

# Science for Environment Policy

## Air pollution and the brain: potential neurological risk shown in Parkinson's study

**Elderly patients with Parkinson's disease** are at greater risk of emergency hospitalisation, as well as premature death, following short periods of increased air pollution by fine particles, finds a US study. The researchers believe that these findings support the theory that fine particles may affect the brain. They also found possible links between pollution and hospitalisation rates for diabetes patients.

**Diabetes and neurological disorders**, such as dementia, Parkinson's and Alzheimer's, are growing [health](#) problems in today's ageing society. Older people may also be more sensitive to hazardous substances and pollution.

The new study suggests that ambient air pollution by fine particles (PM<sub>2.5</sub>, particles smaller than 2.5 micrometres) may be linked to the development of neurological disorders and diabetes. This is because the same biological mechanisms thought to be responsible for the well-established link between PM<sub>2.5</sub> and cardiovascular disease – such as inflammation and dysfunctional blood vessels – are also relevant to neurological disease and diabetes.

To explore their theory, the researchers gathered data from [Medicare](#) (the US national health insurance programme) on emergency admissions to hospital for elderly patients, aged over 65, for the period 1999-2010.

They focused on hospitalisations for patients already diagnosed with the neurological conditions dementia, Alzheimer's disease and Parkinson's disease, as well as diabetes (and only those instances when these conditions were the main reason for admission).

They compared the timings of these hospitalisations with atmospheric levels of PM<sub>2.5</sub> in each patient's home town, using data from the US [Environmental Protection Agency](#). They specifically looked at hospitalisations after rises of fine particle pollution across 121 communities where air pollution monitoring took place. There were nearly 720 000 such hospitalisations altogether.

Hospitalisation rates for patients with Parkinson's went up by 3.23% with every 10 µg/m<sup>3</sup> rise in PM<sub>2.5</sub> over two days. The study also found significant, but smaller, increased risk for diabetes: admissions for these patients went up by 1.14%. PM<sub>2.5</sub> thus has statistically significant effects for elderly patients with these conditions, the study's authors conclude.

Overall, admission rates also rose for patients with Alzheimer's (0.2%) and dementia (0.92%) following the higher PM<sub>2.5</sub> periods. However, the number of these admissions was low in some cities despite the pollution. The study could therefore not conclude that there is a significant association between PM<sub>2.5</sub> and Alzheimer's or dementia.

The researchers also found that death rates, from any cause, increased by 0.64% after each two-day 10 µg/m<sup>3</sup> rise in PM<sub>2.5</sub> for patients with the diseases considered, but the study could not establish that the association is statistically significant.

These findings support other studies which have also observed a plausible link between air pollution and the brain, although the exact link is yet to be defined or conclusively proven.

This study's findings support efforts to reduce air pollution. Key sources of PM<sub>2.5</sub>, regulated under the [Air Quality Directive in the EU](#), include [traffic](#) exhaust emissions, coal-fired power stations and wood-burning emissions.



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**Source:** Zanobetti, A., Dominici, F., Wang, Y., & Schwartz, J. D. (2014). A national case-crossover analysis of the short-term effect of PM<sub>2.5</sub> on hospitalizations and mortality in subjects with diabetes and neurological disorders. *Environmental Health*. 13(1), 38. DOI: 10.1186/1476-069X-13-38. This study is free to view at:

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