Dangerous combination of extreme heat and smoke affected 16.5 million Californians

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Wildfires release fine particulate matter that can lead to respiratory and circulatory problems, and extreme heat can contribute to illnesses like heat stress, heatstroke, cardiovascular disease and even renal failure. But previous research has shown that the interaction of high heat and air pollution can boost health risks beyond what would be expected by the combination alone—a phenomenon that is particularly threatening to the elderly, those with preexisting conditions and other vulnerable populations.

"It's not just one plus one equals two," Rosenthal said of the health hazards. "It might be one plus one equals four."

For their smoke-related findings, the authors focused on fine particulate matter from wildfires alone, excluding pollution from other sources, such as cars and power plants. These fire-related particles, known as PM$_{2.5}$, which are 0.0025 millimeters or less in width, can infiltrate deep into the lungs and are considered especially harmful to respiratory health.

Their research combined smoke distribution models and satellite data on fires' radiative power—a
measurement of the rate of heat released during a fire—to determine where smoke from wildfires was concentrated.

Exactly how and why the combination of smoke and extreme heat can produce an adverse synergistic effect on health is not fully understood, Rosenthal said. The compound effects could be due to conditions resulting from heat exposure that then increase a person’s vulnerability to smoke exposure, or vice versa.

While additional research is needed to determine the specific health impacts of the combination of extreme heat and smoke, the authors recommend that public health guidance and climate adaptation policies take into account these co-exposures, especially as they grow in frequency and intensity.

"Nothing operates alone," Rosenthal said. "Extreme heat and wildfires are interconnected and they overlap."


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