

Wildfire Smoke May Be Linked to Increased Risk for Several Cancers

Wildfire smoke is not only a short-term respiratory or cardiovascular concern, as chronic exposure may also carry long-term cancer risks.

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San Diego – Exposure to wildfire smoke was associated with a significantly increased risk of lung, colorectal, breast, bladder, and blood cancer, according to results from a study presented at the [American Association for Cancer Research \(AACR\) Annual Meeting 2026](#), held April 17-22.

Although it's known that wildfire smoke (WFS) contains a wide array of toxins, including carcinogens like polycyclic aromatic hydrocarbons, the whole-body impacts of WFS in real-world settings remain unclear, especially when it comes to cancer incidence, according to Qizhen Wu, PhD, the presentation's first author and a postdoctoral fellow at The University of New Mexico (UNM) Comprehensive Cancer Center.

Wu explained that the toxic compounds in WFS have the potential to disrupt a variety of biological systems—not just in the lungs, the site of initial exposure, but in the blood as well, which can then spread carcinogens throughout the body. He also noted that smoke exposure is, itself, an inflammatory event with systemic implications for carcinogenesis.

“Wildfires are becoming more frequent and severe in the United States and globally, and WFS has emerged as a major source of ambient air pollution, reversing decades of improvement achieved under the Clean Air Act,” said [Shuguang Leng, MBBS, PhD](#), associate professor at the UNM Comprehensive Cancer Center and the study's senior author. “The main purpose of our study was to examine whether long-term exposure to WFS was associated with the risk of developing cancer in the general population.”

Wu, Leng, and colleagues analyzed cancer incidence data from the [Prostate, Lung, Colorectal, and Ovarian \(PLCO\) Cancer Screening Trial](#), which tracks the cancer incidence of participants: adults from across the United States with no history of prostate, lung, colorectal, or ovarian cancers who enrolled between 1993 and 2001.

To quantify participants' exposure to WFS, the researchers assessed the fine particulate matter (PM2.5) and black carbon from ground-level air pollution data sourced from participants' residential areas. The team used satellite images from 2006 onward to match PM2.5 and black

carbon data with WFS exposure events, and they also used the satellite images to calculate the number of days that participants' areas of residence were exposed to WFS plumes, defined as plume-day counts. The analysis accounted for wildfire smoke exposure monthly until a participant's first cancer diagnosis or their last contact with the study.

Within the PLCO trial, 91,460 participants were evaluable for WFS exposure. From 2006 to 2018, the researchers calculated 36-month moving averages updated monthly for each participant's exposure to WFS as defined by micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) for PM_{2.5} and black carbon and days of exposure for WFS plume-day counts. The median of those moving averages was 0.37 $\mu\text{g}/\text{m}^3$ for WFS PM_{2.5}, 0.0083 $\mu\text{g}/\text{m}^3$ for WFS black carbon, and 1.94 days for monthly WFS plume-day counts.

During the same time period, Wu, Leng, and colleagues identified 1,758 [lung cancer](#) cases; 800 [colorectal cancer](#) cases; 1,739 [breast cancer](#) cases; 242 [ovarian cancer](#) cases; 896 [bladder cancer](#) cases; 1,696 blood cancer cases; and 1,127 [melanoma](#) cases.

Using a statistical analysis method that allows scientists to examine nonlinear risk associations, the researchers confirmed that WFS exposure was significantly associated with an increased risk of developing lung, colorectal, breast, bladder, and blood cancer. There was no evidence of deviation from a linear dose-response relationship. Associations with ovarian cancer and melanoma were not significant.

The team also found that the risk of developing these cancers increased with every additional 1 $\mu\text{g}/\text{m}^3$ in the 36-month moving average of WFS PM_{2.5}. Every 1 $\mu\text{g}/\text{m}^3$ increase in WFS PM_{2.5} exposure was associated with significantly greater likelihoods of developing cancer: 92% greater risk of lung cancer; 131% greater risk of colorectal cancer; 109% greater risk of breast cancer; a 249% greater risk of bladder cancer; and a 63% greater risk of blood cancers.

The associations between increased exposure levels and risk for various cancers were similar for WFS plume-day counts. However, the associations between increased WFS black carbon exposure and risk of cancer development were only significant for breast and bladder cancer.

"For the general public, the key message is that wildfire smoke is not only a short-term respiratory or cardiovascular concern—chronic exposure may also carry long-term cancer risks," said Wu. "Notably, increased cancer risk may occur even at relatively low levels of wildfire smoke PM_{2.5} commonly experienced by general populations."

Wu noted that further investigation was warranted for specific aspects of WFS, including its origin and its contents, which could have different implications for cancer risk across the continent depending on which geographic populations were exposed to which WFS sources. Wildfires from different regions may contain different compounds from burning in varying proportions, and the chemical transformations that occur in smoke as it drifts may also impact biological effects, he said.

“As wildfires continue to increase in frequency and intensity, understanding their long-term health impacts is becoming increasingly important,” said Leng. “While more research is needed, we hope these findings will help raise awareness and support future studies on the long-term health effects of wildfire smoke.”

Limitations of this study include that data from satellite images are only available from 2006, which precluded analysis of wildfire smoke’s role in cancer initiation due to the sometimes yearslong delay between cancer initiation and cancer diagnosis. Additionally, the location-based analysis assumed that participants were located within their residential areas during every measured period of exposure and did not account for time spent indoors versus outdoors.

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