Allergens, Climate Change and Health

FAST FACT:

Allergies are the 6th most costly chronic disease in the U.S., with associated healthcare expenditures of about $21 billion annually[5] and a significant contributor to work and school absence.

Climate change is increasing the length of the pollen season and its intensity, with big impacts on the millions of U.S. residents who already suffer from allergies. In this brief we focus on the impacts of climate change on allergies in California and the U.S.

Allergies already affect a huge number of people

- Hay fever, asthma, and eczema are the three major allergic diseases associated with exposure to aeroallergens — pollens from trees, weeds, and grasses, molds, and other indoor allergens.[1] For those with allergies, pollen triggers sneezing, wheezing, asthma attacks, and inflammation of the nose and eye membranes.
- An estimated 10-30% of people globally are affected by allergic rhinitis (hay fever).[2] The prevalence of hay fever in the U.S. rose from 10% in 1970 to 30% in 2000.[3]
- Over 50 million people in the U.S. each year are affected by contact dermatitis from plants in the poison ivy family (poison ivy, oak and sumac).[4]
- Allergies are the 6th most costly chronic disease in the U.S., with associated healthcare expenditures of about $21 billion annually,[5] and a significant contributor to work and school absence.

Climate change increases potential exposure to allergens

- Increasing temperatures lead to earlier and longer pollen and allergy seasons, due to more frost-free days and earlier and longer flowering seasons.
    - Higher temperatures also increase ozone production, which sensitizes the respiratory tract to allergens.[6]
- Higher carbon dioxide levels cause greater plant growth, resulting in increased pollen production and increased pollen potency. More winter precipitation further contributes to increased pollen production.[7]
    - Annual birch pollen production and peak values are expected to be 1.3–2.3 times higher from 2020–2100, relative to 2000 averages.[8]
    - Exposure to allergy-inducing molds may increase as more frequent and severe extreme weather events lead to more flooding. See Rainfall & Storms, Climate Change and Health
    - The allergenicity of some molds may also increase with higher CO_2 levels.
- Carbon dioxide enhances production of the chemical (urushiol) in poison ivy and poison oak that causes contact dermatitis, as well as the spread in growth of these allergenic plants.

DID YOU KNOW?

Higher carbon dioxide levels cause greater plant growth, resulting in increased pollen production and increased pollen potency. More winter precipitation further contributes to increased pollen production.

Between 1995 and 2011 ragweed season has increased as much as 11 to 27 days in the central US and Canada as a result of rising temperatures. These increases are correlated with the number of frost-free days in the region.[10 11]

- California's frost-free season has already increased by three weeks (compared to pre-1960), and is likely to increase by an additional 8 weeks by the end of the century if greenhouse gas emissions are not curtailed.[9]

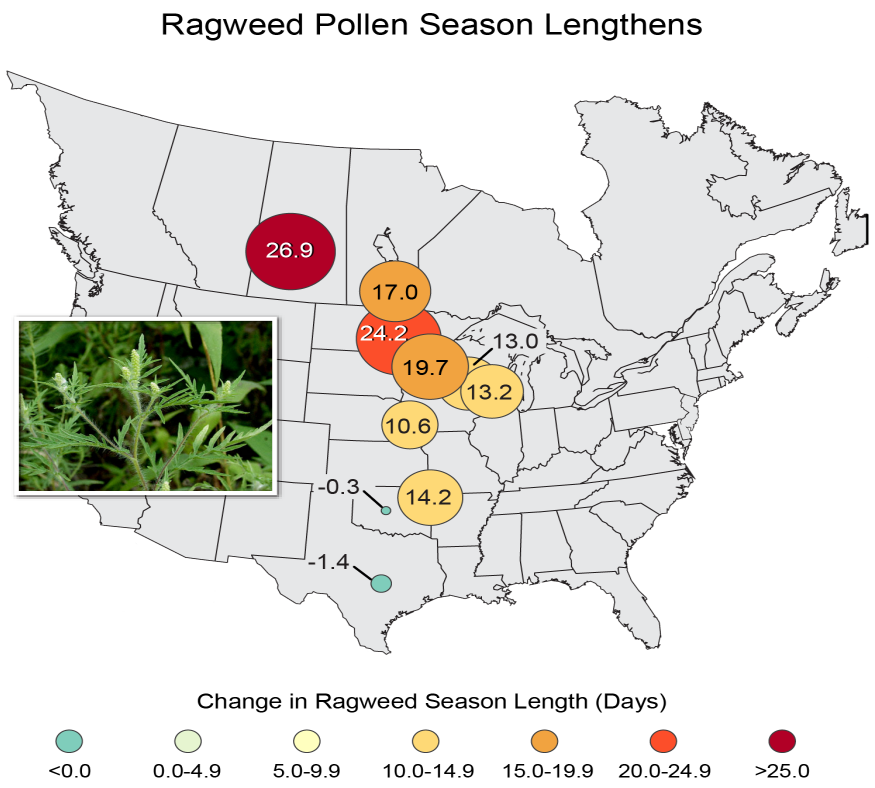

Photo Credit: Lewis Ziska, USDA

Climate change, allergies and health equity:

Social and economic inequities, as well as individual characteristics, place some individuals and communities at greater risk than others for allergies from climate change:

- **Poverty:** People living in poverty may experience substandard housing and lack health insurance coverage for allergy management. Low-income communities are often under-insured for property loss due to flooding, resulting in fewer resources for home rehabilitation to prevent mold growth.
- **Housing:** Poor housing construction or ventilation can increase exposure to pollen or mold, exacerbating asthma and allergy symptoms.
- **Working conditions:** Outdoor workers face increased exposure to pollen and to allergenic plants. Low-wage workers without paid sick leave face job and economic loss if required to miss work due to allergies or asthma.[12]
- **Asthma or other chronic respiratory illness:** Exposure to aeroallergens can trigger asthma symptoms.

What can physicians do to address climate change and allergies?

- Talk to patients about how climate change is increasing exposure to allergens, and what they can do to minimize their exposures to reduce allergy and asthma symptoms:
  - Check pollen levels frequently — patients can sign up for free alerts at National Allergy Bureau™ (NAB)
  - For patients with allergies, the best times to be outdoors are when pollen levels are lower, typically on rainy, cloudy, and windless days.
  - Keep windows closed during allergy season, to prevent pollen from drifting inside; drive with car windows closed.
  - Consider showering after spending time outdoors, where pollen can collect on your skin, clothes, and hair.
  - For patients with asthma, check ozone levels at http://www.airnow.gov/
- Educate your colleagues and community on the links between climate change, allergens and health, and how to prevent adverse health impacts.
- Promote mitigation and adaptation strategies related to climate change and allergies
  - Encourage local planning departments to plant low-allergenicity trees, shrubs and plants in neighborhoods.
  - Support strengthened monitoring and reporting of pollen and ragweed levels.
- Support policies and programs in your community and in your health system that authentically engage and partner with community residents in addressing climate and health problems. Address social and economic inequities and vulnerabilities to allergen-related illness, for individuals and communities.
  - Connect individuals to social services for health care coverage to enable better management of allergies and asthma.
  - Advocate that emissions credits and other revenues be invested in the hardest-hit communities for resilience measures such as improved ventilation in housing, mold remediation, planting of less-allergenic trees, and measures to reduce air pollution from stationary and vehicular sources.

FAST FACT:

An estimated 10–30% of people globally are affected by allergic rhinitis (hay fever).

For More Information

- American Academy of Allergy, Asthma and Immunology: http://www.aaaai.org/
- EPA report on climate change and allergens: https://cfpub.epa.gov/ncea/risk/recordisplay.cfm;jsessionid=13974F5D67FADE552079AEABE3B2742F.cfpub?deid=190306&CFID=72904308&CFTOKEN=64421912
- US Climate and Health Assessment, Chapter 3: Air Quality Impacts: https://health2016.globalchange.gov/air-quality-impacts
- Sneezing and Wheezing-NRDC report on climate change, allergies, asthma and air quality: https://www.nrdc.org/sites/default/files/sneezing-report-2015.pdf

Citations

1 U.S. EPA. A Review of the Impact of Climate Variability and Change on Aeroallergens and Their Associated Effects (Final Report). U.S. Environmental Protection Agency, Washington, DC, Available at https://cfpub.epa.gov/ncea/risk/recordisplay.cfm;jsessionid=13974F5D67FADE552079AEABE3B2742F.cfpub?deid=190306&CFID=72904308&CFTOKEN=64421912

2 World Health Organization. White Book on Allergy 2011-2012 Executive Summary. By Prof. Ruby Pawankar, MD, PhD, Prof. Giorgio Walter Canonica, MD, Prof. Stephen T. Holgate, BSc, MD, DSc, FMed Sci and Prof. Richard F. Lockey, MD. Available at http://www.aaaai.org/about-aaaai/newsroom/allergy-statistics

3 Fann, N., T. Brennan, P. Dolwick, J.L. Gamble, V. Ilacqua, L. Kolb, C.G. Nolte, T.L. Spero, and L. Ziska, 2016: Ch. 3: Air Quality Impacts. *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. U.S. Global Change Research Program, Washington, DC, 69–98.

4 American Skin Association. *Poison ivy, sumac and oak*. Available at: http://www.americanskin.org/resource/poisonivy.php

5 U.S. EPA. A Review of the Impact of Climate Variability and Change on Aeroallergens and Their Associated Effects (Final Report). U.S. Environmental Protection Agency, Washington, DC, Available at https://cfpub.epa.gov/ncea/risk/recordisplay.cfm;jsessionid=13974F5D67FADE552079AEABE3B2742F.cfpub?deid=190306&CFID=72904308&CFTOKEN=64421912

6 Kinney, P.L., Ito, K., Weinberger, K.R., Sheffield, P.E. (2015). Respiratory and allergic disorders. In B.S. Levy & J.A. Patz (Eds.), *Climate change and public health* (pp. 105-128), New York, NY: Oxford University Press.

7 Fann, N., T. Brennan, P. Dolwick, J.L. Gamble, V. Ilacqua, L. Kolb, C.G. Nolte, T.L. Spero, and L. Ziska, 2016: Ch. 3: Air Quality Impacts. *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. U.S. Global Change Research Program, Washington, DC, 69–98.

8 Ibid

9 US Global Change Research Project (2014). National Climate Assessment: Climate Change Impacts in the United States. Washington, D.C. http://nca2014.globalchange.gov/

10 Fann, N., T. Brennan, P. Dolwick, J.L. Gamble, V. Ilacqua, L. Kolb, C.G. Nolte, T.L. Spero, and L. Ziska, 2016: Ch. 3: Air Quality Impacts. *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. U.S. Global Change Research Program, Washington, DC, 69–98.

11 Ziska, L. et al., 2011: Recent warming by latitude associated with increased length of ragweed pollen season in central North America. Proceedings of the National Academy of Sciences, 108, 4248-4251, doi:10.1073/pnas.1014107108.

12 Ben-Ishai, L. (2015). Wages lost, jobs at risk: the serious consequences of lack of paid leave. The Center for Law and Social Policy. Washington, D.C.

Photo page 1: Susan Sermoneta; page 2: Alastair Vance; page 3: Stephanie Bryant; page 4: Henri Sivonen.

Center for Climate Change & Health

PUBLIC HEALTH INSTITUTE®

IN PARTNERSHIP WITH

Nepo Network of Ethnic Physician Organizations

CMAF California Medical Association Foundation Improving Public Health Since 1963

NMA National Medical Association Since 1895

Created with the support of Kaiser Permanente and The Kresge Foundation