

Forest fires, cars, power plants join list of risk factors for Alzheimer's disease

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Diagram of the brain of a person with Alzheimer's Disease. Credit: Wikipedia/public domain.

A new study led by researchers at UC San Francisco has found that among older Americans with cognitive impairment, the greater the air pollution in their neighborhood, the higher the likelihood of amyloid plaques—a hallmark of Alzheimer's disease. The study adds to a body of evidence indicating that pollution from cars, factories, power plants and forest fires joins established dementia risk factors like smoking and diabetes.

In the study, which appears in *JAMA Neurology* on Nov.30, 2020, the researchers looked at the PET scans of more than 18,000 seniors whose

average age was 75. The participants had dementia or mild [cognitive impairment](#) and lived in zip codes dotted throughout the nation. The researchers found that those in the most polluted areas had a 10 percent increased probability of a PET scan showing [amyloid plaques](#), compared to those in the least polluted areas.

When applied to the U.S. population, with an estimated 5.8 million people over 65 with Alzheimer's disease, high exposure to microscopic airborne particles may be implicated in tens of thousands of cases.

"This study provides additional evidence to a growing and convergent literature, ranging from animal models to [epidemiological studies](#), that suggests [air pollution](#) is a significant risk factor for Alzheimer's disease and dementia," said senior author Gil Rabinovici, MD, of the UCSF Memory and Aging Center, Department of Neurology and the Weill Institute for Neurosciences.

Amyloid Plaques Not Indicative of All Dementias

The 18,178 participants had been recruited for the IDEAS study (Imaging Dementia—Evidence for Amyloid Scanning), which had enrolled Medicare beneficiaries whose mild cognitive impairment or dementia had been diagnosed following comprehensive evaluation. Not all of the participants were later found to have positive PET scans—40 percent showed no evidence of plaques on the scan, suggesting non-Alzheimer's diagnoses like frontotemporal or vascular dementias, which are not associated with the telltale [amyloid](#) plaques.

Air [pollution](#) in the neighborhood of each participant was estimated with Environmental Protection Agency data that measured ground-level ozone and PM2.5, atmospheric particulate matter that has a diameter of less than 2.5 micrometers. The researchers also divided locations into quartiles according to the concentration of PM2.5. They found that the

probability of a positive PET scan rose progressively as concentrations of pollutants increased, and predicted a difference of 10 percent probability between the least and most polluted areas.

"Exposure in our daily lives to PM2.5, even at levels that would be considered normal, could contribute to induce a chronic inflammatory response," said first author Leonardo Iaccarino, Ph.D., also of the UCSF Memory and Aging Center, Department of Neurology and the Weill Institute of Neurosciences. "Over time, this could impact brain health in a number of ways, including contributing to an accumulation of amyloid plaques."

Overall concentrations of PM2.5 would not be considered very high for it to have a significant association with amyloid plaques, amounting to annual averages in San Francisco during the study time, added Rabinovici.

"I think it's very appropriate that air pollution has been added to the modifiable risk factors highlighted by The Lancet Commission on dementia," he said, referring to the journal's decision this year to include air pollution, together with excessive alcohol intake and traumatic brain injury, to their list of risk factors.

The study complements previous large-scale studies that tie air pollution to dementia and Parkinson's disease, and adds novel findings by including a cohort with [mild cognitive impairment](#)—a frequent precursor to [dementia](#)—and using amyloid plaques as a biomarker of disease. Other studies have linked air pollution to adverse effects on cognitive, behavioral and psychomotor development in children, including a UCSF-University of Washington study that looked at its impact on the IQ of the offspring of pregnant women.

Provided by University of California, San Francisco

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