

Canada wildfires and record breaking air pollution in USA cities: interlinkages between climate change, wildfires, air pollution and health

Fossil fuel combustion for transportation, electricity generation, industrial processes, and residential heating and cooking has significantly increased both the concentration of climate-warming greenhouse gases, and air pollution. Air pollution is the leading environmental hazard that contributes to 6.7 million deaths per year globally, which makes it the fourth leading risk factor for premature mortality, only after hypertension, tobacco smoking and poor diet¹. Climate change increases ambient temperature, leading to more extreme weather patterns. The consequences of climate change include more frequent and intense heat waves, droughts and water scarcity, severe wildfires, rising sea levels, catastrophic wind and rain storms, flooding, melting polar ice, introduction of new aeroallergens and infections to new areas, prolonged allergen seasons, and declining biodiversity. Climate change affects entire Earth systems, exposing delicate and close connection between nature and human health, and it is recently acknowledge as the greatest threat to global health in 21st century. The changes in precipitation patterns have led to an increase in extreme drought spells, which in turn, along with warmer climates, leads to increase in the frequency and the intensity of wildfires as well as the length of the fire season².

Canada's current unprecedented wildfire season, the earliest on record with over 400 wildfires, has burned nearly 10 million acres of forest, and displaced more than 20,000 people from their homes.³ It is a reminder of the necessity for immediate and far-reaching actions to protect the well-being of present and future generations. This reminder comes as the ongoing Bonn Climate Change Conference (SB58) aims to prepare decisions for adoption at COP28 in the United Arab Emirates in December, and with the impending EU parliamentary vote on air quality directives.

The health risks from wildfires include risks from direct exposure to fire, as well as risks from exposure to wildfire smoke. Direct exposure to flames or radiant heat for firefighters and individuals residing in close proximity to wildfires can cause burns, injuries, and fatalities. In addition to physical injuries, the risks posed by fires and the subsequent loss of belongings and housing, as well as disruptions to health care, food and water supply systems, and the economy, can have detrimental effects on overall health and mental well-being, including post-traumatic stress disorder, depression, and insomnia.⁴ The smoke from the current wildfires in Canada has blown south into the US, breaking records in air pollution levels in Toronto, Ottawa, New York City, Boston, Detroit, Washington DC, and affecting over 30 million people with unprecedented exposure. On 7 June, New York was the most polluted city in the world, with pictures of the city's skyline engulfed in thick smog making headlines around the world. Authorities have advised people to stay indoors or wear a mask if going outdoors, schools have cancelled all outdoor activities, and many people have taken other precautions, worried about the health impact of this air pollution episode.

Wildfire smoke is a complex mixture of particulate matter and gaseous pollutants that can travel thousands of miles. There is extensive evidence on the negative health effects of particulate and gaseous air pollution. While the health effects of wildfire smoke are less studied, epidemiological studies showed that exposure to wildfire particulate matter increased the risk of all-cause, cardiovascular, and respiratory mortality⁵. In addition, exposure to wildfire smoke may impair lung function and increase the risk for related respiratory events such as hospitalizations, emergency department visits, physician visits, and medication use for asthma, chronic

¹ The Health Effects Institute (HEI). *State of Global Air 2020. Special Report*. www.stateofglobalair.org/

² IPCC 2021. doi:10.1017/9781009157896.013; <https://www.noaa.gov/noaa-wildfire/wildfire-climate-connection>

³ <https://www.nytimes.com/live/2023/06/09/world/canada-wildfires-air-quality-smoke/heres-the-latest-on-canadas-wildfires-and-the-effects-of-the-smoke-in-north-america?smid=url-share>

⁴ <https://www.nejm.org/doi/full/10.1056/NEJMSr2028985>

⁵ [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(21\)00200-X/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(21)00200-X/fulltext)

obstructive pulmonary disease, and respiratory infection.⁶ A growing number of studies indicate that wildfire smoke exposure may also increase the risk of adverse birth outcomes.⁷ Certain populations may be at greater risk of experiencing a health effect due to wildfire smoke, such as people with pre-existing asthma and other respiratory or cardiovascular diseases, children, pregnant women, older adults, people of low socio-economic status, and outdoor workers⁸.

In Australia, the 2019–20 bushfires season led to 6177 excess emergency department visits for respiratory diseases and 3120 visits for cardiovascular diseases.⁹ While it is still too soon to grasp and estimate the full health effects of the current wildfires in Canada on the populations in Canada and USA, the scale of this underlines the close and delicate link between climate change, air pollution and health, which demands urgent joint actions and solutions.

We urge the implementation of immediate climate change mitigation action to restrict the global mean temperature rise to 2.0°C or 1.5°C above pre-industrial levels, which could potentially prevent 60% or 80% of the projected increase in wildfire exposure.¹⁰ Such actions have the potential to save numerous lives from the devastating impacts of wildfires. We also call for ambitious health-based air pollution policies, aligned with World Health Organization 2021 Air Quality Guidelines,¹¹ to reduce the related direct health burden from air pollution, and indirect health impact from climate change. These bold policies are necessary and urgently needed to mitigate the effect of unprecedented climate change on our planet and to protect planetary and our health.

⁶ <https://www.nejm.org/doi/full/10.1056/NEJMSr2028985>

⁷ <https://ehp.niehs.nih.gov/doi/full/10.1289/EHP10544>

⁸ <https://www.epa.gov/wildfire-smoke-course/which-populations-experience-greater-risks-adverse-health-effects-resulting>

⁹ <https://doi.org/10.1016/j.scitotenv.2021.152226>

¹⁰ <https://doi.org/10.1016/j.envint.2019.04.025>

¹¹ <https://apps.who.int/iris/handle/10665/345329>