

CONTACT: Alzheimer's Association Media Line, 312.335.4078, media@alz.org
AAIC 2024 Press Office, aaicmedia@alz.org

FROM THE ALZHEIMER'S ASSOCIATION INTERNATIONAL CONFERENCE 2024 EXPOSURE TO WILDFIRE SMOKE GREATLY RAISES RISK OF DEMENTIA DIAGNOSIS

Key Takeaways

- **Wildfire smoke may be particularly hazardous to brain health, according to a 10-year study of more than 1.2 million southern Californians.**
- **Exposure to wildfire smoke increases the risk of being diagnosed with dementia more than other forms of air pollution.**
- **The risk of exposure to fine particulate matter (PM_{2.5}) air pollution is much more pronounced when the source is wildfire smoke than when it comes from other sources, such as motor vehicles and factories.**
- **To lower their risk, people should update their home air filtration systems when possible, stay inside when the air quality is unhealthy, and wear an N95 mask outside when the Air Quality Index reaches 100.**

PHILADELPHIA, July 29, 2024 — Exposure to wildfire smoke increases the risk of being diagnosed with dementia more than other types of air pollution, according to a decade-long study of more than 1.2 million people in southern California. The findings, reported today at the [Alzheimer's Association International Conference](#)® (AAIC®) 2024, in Philadelphia and online, suggest the brain health threat posed by wildfire smoke is higher than other forms of air pollution.

Wildfire smoke, motor vehicles and factories all emit a type of air pollution called fine particulate matter (PM_{2.5}). This is a microscopic mixture of solid and liquid droplets in the air that are 30 times smaller than the width of an average human hair. Researchers found that the risk of dementia diagnosis due to exposure to PM_{2.5} in wildfire smoke was notably stronger — even with less exposure — than the risk due to the other sources of PM_{2.5} air pollution. Exposure to non-wildfire PM_{2.5} raised the risk of dementia diagnosis, but not as much as wildfire smoke.

High levels of PM_{2.5} also have been shown to raise the risk of heart disease, asthma and low birth weight.

“With the rising global incidence of wildfires, including in California and the western U.S., exposure to this type of air pollution is an increasing threat to brain health,” said Claire Sexton, DPhil, Alzheimer's Association senior director of scientific programs and outreach. “These findings underscore the importance of enacting policies to prevent wildfires and investigating better methods to address them.”

Researchers analyzed the health records of 1,227,241 socioeconomically diverse Kaiser Permanente southern California members who were 60 years or older between 2009-2019, none of whom had been diagnosed with dementia at the beginning of the study. Total PM_{2.5} was estimated from various sources, including satellite-derived aerosol properties and Environmental Protection Agency monitoring. Researchers used air quality monitoring data, satellite imagery and machine learning techniques to separate wildfire and non-wildfire PM_{2.5}. They determined each study participant's exposure to both sources of PM_{2.5} according to where they lived. They compared that information to subsequent diagnoses of dementia in participants' health records.

Reported for the first time at AAIC 2024, the researchers observed a 21% increase in the odds of dementia diagnosis for every increase of 1 microgram per meter — or $\mu\text{g}/\text{m}^3$, which is the amount of particulate matter in a cubic meter of air — in the three-year average wildfire $\text{PM}_{2.5}$ exposure. Comparatively, they determined study participants had a 3% increased risk of dementia diagnosis for every increase of 3 $\mu\text{g}/\text{m}^3$ in the three-year average of non-wildfire $\text{PM}_{2.5}$ exposure.

“Previous research has found that exposure to $\text{PM}_{2.5}$ is associated with dementia, but in light of our large, long-term study, it’s apparent the risk from exposure due to wildfire smoke is an even bigger concern,” said Holly Elser, M.D., Ph.D., the study’s first author and a neurology resident at the Hospital of the University of Pennsylvania, Philadelphia. “Air pollution produced by wildfires now accounts for more than 70% of total $\text{PM}_{2.5}$ exposure on poor air quality days in California. This is a real problem.”

Dr. Elser noted several reasons why $\text{PM}_{2.5}$ produced by wildfires might be more hazardous to health: they are produced at higher temperatures, contain a greater concentration of toxic chemicals and, on average, are smaller in diameter than $\text{PM}_{2.5}$ from other sources. She said more research needs to be done to determine the exact mechanisms.

“The findings appeared most pronounced among individuals from racially and ethnically minoritized groups and in high poverty areas,” said Joan A. Casey, Ph.D., senior author of the study and assistant professor in the Department of Environmental and Occupational Health Sciences at the University of Washington, Seattle. “These findings underscore that clinical and health policies seeking to prevent dementia-associated disparities should include efforts to reduce exposure to long-term wildfire and non-wildfire $\text{PM}_{2.5}$.”

Drs. Elser and Casey recommend that people update their air filtration systems and check the air quality on their weather app if they use one. An Air Quality Index (AQI) number of 100 or higher means the air is unhealthy to breathe. To reduce their risk when the AQI is 100 or higher, people should stay inside when possible and close the windows, and wear an N95 mask when they go outside.

About the Alzheimer’s Association International Conference® (AAIC®)

The Alzheimer’s Association International Conference (AAIC) is the world’s largest gathering of researchers from around the world focused on Alzheimer’s and other dementias. As a part of the Alzheimer’s Association’s research program, AAIC serves as a catalyst for generating new knowledge about dementia and fostering a vital, collegial research community.

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About the Alzheimer’s Association®

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- Holly C Elser, M.D., Ph.D., et al. Long-term wildfire smoke exposure and incident dementia in a large California cohort. (Funding: the U.S. National Institute on Aging R01-AG071024)

*** AAIC 2024 news releases may contain updated data that does not match what is reported in the following abstract.

Proposal ID: 86179

Long-term wildfire smoke exposure and incident dementia in a large California cohort

Background: Long-term exposure to ambient air pollution—including fine particulate matter $<2.5\mu\text{m}$ in diameter ($\text{PM}_{2.5}$) has previously been associated with incident dementia. As climate change drives longer and more intense wildfire seasons, exposure to $\text{PM}_{2.5}$ produced by wildfires may be a unique and increasingly important risk factor for dementia.

Method: In this retrospective open cohort study, we examined the association between long-term exposure to wildfire $\text{PM}_{2.5}$ and dementia among Kaiser Permanente Southern California patients aged ≥ 60 from 2009–2019 in California. Study participants were dementia-free at baseline. Incident dementia was identified within the electronic health record using International Classification of Diseases 9 and 10 codes. Estimates for rolling three-year average concentrations of wildfire and non-wildfire $\text{PM}_{2.5}$ were assigned to each participant based on census tract of residence, which was updated quarterly. We used pooled logistic regression to estimate the odds of dementia diagnosis associated with a one $\mu\text{g}/\text{m}^3$ increase in the three-year average of wildfire and non-wildfire $\text{PM}_{2.5}$. All models included fixed effects for calendar year and adjusted for age, sex, race and ethnicity, marital status, smoking status, Charlson Comorbidity Index (minus dementia), and census tract poverty and population density.

Result: The study included 1,227,241 members. Approximately half were women (53%) and were married (54%). A majority self-identified as non-Hispanic White (49%) or Hispanic (26%). Over the study period, the mean wildfire $\text{PM}_{2.5}$ concentration was 0.09 (IQR: 9.6–12.4). After adjusting for covariates, the odds of dementia diagnosis was 10% higher for every 1 $\mu\text{g}/\text{m}^3$ higher three-year average wildfire $\text{PM}_{2.5}$ concentration (OR=1.10, 95%CI: 0.96,1.25). For non-wildfire $\text{PM}_{2.5}$, the odds of dementia diagnosis were 1 higher for every 1 $\mu\text{g}/\text{m}^3$ higher three-year average exposure (OR=1.01, 95%CI: 1.00,1.01).

Conclusion: Long-term exposure to $\text{PM}_{2.5}$, both wildfire and non-wildfire, may be an important risk factor for dementia.

Presenting author:

Holly C Elser, MD, PhD Holly.Elser@Pennmedicine.upenn.edu
Hospital of the University of Pennsylvania, Philadelphia

Tables and Figures:

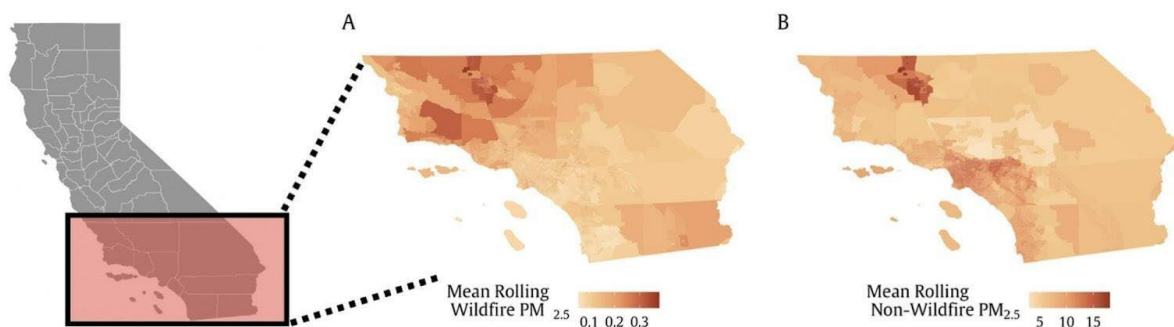


Figure. Mean of all quarter-specific three-year rolling average fine particulate matter ($\text{PM}_{2.5}$) concentrations in $\mu\text{g}/\text{m}^3$ in the Kaiser Permanente Southern California catchment area, 2006–2019 for (A) wildfire $\text{PM}_{2.5}$ and (B) non-wildfire $\text{PM}_{2.5}$