Wildfires, Climate Change and Health

DID YOU KNOW?

Without bold efforts to reduce greenhouse gas emissions, drought-fueled wildfires are expected to increase by 58–128% by 2085 across California.

As climate change leads to hotter and drier summers, wildfires are already increasing in frequency, duration and severity in many parts of the U.S., especially the West.[1] In this brief, we focus on the health impact of climate change and wildfires in California and the U.S.

Wildfires and health

- Wildfires are a major source of particulate matter (PM), especially during summertime in the West.[2 3] See Air Quality, Climate Change and Health
    - Particulate matter increases the risk of lung cancer, COPD, cardiovascular disease and the development and exacerbation of asthma and other respiratory diseases.
    - PM from wildfires is associated with increased risk of premature death, increased emergency department visits due to asthma, bronchitis, and chest pain and negative birth outcomes.[4]
        - 2007 Southern California wildfires led to significant increases in emergency room visits for asthma and breathing difficulty.[5]
- Wildfires also increase other harmful air exposures, including exposure to carbon monoxide, ground level ozone and toxic chemicals released from burning building materials or chemicals used to fight the fire.[6]
    - In 2007, California wildfires caused ground-level ozone spikes to rise to unhealthy levels across much of rural California.
- Indoor air quality is also impacted as smoke penetrates into homes. Because people spend more of their time inside, the majority of exposure to, and health effects from, wildfire particulate matter come from particles inhaled indoors.[7]
- Wildfires cause immediate harm through burns, traumatic injury, smoke inhalation and PTSD.[8]
    - From 2000-2013, more than 300 firefighters died in the line of duty and the average number of annual work-related firefighter deaths has been increasing since the 1970s.[9 10]
- Wildfire smoke can travel very long distances and affect the health of people far downwind of the fire.
    - Smoke from the 2002 wildfires in Quebec caused a 30-fold increase in $PM_{2.5}$ in Baltimore, MD, which is nearly 1,000 miles downwind.[11] Likewise, pollutants from a 2004 Alaska wildfire were found in Europe.[12]

DID YOU KNOW?

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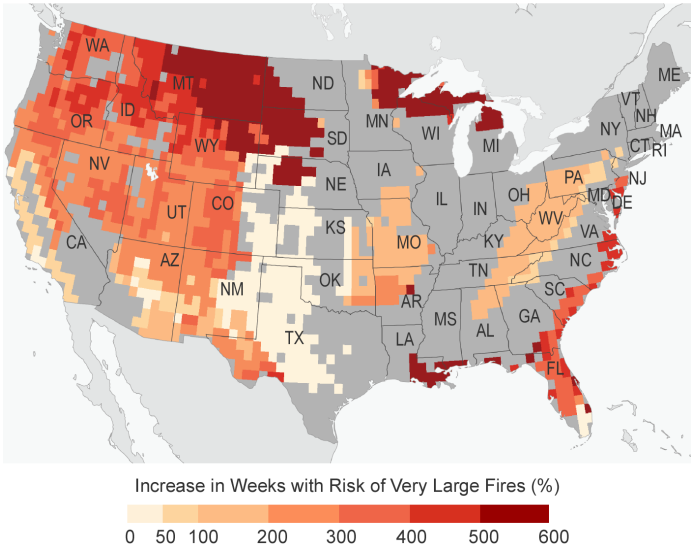
- Soil erosion and runoff from wildfires can contaminate water supplies far downstream from the fire site, negatively impacting the quality, quantity and availability of safe freshwater supplies.[13]
    - The 2013 Yosemite rim fire threatened to contaminate water for San Francisco Bay Area residents 200 miles away, since the city draws its water from Hetch Hetchy reservoir near the wildfire.
- Health care and public health systems — including skilled nursing facilities — are stressed by the need for evacuations, emergency response resources (shelter, food, water) and increased medical visits during and following a wildfire.

Climate change is worsening wildfire risks

Climate change will significantly increase the frequency, intensity and duration of wildfires, as well as increase the length of wildfire seasons across the U.S. and particularly in the West.

- In California, earlier snowmelt, higher temperatures and drier conditions over a longer fire season will directly increase the risk of wildfires across the state:[14]
    - Without bold efforts to reduce greenhouse gas emissions, drought-fueled wildfires are expected to increase by 58-128% by 2085 across California. The amount of area burned will increase between 51-169% in different areas across the state.
- Trends in land use and development, with more and more development happening at the wildland-urban interface, will compound the effects of increasing wildfires.
    - By 2050, fire damages in California could range from $200 million-$2.5 billion per year.[15]
- Warming weather and drought have led to a severe epidemic of bark beetles nationwide. Since 2010, about 66 million trees have been killed by a combination of drought and bark beetle, just in the central and southern Sierras. This large tree die-off releases tons of CO_2 and increases the risk of intense wildfires.

Projected Increase in Risk of Very Large Fires by Mid-Century



Source: US. Global Change Research Project

FAST FACT:

Wildfires also increase other harmful air exposures, including exposure to carbon monoxide, ground level ozone and toxic chemicals released from burning building materials or used to fight the fire.

Wildfires also worsen climate change

Wildfires contribute to global warming by releasing massive amounts of carbon into the atmosphere and reducing the amount of forest available for carbon sequestration.[16]

- Up to 3% of annual U.S. greenhouse gas emissions come from wildfires.[17]
- The western forests are an important source of carbon sequestration, capturing 20-40% of U.S. carbon emissions.

Climate change, wildfires and health equity

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

- **Poverty:** low-income families and individuals are less likely to have disaster insurance to help rebuild after a catastrophic fire.
- **Occupational risks:** Firefighters, health care personnel and emergency responders are at increased risk for injury, death and respiratory impacts of wildfires, as well as mental health effects due to trauma. Other outdoor workers, such as farmworkers and utility workers, are also at risk for respiratory effects of traveling smoke plumes and pollution.
- **Age:** The very young and the very old are more sensitive to the air quality impacts of wildfires. For children in particular, their still-developing respiratory systems make them especially vulnerable to long-term impacts of wildfire smoke, particulate matter and ground level ozone.
- **Chronic conditions:** Individuals with pre-existing cardiac or respiratory disease are at risk of disease exacerbations due to wildfire smoke. Also, the emergency conditions created by wildfires disrupt individuals' ability to adequately manage their health conditions.
- **Limitations in physical or cognitive ability** place some individuals at greater risk of injury or death during evacuations from wildfires.
- **Pregnant women** are particularly sensitive to wildfire smoke and particulate matter, which is associated with low birth weight.[18]

What can physicians do to address climate change and wildfires?

- Talk with patients about the risks and dangers of wildfires and how to prevent related health impacts.
    - Advise patients with pre-existing respiratory illness (asthma, COPD) to check air quality levels during wildfires and to limit outdoor air exposure when air quality is poor.
    - If patients are sheltering in place due to wildfire, advise them to keep windows and doors closed, set air conditioners to recirculate (close air intake) and use HEPA air filters if available to decrease indoor air pollution.
    - Connect patients to resources for financial support in coping with wildfires.
    - Remind patients living in fire-prone areas to make sure they have a "defensible" space clear of brush and trees that can burn easily.

- Encourage patients living near fire-prone areas to create an emergency response plan in case of evacuation due to fire, and warn them to always pay attention to evacuation recommendations.

- Educate providers and the community on the links between climate change, wildfires and health, and what can be done to prevent negative health impacts.
- Promote mitigation and adaptation strategies related to climate change and wildfires.
  - Advocate for land use policies that reduce development at the wildland-urban interface, thus reducing the risk of property damage related to wildfires.
    - Support stronger zoning policies to limit development near fire-prone areas.
  - Advocate for changes in building codes that require the use of flame-resistant building materials in fire-prone areas.
  - Provide adequate funding and support for smart forestry management to conduct controlled burns and thin out overcrowded forests, which are more susceptible to high intensity, fast burning wildfires.
- 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, including social and economic vulnerabilities to wildfire for individuals and communities.

FAST FACT:

Wildfires cause immediate harm through burns, traumatic injury, smoke inhalation and PTSD.

For More Information

- CDPH Wildfire Smoke Guides: https://www.cdph.ca.gov/programs/cclho/Pages/WildfireSmokeGui.aspx
- Oregon Health Authority Wildfires and Smoke page (includes patient care guides): http://public.health.oregon.gov/preparedness/prepare/pages/prepareforwildfire.aspx
- Washington Department of Health Wildfire Smoke page: http://www.doh.wa.gov/CommunityandEnvironment/AirQuality/SmokeFromFires/WildfireSmoke
- CalFire Fire Prevention page http://calfire.ca.gov/fire_prevention/fire_prevention
- Centers for Disease Control Wildfire Emergency Response page: http://emergency.cdc.gov/disasters/wildfires/

Page 2 photo: Kari Greer/US Forest Service; page 3 photo: USDA; page 5 photo: Eileen McFall

Citations

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2 Ibid.

3 Bell, J.E., S.C. Herring, L. Jantarasami, C. Adrianopoli, K. Benedict, K. Conlon, V. Escobar, J. Hess, J. Luvall, C.P. Garcia-Pando, D. Quattrochi, J. Runkle, and C.J. Schreck, III, 2016: Ch. 4: Impacts of Extreme Events on Human Health. *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. U.S. Global Change Research Program, Washington, DC, 99–128.

FAST FACT:

Wildfire smoke can travel very long distances and affect the health of people far downwind of the fire.

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[7] Ibid.

[8] Ibid.

[9] Ibid.

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