Smoke from wildfires can tip air quality to unhealthy levels

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Smoke plumes emanating from wildfires are swept high up into the air and spread over thousands of kilometers even days after a fire has been put out. The fine particles and harmful ozone contained in these plumes often have devastating effects on the air quality of US cities and consequently the health of their inhabitants. This is according to Alexandra Larsen of North Carolina State University in the US who led the first ever study taking a long-term look into the effects that wildfire smoke has on air quality across the US. The article appears in the *Journal of Exposure Science and Environmental Epidemiology* which is published by Springer Nature.

Since the 1970s, the number of large-scale wildfires in the US, which spread across 10 000 acres (~4000+ hectares) or more, has increased fivefold. This is worrying because exposure to particles and gases associated with wildfire smoke often leads people to be hospitalized with breathing and heart-related problems.

To measure the impact of wildfires on air quality, Larsen and her colleagues analyzed different sources of relevant data collected between 2006 and 2013. The data included the US National Oceanic and Atmospheric Administration (NOAA) Hazard Mapping System (HMS) that gathers daily satellite information about the presence and spread of smoke plumes.

Also, the researchers referred to the US Environmental Protection Agency's Air Quality System which monitors air pollution levels at

different sites across the US, and levels of ozone and fine particulate matter on a given day. Fine particles and ozone have been linked to a range of health problems.

Larsen and her colleagues found that ozone concentrations were on average 11.1 percent higher on days when plumes were seen than on clear days. Unsurprisingly, fine particle levels were also significantly higher than normal (33.1 percent) on such days.

For Larsen, a striking finding is that the presence of wildfire smoke also had a knock-on effect and the effect was higher for ozone. While plumes had occurred only on 6-7 percent of days, these plumes accounted for 16 percent of unhealthy days due to small particles and 27 percent of unhealthy days due to ozone.

"Smoke-plume days accounted for a disproportionate number of days with elevated air quality index levels, indicating that moderate increases in regional air pollution due to large fires and long-distance transport of smoke can tip the air quality to unhealthy levels," says Larsen.

The pollutants emanating from wildfire smoke had a greater impact across Massachusetts, Connecticut, Illinois, Indiana, and Kansas. The windswept plumes caused ozone concentrations over these cities to rise.

"Enhanced ozone production in urban areas is a concern because of the population size potentially impacted and because air pollution levels could be already elevated due to local and mobile sources," explains Larsen.

More information: Alexandra E. Larsen et al, Impacts of fire smoke plumes on regional air quality, 2006–2013, *Journal of Exposure Science & Environmental Epidemiology* (2017). DOI: 10.1038/s41370-017-0013-x

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