STATE ENVIRONMENTAL HEALTH INDICATORS COLLABORATIVE (SEHIC) CLIMATE AND HEALTH INDICATORS

Category: **Environmental Indicators**

Indicator: **Pollen Indicator**

Measure(s):

1) **Date when the pollen season started, by pollen source (grasses, trees, weeds) in a calendar year.**
2) **Date when the pollen season ended, by pollen source, in a calendar year.**
3) **Length of pollen season, in days, by pollen sources, in a calendar year.**
4) **Number and percent of days during the pollen season when pollen readings were categorically elevated (NAB categories of high or very high), by pollen source and species, in a calendar year.**
5) **Mean, minimum and maximum daily pollen counts for the pollen season, by pollen source and species, in a calendar year.**
6) **Pollen types (species) measured in a calendar year**

MEASURE DESCRIPTION

Last updated:	January 14, 2013
Demographic unit:	Annual total population estimate for the calendar year for the region surrounding the pollen monitor (as determined by data user); sub-populations of susceptible persons, e.g., young, old, persons with allergies and respiratory conditions, such as asthma, rhinitis and COPD.
Geographic unit:	Region surrounding monitor
Temporal unit:	Year, Pollen Season, Week, Day
Significance and background:	Climate change has been linked to longer pollen seasons, increased pollen production, changes in the types of pollen observed in a particular location, and increased pollen allergenicity.[1,2] Because pollen can adversely influence health outcomes such as allergies and asthma, any increases in pollen associated with climate change could result in an increased burden of asthma and allergies.[2,3] These outcomes may be affected not only by increasing pollen levels, but also by higher pollen allergenicity and the interaction of elevated pollen levels with other respiratory triggers, specifically air pollution.[3]
Rationale:	The development of environmental health indicators for pollen load and presence of ragweed have been recommended.[4] A standardized pollen indicator could be of use to both public health researchers and practitioners in linkages with health outcome data. Environmental public health practitioners can also use this pollen indicator to plan, carry out and evaluate the effectiveness of different environmental health intervention efforts on the mitigation of health outcomes or chronic diseases that are adversely impacted by higher pollen levels. Researchers could utilize a pollen indicator either as a predictor or covariate in linkages with health outcome data. Asthma and allergy practitioners may be able to use a pollen indicator to inform patients about pollen seasons.

Data resources:	National Allergy Bureau (NAB) http://www.aaaai.org/nab/index.cfm Other possible sources of pollen data include: local NAB monitors (see http://www.aaaai.org/nab/index.cfm?p=displaystationinfo for list of certified counting stations), the USDA Natural Resources Conservation Service PLANTS database (ragweed), the Global Biodiversity Information Facility (ragweed), the New Mexico Environmental Public Health Tracking Program and NASA (satellite imagery)
Limitations of the measure:	Differences in pollen levels can occur among pollen counting stations, even those in close proximity to other pollen counting stations, such as within the same city. Reasons for these dissimilarities can include differences in time of day of pollen sample collection. Pollen concentrations are usually highest after the dew dries, sometime between sunrise and late morning. In addition, differences in temperature, wind condition, humidity, and precipitation among the monitors can also account for differences among pollen levels. For example, differences in wind conditions affect pollen levels, because pollen particles are small, light, dry and are easily carried by wind over long distances. Additionally, increases in humidity, including periods after rainfall, cause pollen to become heavier with moisture, which keeps pollen on the ground and not measured by pollen monitors. Therefore, pollen levels measured before and after meteorological changes can be significantly different. In addition to differences in time of collection and weather, proximity of sampling equipment to pollen-producing vegetation can also affect pollen levels. For example, samples taken from urban environments can differ significantly from those taken from rural environments. Finally, differences in surrounding geography can affect transport of pollen, resulting in differences in measured pollen levels, even between monitors that are relatively close to each other. [6] Another limitation of this indicator is that the numbers and locations of NAB pollen monitors are not sufficient to provide uniform pollen measurements in all areas of the U.S. In addition, the pollen monitors are maintained and samples are taken by volunteers, and technical difficulties with the equipment, illness, temporary lack of staff, and time away from the office can create gaps in pollen data. Finally, the biologically relevant radius around a pollen monitor, in which the monitored level of pollen is similar to the actual human exposure, is unknown; this distance is probably less than 5 or 10 miles, and, unlike previously developed SEHIC indicators, the attributes of this pollen indicator will necessarily vary within a sub-state geographic polygon.
Recommendations/uses:	This indicator can be used to evaluate the impact of pollen on respiratory health outcomes, including allergies and asthma, and to show changes in pollen over time which may be related to climate change.
Related measures:	Rates of asthma hospitalizations and emergency department visits; allergy medication use

Notes and references:	1. Beggs PJ, Bambrick HJ. Is the Global Rise of Asthma an Early Impact of Anthropogenic Climate Change? *Environ Health Perspect* 113:915–919 (2005). 2. Levetin E and Van de Water P. Changing Pollen Types/Concentrations/Distributions in the United States: Fact or Fiction? *Current Allergy and Asthma Reports* 8:418-424 (2008). 3. Shea KM, Truckner RT, Weber RW, Peden DB. Climate change and allergic disease. *J Allergy Clin Immunol* 2008;122:443-53. 4. English PB, Sinclair AH, Ross Z, Anderson H, Boothe V, Davis C, Ebi K, Kagey B, Malecki K, Schultz R, Simms E. Environmental Health Indicators of Climate Change for the United States: Findings from the State Environmental Health Indicator Collaborative. *Environ Health Perspect* 117:1673–1681 (2009). 5. American Academy of Allergy, Asthma & Immunology, National Allergy Bureau. "Frequently Asked Questions about Pollen," www.aaaai.org/nab/index.cfm?p=faq, Access Date: 4-6-2010.

HOW-TO GUIDE – SEHIC CLIMATE AND HEALTH INDICATOR

POLLEN

All of the measures listed below are calculated using available categorical pollen data from the National Allergy Bureau (NAB) Pollen and Mold Report. See the report, posted on the American Academy of Allergy Asthma and Immunology website: http://www.aaaai.org/global/nab-pollen-counts.aspx for more information. Note that the NAB web site does not contain individual pollen counts. Steps 1 through 4 below can be computed using categorical pollen results available from the NAB web site. But, actual pollen counts by taxa, at least for trees, grasses and weeds, are required to compute the remaining two steps, #5 and #6. Actual pollen readings from a pollen counting station can only be obtained from the pollen counting station. Contact information for each active pollen counting station is available from the NAB web site. Pollen counting stations differ in their data sharing policies. The process may be easier and take less time to obtain pollen data with some pollen counting stations than with other pollen counting stations. Also, some pollen counting stations may have a data purchase fee. The URL to the NAB web site is: http://www.aaaai.org/nab/index.cfm?p=displaystationinfo.

Note that most pollen stations collect data only during the local pollen season, which, in many instances, may not be the entire calendar year, and that the data may not be collected every day during the season. The measures below account for these different aspects of the data. Also, some states may have more than one pollen monitor. In this case, measures can be computed separately for each location.

If there is more than one pollen counting station in a state, it is possible to use this pollen indicator to represent local pollen levels around each pollen counting station. For example, pollen indicator results could be used to represent proxy pollen values for a county or community that has a single pollen counting station. If there is only one pollen counting station in a state, then the computed pollen indicator measures, as shown below, can be used as a proxy for the entire state.

Specific Measures:

1. **Date when the pollen season started, by pollen source (i.e., grasses, trees, weeds) in a calendar year.**
   - Determine the first day, recorded as mm/dd/yyyy, in which counting began for any pollen source in the calendar year.
   - The first day should be recorded for the first pollen reading, no matter the type of pollen recorded, as well as for grasses, trees and weeds, separately.
   - Note: In the event a pollen station operates year-round, the first day should be January 1. If the first day when pollen readings were reported was after the first of January, then that date is the start of the pollen season.

2. **Date when the pollen season ended, by pollen source, in a calendar year.**
   - Determine the last day, also recorded as mm/dd/yyyy, in which counting took place for any pollen source in the calendar year.

- The end of the pollen season should be recorded for the three pollen sources, trees, grasses separately.
- Note: If a pollen station makes pollen readings throughout the calendar year, the last day should be December 31. Likewise, if the last pollen reading was made on a date prior to December 31, then record that date as the end date for the pollen season.

3. **Length of pollen season, in days, by pollen source, in a year** (#2-#1).
   - Subtract the date in #2 from the date in #1 to get the length of season in days for any pollen reading and for grasses, trees, and weeds (and/or by species), separately.
   - There should be four values, one for any pollen recorded; another for tree pollen; a third for grass pollen; and, the fourth for weed pollen.
   - Note: If the pollen season coincides with the calendar year, the length of the pollen season will be 365 days, for non-leap years. For most NAB pollen counting stations the last day of the pollen season will be in October.

4. **Number and percent of days during the pollen season when pollen readings were categorically elevated (NAB categories of high or very high), by pollen source and species (if available from NAB or a pollen counting station as grasses, trees and weeds), in a calendar year**
   - Determine the number of days in the pollen season in the calendar year when the readings were recorded in NAB's high or very high category for each generic pollen source/species, if the latter is available.
   - Divide by the number of days for which there are readings available for each pollen source/species (note this number will likely be different from measure #3 as stations typically do not take readings every day during the pollen season).
   - Compute the duration of the pollen season for any pollen (trees or grasses or weeds) and for each pollen source separately.
   - When finished, there should be four values. The first will be the duration of the pollen season in days for any pollen type. The second should be the duration of the pollen season in days for tree pollen. The third will be the duration of the pollen season in days for grass pollen. The fourth will be the duration of the pollen season in days for weed pollen.

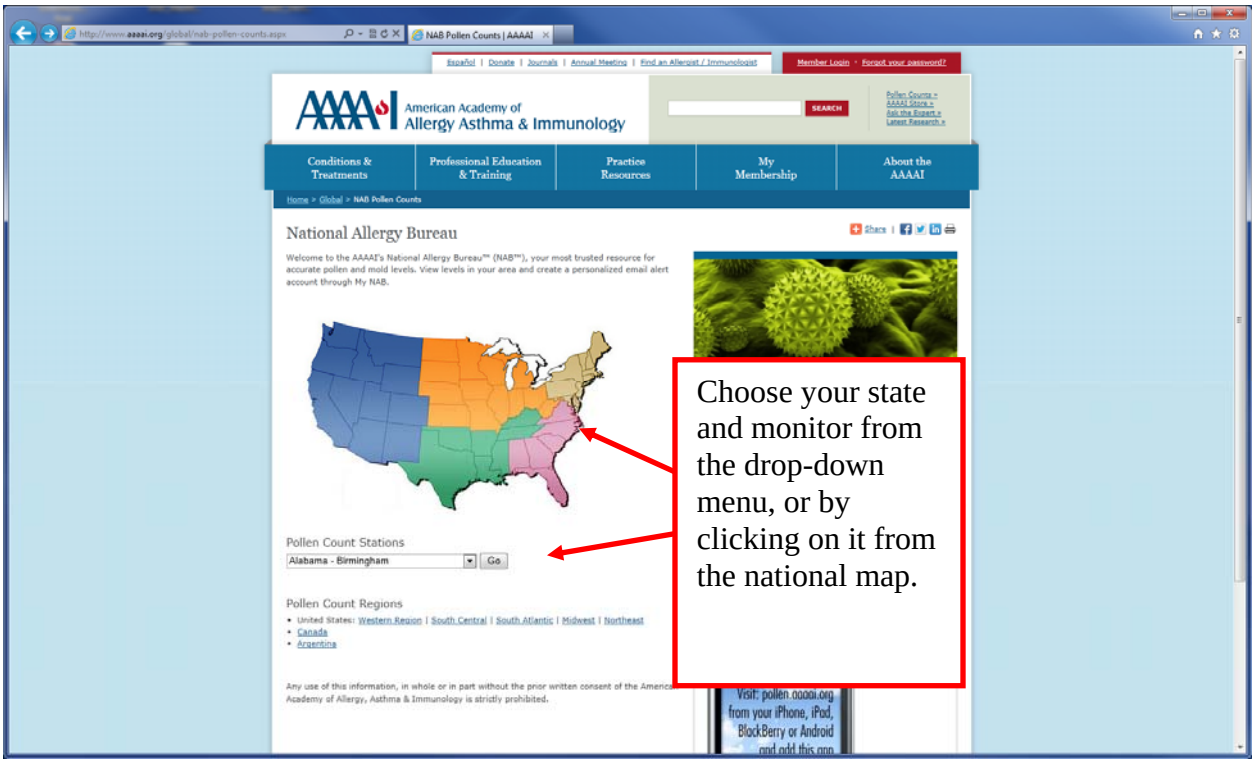
   Note: Pollen indicator measures in #1 through #4 can be computed using daily pollen category values. But, daily pollen counts only available from a pollen counting station are required to compute the next two pollen indicator measures, #5 and #6, below.

5. **Mean, minimum and maximum daily pollen counts for the pollen season, by pollen source and species, in a calendar year.**
   - For each pollen source and/or species, calculate the mean daily pollen count by taking the sum of all of the daily counts for the entire season (numerator) and dividing by the number of days for which readings are available (denominator). Find the minimum and maximum of the daily pollen counts for the pollen season.

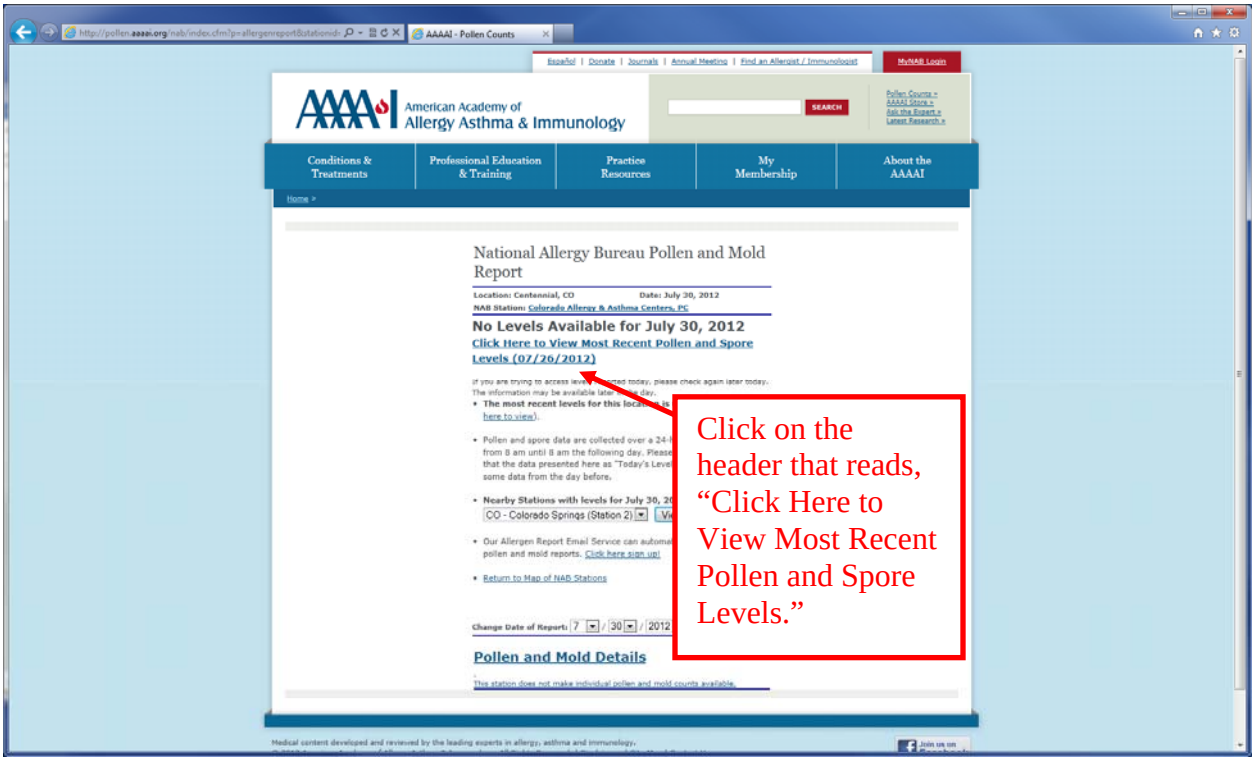
6. **Pollen types (species) measured in a calendar year**
   - List all of the pollen types (species) measured at the monitor in the calendar year.

How to obtain the data from the National Allergy Bureau (NAB)

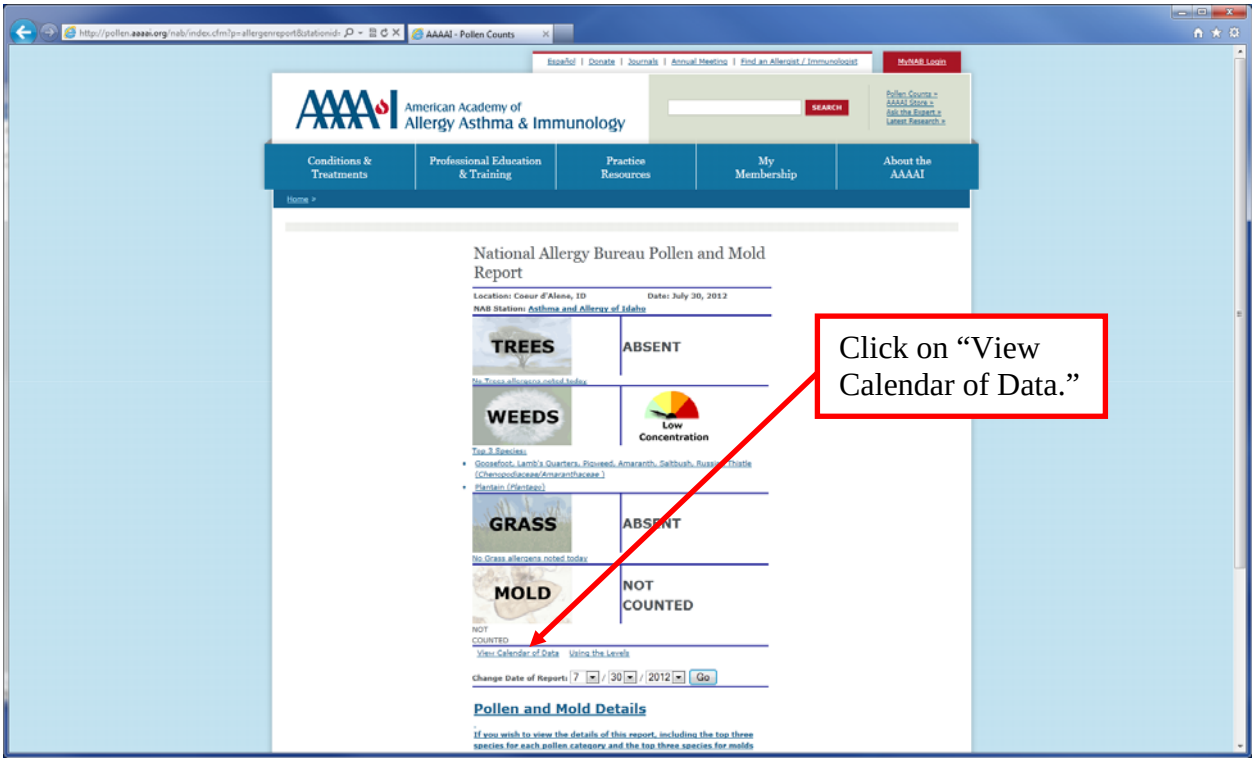
1. Go to the NAB website: http://www.aaaai.org/global/nab-pollen-counts.aspx. Select your state from the pull down menu or by clicking on it from the national map (clicking on the national map will bring you to a regional map), where you will need to select your state's station again.



2. Click on the header that reads, “Click Here to View Most Recent Pollen and Spore Levels.”



3. Click on “View Calendar of Data.”



4. Use the resulting calendar to retrieve data for the measures.