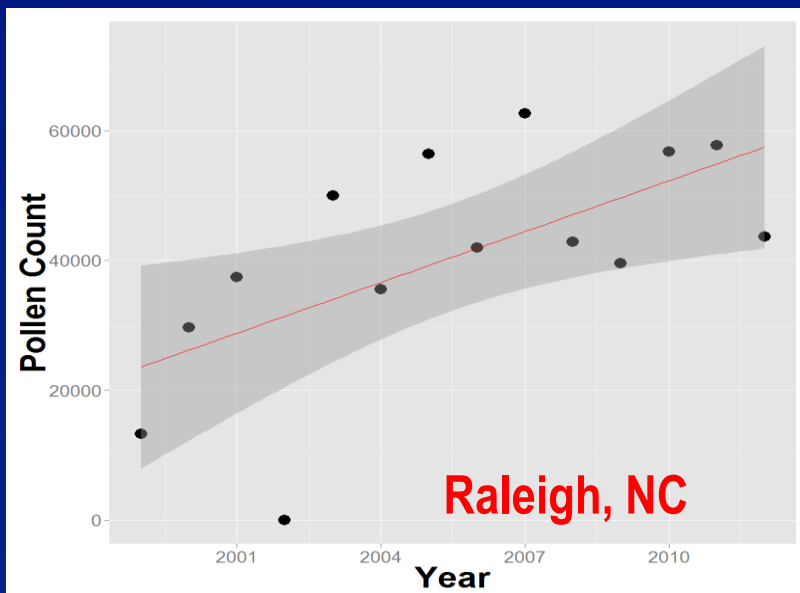
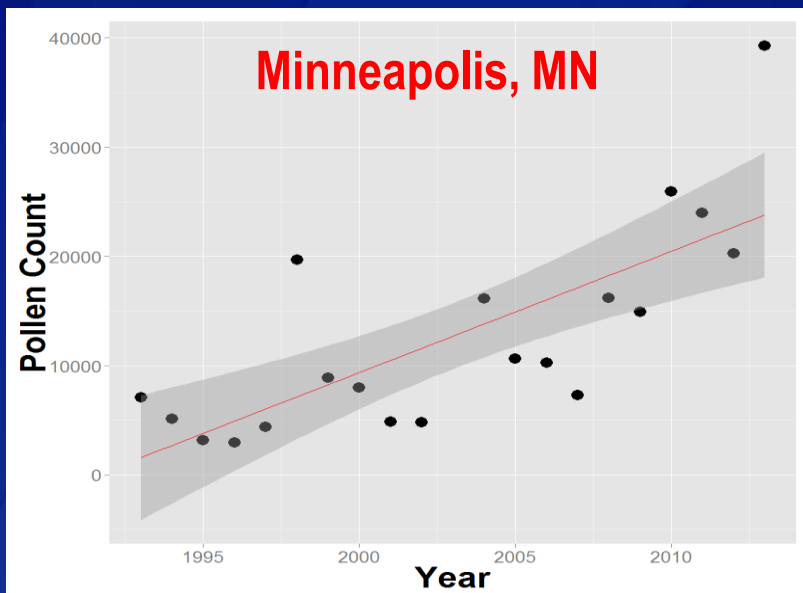
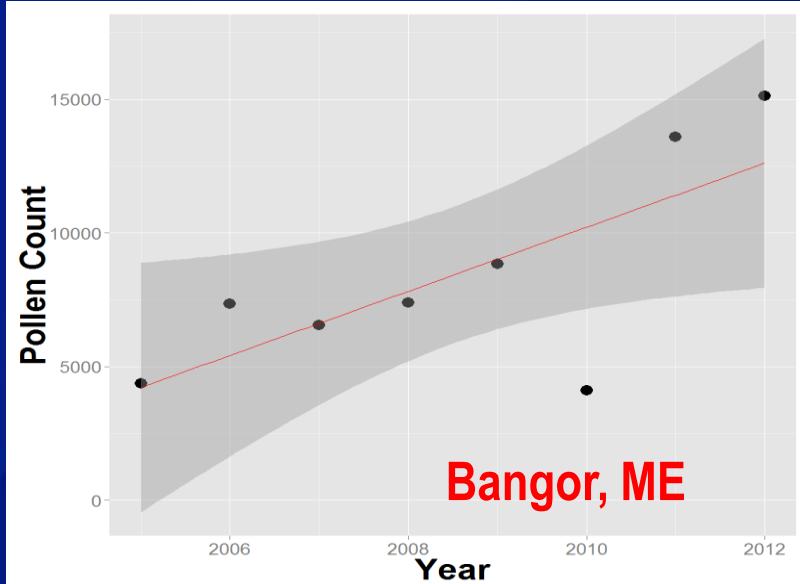
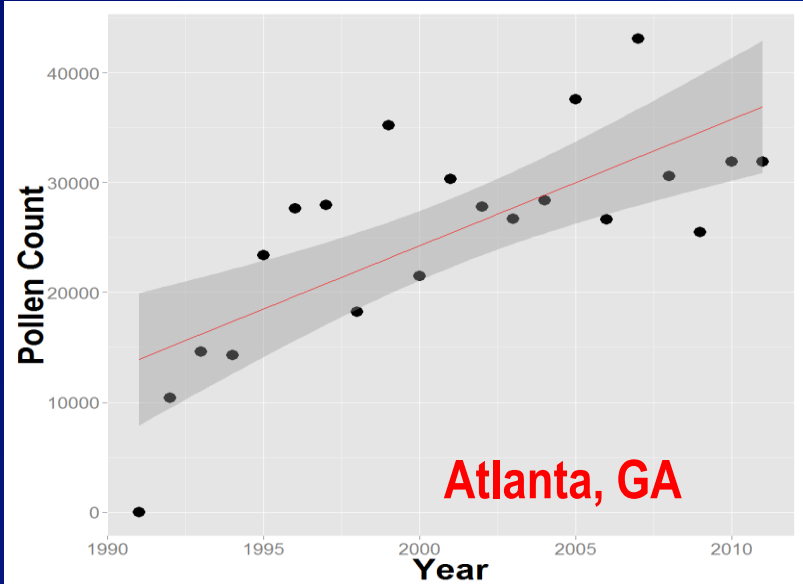
- Pollen Season Onset – day when 5% of cumulative pollen count occurred, per season
- Season Peak – day of maximum pollen count
- Season End – day when 95% of cumulative pollen count occurred, per season

Atlanta – Tree pollen onset and winter cooling



Delayed spring tree pollen season

- Decreasing Winter minimum temperature delay season onset
- ($R^2 = 0.38$, $p\text{-value} < 0.004$, $df = 18$)



Trends in tree
pollen count - multicity

National Allergy Bureau - Atlanta MSA monitor

March 2011 - Daily Pollen Counts

S	M	T	W	T	F	S
<u>27</u>	<u>28</u> 129	<u>1</u> 60	<u>2</u> 95	<u>3</u> 54	<u>4</u> 54	<u>5</u>
<u>6</u>	<u>7</u> 69	<u>8</u> 30	<u>9</u> 25	<u>10</u> 8	<u>11</u> 60	<u>12</u>
<u>13</u>	<u>14</u> 228	<u>15</u> 72	<u>16</u> 13	<u>17</u> 35	<u>18</u> 132	<u>19</u>
<u>20</u>	<u>21</u> 853	<u>22</u> 2258	<u>23</u> 2459	<u>24</u> 3939	<u>25</u> 2017	<u>26</u>
<u>27</u>	<u>28</u> 202	<u>29</u> 937	<u>30</u> 396	<u>31</u> 33	<u>1</u> 1004	<u>2</u>
<u>3</u>	<u>4</u> 3301	<u>5</u> 2293	<u>6</u> 685	<u>7</u> 822	<u>8</u> 1032	<u>9</u> 2720

Tree pollen season

September 2011 - Daily Pollen Counts

S	M	T	W	T	F	S
<u>28</u>	<u>29</u> 53	<u>30</u> 25	<u>31</u> 31	<u>1</u> 26	<u>2</u> 32	<u>3</u>
<u>4</u>	<u>5</u>	<u>6</u> 11	<u>7</u> 7	<u>8</u> 7	<u>9</u> 16	<u>10</u>
<u>11</u>	<u>12</u> 41	<u>13</u> 177	<u>14</u> 250	<u>15</u> 530	<u>16</u> 347	<u>17</u>
<u>18</u>	<u>19</u> 156	<u>20</u> 101	<u>21</u> 105	<u>22</u>	<u>23</u>	<u>24</u>
<u>25</u>	<u>26</u> 43	<u>27</u> 28	<u>28</u> 39	<u>29</u> 60	<u>30</u> 37	<u>1</u>
<u>2</u>	<u>3</u> 20	<u>4</u> 25	<u>5</u> 18	<u>6</u> 25	<u>7</u> 36	<u>8</u>

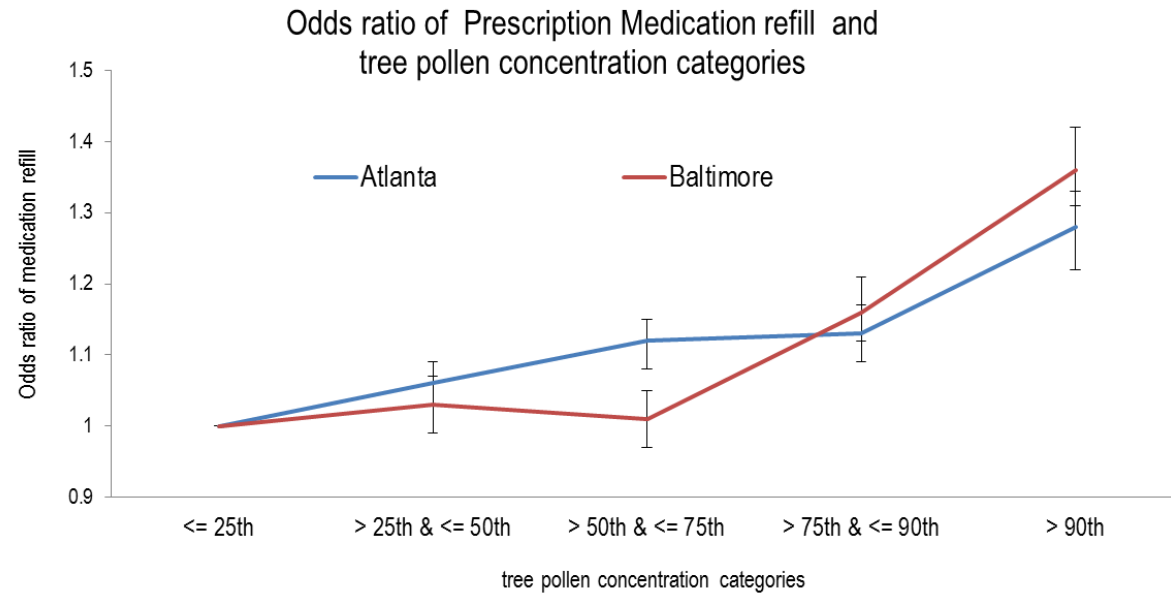
Ragweed pollen season

Health data - MarketScan® administrative health database

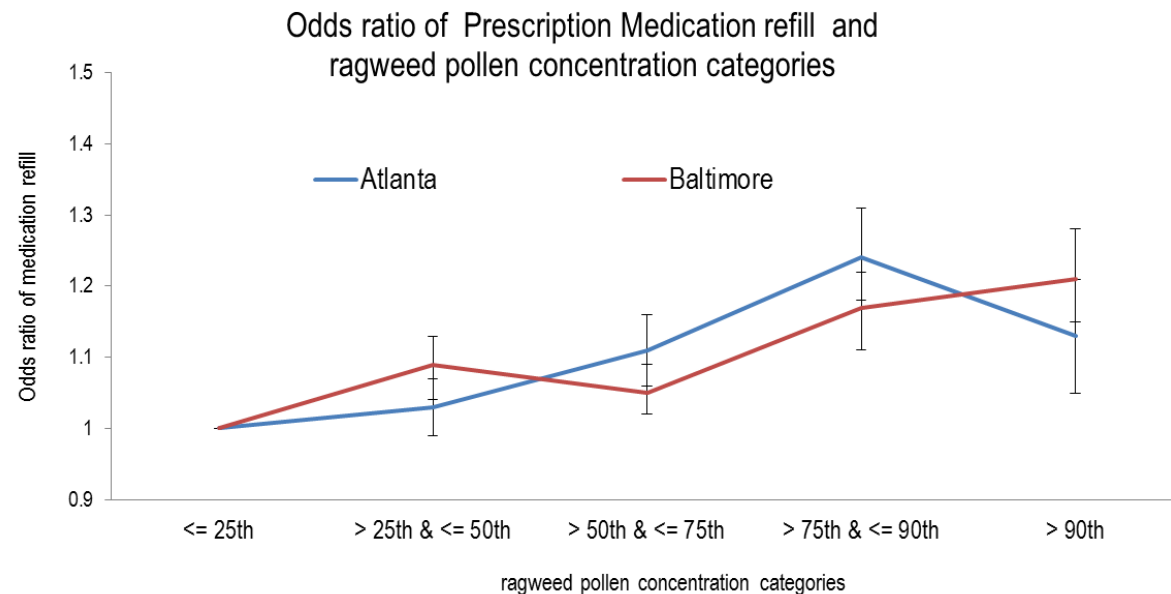
Employer-based health insurance population

- Age, gender, dependent/employee
- County of residence & service provision
- Insurance plan type
- Date of Allergic Rhinitis (ICD-9 code 477.9) – outpatient physician visit
- Date of prescription medication refill – brand/generic name & NDC codes
- Comorbidity (based on other diagnoses codes)

→ **Date of episodes and county information allow merging health data with environmental exposure data**

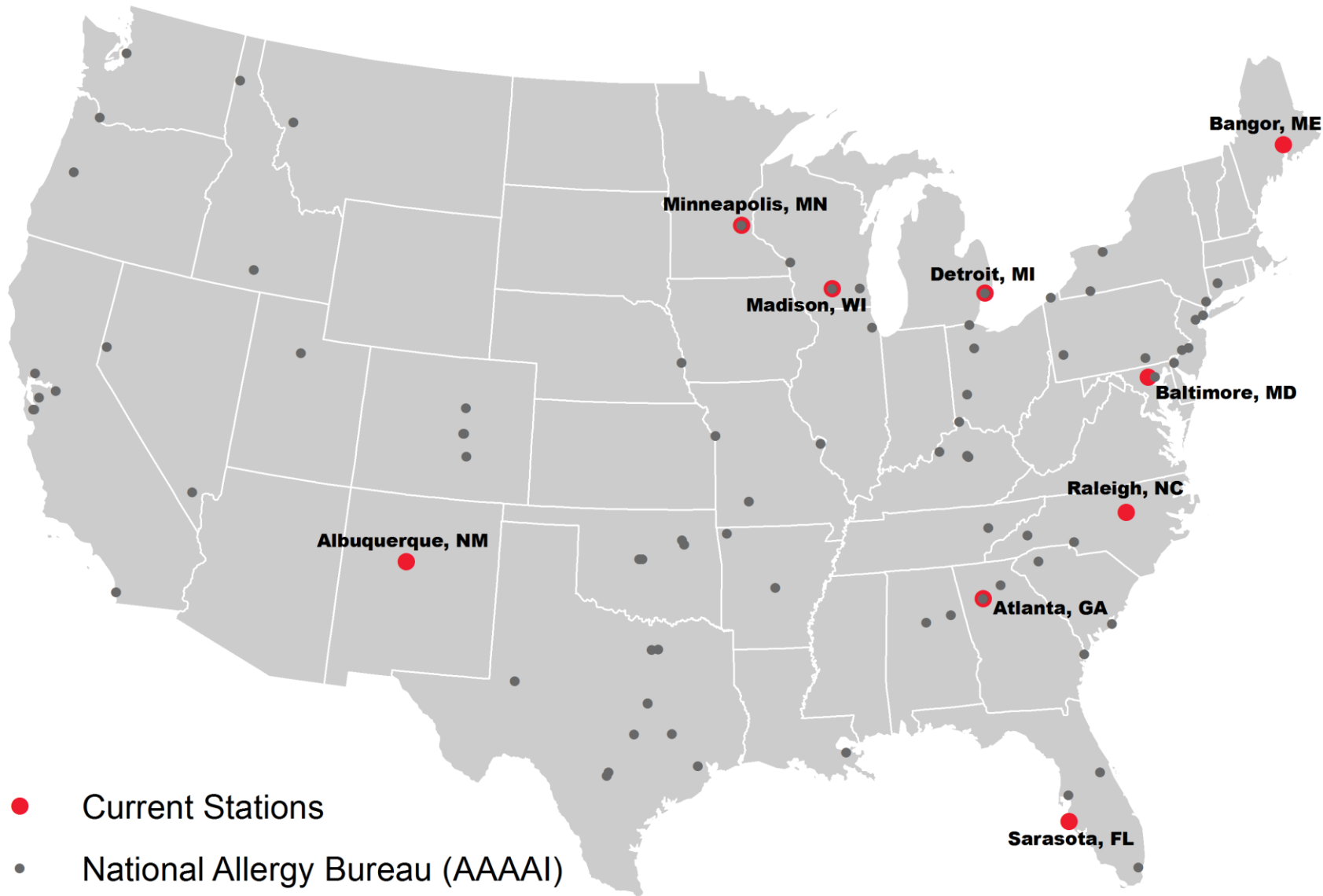


Conditional Logistic Regression – time-stratified case-crossover model



Next steps....

- Compile data from multiple locations to assess spatial variation in health risks
- Assess the cumulative health impact of pollen over a period of time, instead of a single day
- > Comparison of results across locations with different pollen measurement techniques



National Allergy Bureau pollen monitor locations

The Use of Google Trends in Health Care Research: A Systematic Review

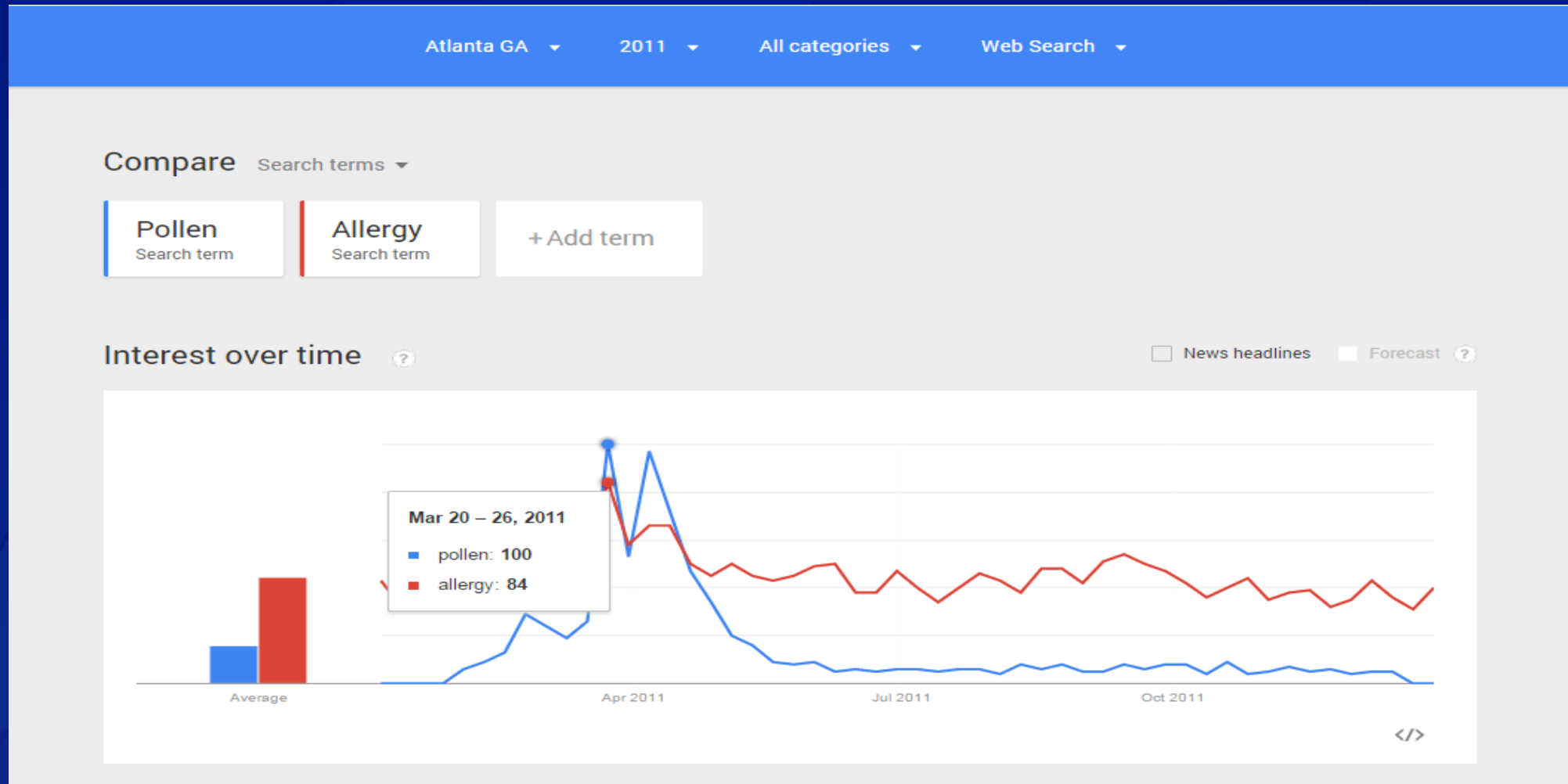
Sudhakar V. Nuti¹, Brian Wayda², Isuru Ranasinghe¹, Sisi Wang³, Rachel P. Dreyer¹, Serene I. Chen², Karthik Murugiah^{1*}

Geospatial Health 4(2), 2010, pp. 135-137

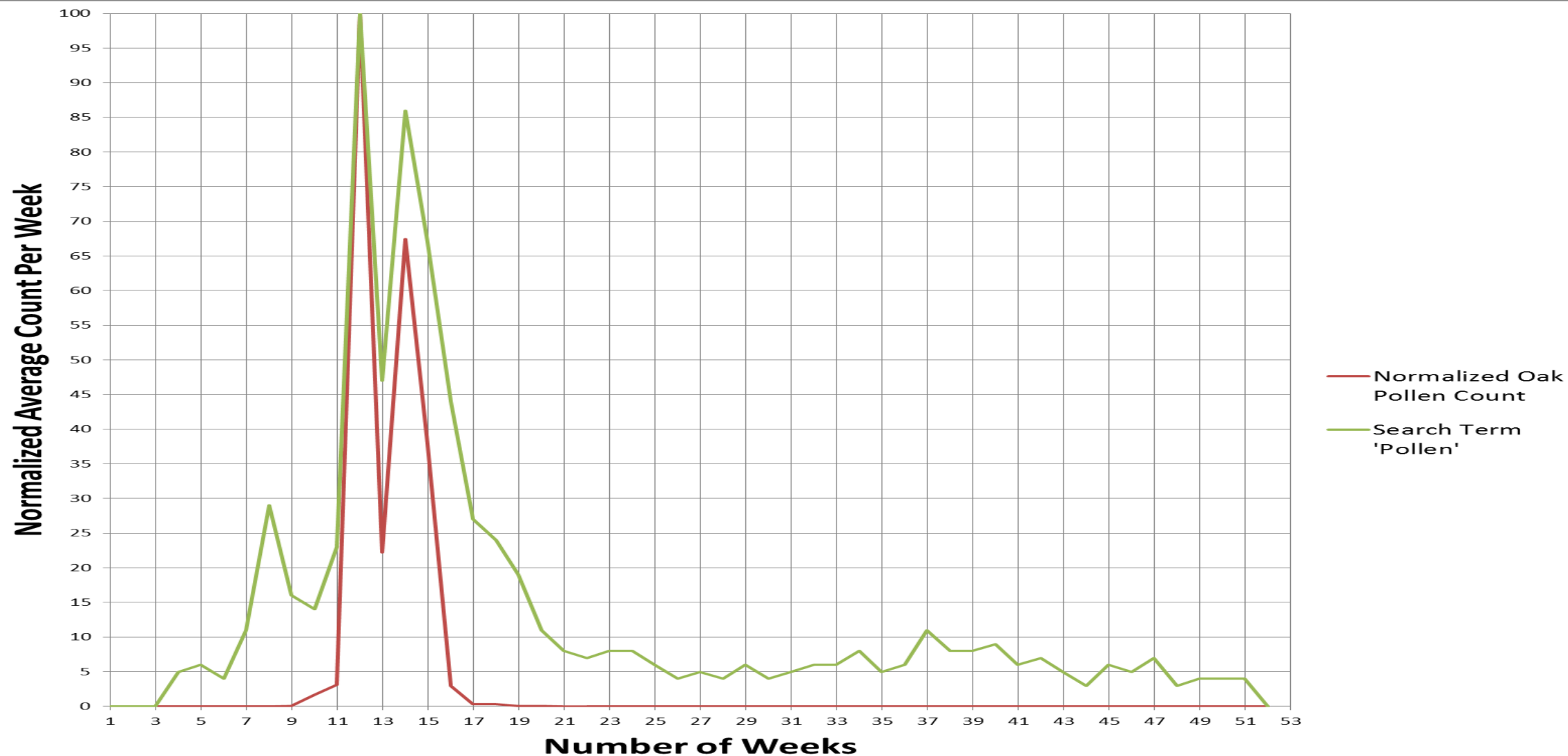
The utility of “Google Trends” for epidemiological research: Lyme disease as an example

Ari Seifter¹, Alison Schwarzwald¹, Kate Geis¹, John Aucott²

Exploring Google Trends data as a proxy for pollen



Normalized Oak pollen count in Atlanta & Google Trends search term "Pollen" (2011)



Next steps....

- Use daily Google Trends data on pollen-related searches and examine correlations with measured pollen over time
- Expand the analysis to multiple locations

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