

**16-EH-01****Committee:** Environmental Health**Title:** Developing a National Aeroallergen Tracking Network**I. Statement of the Problem:**

The prevalence of allergic rhinitis, also known as hay fever, in the U.S. population has increased from 10% to 30% from 1970 to 2000, and this condition affects approximately 40% of children (Meng et al., 2016; O'Connell, 2004; Oswalt & Marshall, 2008). Further, approximately 25 million people in the United States currently have asthma, and the numbers are expected to grow (Akinbami, Moorman, Liu, & National Center for Health Statistics, 2011; Bahadori et al., 2009; Masol et al., 2004). Outdoor aeroallergens such as pollen and mold exacerbate health conditions including asthma, allergic rhinitis, chronic obstruction pulmonary disease (COPD), and conjunctivitis (Bush et al., 2006; Knutsen et al., 2012; National Asthma Education and Prevention Program, 2007; Wallace & Dykewicz, 2008). In recent decades, cutaneous sensitivities to various aeroallergens have increased (Meng et al., 2016). While not having a significant effect on mortality, aeroallergens have large effects on morbidity, well-being, school attendance, work productivity, and are associated with increasing health care costs (Bahadori et al., 2009; O'Connell, 2004).

The burden of allergic respiratory disease has been increasing, in part, due to increasing exposure to aeroallergens as plants respond to warmer temperatures and higher atmospheric carbon dioxide concentrations (Lang-Yona et al., 2013; Levetin & Van de Water, 2008; Shea et al., 2008; Takaro, Knowlton, & Balmes, 2013; Wolf et al., 2010; Ziska et al., 2003; Ziska et al., 2011). Increased carbon dioxide can elevate pollen production in plants such as ragweed, and increase the spore abundance and allergenic activity of mold (Lang-Yona et al., 2013; Wolf et al., 2010; Ziska et al., 2003). Warmer annual average air temperatures can contribute to a shift in the timing and extend the duration of pollen seasons (Luber et al., 2014; Ziska et al., 2011). The adverse effects of aeroallergens on human health may be exacerbated as the intensity, frequency, and duration of air pollution episodes increase with a steadily warming climate (Cecchi et al., 2010; Takaro, Knowlton, & Balmes, 2013).

Despite the large and increasing percentage of the U.S. population with allergic respiratory disease, reliable and geographically-specific pollen and mold measurement data are often unavailable to patients, public health practitioners, health care providers, or researchers. At present, aeroallergen monitoring (i.e., regular, validated observation) is geographically and temporally limited and dependent on individual collectors who are often self-funded and do not report data to a centralized network. Therefore, specific questions related to tracking aeroallergens need to be addressed, such as optimal spatial (e.g., spacing of stations) and temporal (e.g., frequency of pollen collection) resolution, level of speciation required, and the most appropriate sampling and analysis equipment to use. Models have been developed to fill in gaps in the observed data and forecast the potential impact of climate change on aeroallergens (Zhang, 2013; Zhang, 2015); however, details regarding models and their validation are generally lacking. There is potential to develop more accurate models using alternative indicators for tracking aeroallergens and exposure based on satellite imagery, temperature and precipitation data, phenology tracking, and health data (e.g., over-the-counter antihistamine purchases and insurance claims). However, these indicators need to be validated, a task that requires robust aeroallergen data.

There is a need for a coordinated, cross-disciplinary effort to collect, catalogue, and analyze pollen and mold data to allow for improved diagnosis and treatment of patients with allergic respiratory diseases, public health tracking, research on the effects of climate on aeroallergens and health, development of evidence-based interventions, and dissemination of key findings.

## II. Statement of the desired action(s) to be taken:

CSTE recognizes that exposure to aeroallergens has significant public health implications and that human exposure is changing in response to our changing climate. A coordinated, **national aeroallergen tracking network**, which incorporates both new and existing stations identified through an **inventory**, and an accessible **data repository** should be a public health priority at the national, state, territorial, tribal, and local levels. **Applications of the data** collected may include public health tracking, clinical diagnostics and treatment, academic research, and near-term forecasting. In addition, there is a need to develop **evidence-based interventions and guidance** to reduce the burden of allergic respiratory disease and to conduct related **outreach** activities. CSTE recognizes that an important part of this collaboration is to designate a leader in this effort.

To this end, CSTE recommends that:

- 1) CSTE, American Academy of Allergy, Asthma & Immunology (AAAAI), American College of Allergy, Asthma & Immunology (ACAAI), and other partners should support the ongoing effort to conduct an **inventory** of existing aeroallergen monitors, which includes identifying and engaging potential partners and locating existing stations.
- 2) Centers for Disease Control and Prevention (CDC), National Institute of Environmental Health Sciences (NIEHS), United States Environmental Protection Agency (EPA), current data collectors, and other partners should support the development of a **national aeroallergen tracking network**. This network should be open to any counting station meeting minimum quality requirements developed collaboratively by participating partners. Direct support and outreach is necessary for existing stations, which should be the foundation of a comprehensive and sustainable aeroallergen tracking strategy. This strategy may also require the initiation of new, strategically-located stations.
- 3) CDC, National Oceanic and Atmospheric Administration (NOAA), and other partners should support the development and maintenance of a **data repository** to house data collected by the national aeroallergen tracking network and which incorporates auxiliary exposure data, such as meteorological and climatological metrics. Development of IT infrastructure should be flexible enough to accommodate existing and emerging data collection methods and include collection of metadata and an online portal. The repository should be secure but easily accessible to partners in national, state, territorial, tribal, and local public health and environmental agencies. Access may also be granted to academic, health care, and pharmacological users meeting predefined criteria.
- 4) CDC, EPA, NIEHS, NOAA, CSTE, and other partners should support the **application of data** collected by the network and stored in the data repository. Public health partners should be encouraged to focus on environmental tracking, including the development of pollen and mold indicators that are flexible enough to incorporate local health outcome data. Indicator development should also include the development of guidance on using data appropriate in a public health context. Health care providers should have access to aeroallergen data to support the diagnosis and treatment of patients with allergic respiratory disease. Academic partners should be encouraged to use aeroallergen data for research, including, but not limited to, analysis of thresholds at which counts may be harmful to human health and development of near-term forecasts.
- 5) CDC, EPA, NIEHS, NOAA, and other partners should develop **evidence-based interventions and guidance** to reduce the burden of allergic respiratory disease. The value of hazard communications, including an aeroallergen alert system, should be evaluated. If developed, alerts should be location-specific and based on predefined threshold criteria. Other interventions may be related to building and urban design. Information should be disseminated to public health and environmental agencies, health care providers, and concerned members of the public.

6) CDC, CSTE, AAAAI, ACAAI, National Phenology Network, and other partners should foster **outreach** activities, including engaging citizen scientists in data collection and developing educational resources about aeroallergens and health outcomes for various audiences. Data should be disseminated in multiple forms, including data visualizations that make it accessible and understandable to the general public.

### III. Public Health Impact:

The data collected by a national aeroallergen tracking network will be used for tracking and forecasting. There is a need for the development of better indicators, more accurate predictive models which can be used both to provide modeled data where no monitors exist, and additional research into the health impacts of pollen and mold. Aeroallergens are considered leading indicators of climate change, and the development of this network will allow researchers to better predict future changes in pollen and mold counts and seasons associated with warming temperatures and increasing atmospheric carbon dioxide levels.

A national network will positively benefit those who suffer from allergic disease. More comprehensive data will provide both patients and health care providers with more accurate and timely information about the onset and duration of pollen and mold seasons. Providers can use information about current pollen and mold conditions for diagnostic purposes and use forecasts for treatment plans. Informed and educated patients can take a more active role in their care. Further, the development of an alert system, analogous to the EPA's Air Quality Index, could expand the reach of hazard communications regarding high aeroallergen levels to public health and environmental agencies and the public.

Finally, a national network will improve the efficacy of public health actions to reduce the burden of allergic disease. Data can be used to inform interventions, such as the timing of aeroallergen early warning messaging, the design and operation of building filtration systems, and planting less allergenic tree species in urban areas. It will complement and inform public health systems and programs concerned with air quality, asthma, and COPD. Overall, both individual and population-level health benefits will be derived as public health practitioners, health care providers, patients, and researchers have access to a robust national aeroallergen tracking network. CSTE believes that this effort should not be funded at the expense of existing air quality monitoring.

### IV. Revision History

### V. References

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