EXPOSURE TO PARTICULATE AIR POLLUTION AND COGNITIVE DECLINE IN OLDER WOMEN

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Background and Aims: Chronic exposure to particulate air pollution may accelerate cognitive decline in older adults. We examined long-term exposure to thoracic (PM$_{10}$) and fine (PM$_{2.5}$) particulate air pollution in relation to cognitive decline.

Methods: Our investigation included 17282 US women, aged 70-81 years, who were participants in the Nurses’ Health Study. We used geographic information systems (GIS)-based spatio-temporal smoothing models to estimate recent (1 month) and long-term (6-13 years) exposures to PM$_{10}$ and PM$_{2.5}$ for women residing in the contiguous US. We evaluated the women’s cognition using validated telephone assessments of cognition, administered 3 times at approximately 2-year intervals, including tests of general cognition, verbal memory, category fluency, and attention. We used generalized estimating equation regression to estimate differences in the rate of cognitive decline over 4 years, across levels of PM$_{10}$ and PM$_{2.5}$ exposures preceding cognitive testing.

Results: Higher levels of long-term exposure to both PM$_{10}$ and PM$_{2.5}$ were associated with significantly faster cognitive decline. Decline on a global score, combining results of all 6 tests, was 0.017 standard units worse per 10 µg/m$^3$ increment in PM$_{10}$ exposure (95% confidence interval, -0.027 to -0.007) and 0.036 units worse per 10 µg/m$^3$ increment in PM$_{2.5}$ exposure (95% confidence interval, -0.064 to -0.008). These differences in cognitive trajectory were similar to the differences in trajectories between women in our cohort who were 1.5 and three years apart in age, respectively, indicating that the long-term effects of particulate air pollution are cognitively equivalent to aging by up to three years. Recent exposures to PM$_{10}$ and PM$_{2.5}$ were not significantly associated with cognitive decline.

Conclusions: Long-term exposure to PM$_{10}$ and PM$_{2.5}$, at levels typically experienced by many persons in the US, is associated with significantly worse cognitive decline in older women.