Significant link found between air pollution and neurological disorders

October 19 2020

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Air pollution was significantly associated with an increased risk of hospital admissions for several neurological disorders, including

Parkinson's disease, Alzheimer's disease, and other dementias, in a long-term study of more than 63 million older U.S. adults, led by researchers at Harvard T.H. Chan School of Public Health.

The study, conducted with colleagues at Emory University's Rollins School of Public Health and Columbia University's Mailman School of Public Health, is the first nationwide analysis of the link between fine particulate (PM2.5) pollution and neurodegenerative diseases in the U.S. The researchers leveraged an unparalleled amount of data compared to any previous study of air pollution and neurological disorders.

The study will be published online October 19, 2020 in *The Lancet Planetary Health*.

"The 2020 report of the Lancet Commission on dementia prevention, intervention, and care has added air pollution as one of the modifiable risk factors for these outcomes," said Xiao Wu, doctoral student in biostatistics at Harvard Chan School and co-lead author of the study. "Our study builds on the small but emerging evidence base indicating that long-term PM2.5 exposures are linked to an increased risk of neurological health deterioration, even at PM2.5 concentrations well below the current national standards."

Researchers looked at 17 years' worth (2000-2016) of hospital admissions data from 63,038,019 Medicare recipients in the U.S. and linked these with estimated PM2.5 concentrations by zip code. Taking into account potential confounding factors like socioeconomic status, they found that, for each 5 microgram per cubic meter of air ($\mu g/m^3$) increase in annual PM2.5 concentrations, there was a 13% increased risk for first-time hospital admissions both for Parkinson's disease and for Alzheimer's disease and related dementias. This risk remained elevated even below supposedly safe levels of PM2.5 exposure, which, according to current U.S. Environmental Protection Agency standards, is an annual

average of 12 μg/m^3 or less.

Women, white people, and urban populations were particularly susceptible, the study found. The highest risk for first-time Parkinson's disease hospital admissions was among older adults in the northeastern U.S. For first-time Alzheimer's disease and related dementias hospital admissions, older adults in the Midwest faced the highest risk.

"Our U.S.-wide study shows that the current standards are not protecting the aging American population enough, highlighting the need for stricter standards and policies that help further reduce PM2.5 concentrations and improve air quality overall," said Antonella Zanobetti, principal research scientist in Harvard Chan School's Department of Environmental Health and co-senior author of the study.

More information: "Long-term effects of PM2.5 on neurological disorders in the American Medicare population: a longitudinal cohort study," Liuhua Shi, Xiao Wu, Mahdieh Danesh Yazdi, Danielle Braun, Yara Abu Awad, Yaguang Wei, Pengfei Liu, Qian Di, Yun Wang, Joel Schwartz, Francesca Dominici, Marianthi-Anna Kioumourtzoglou, Antonella Zanobetti, *The Lancet Planetary Health*, online October 19, 2020, doi: doi.org/10.1016/S2542-5196(20)30227-8

Provided by Harvard T.H. Chan School of Public Health