

## EPIDEMIOLOGY

## Air pollution and the risk of dementia: The rotterdam study

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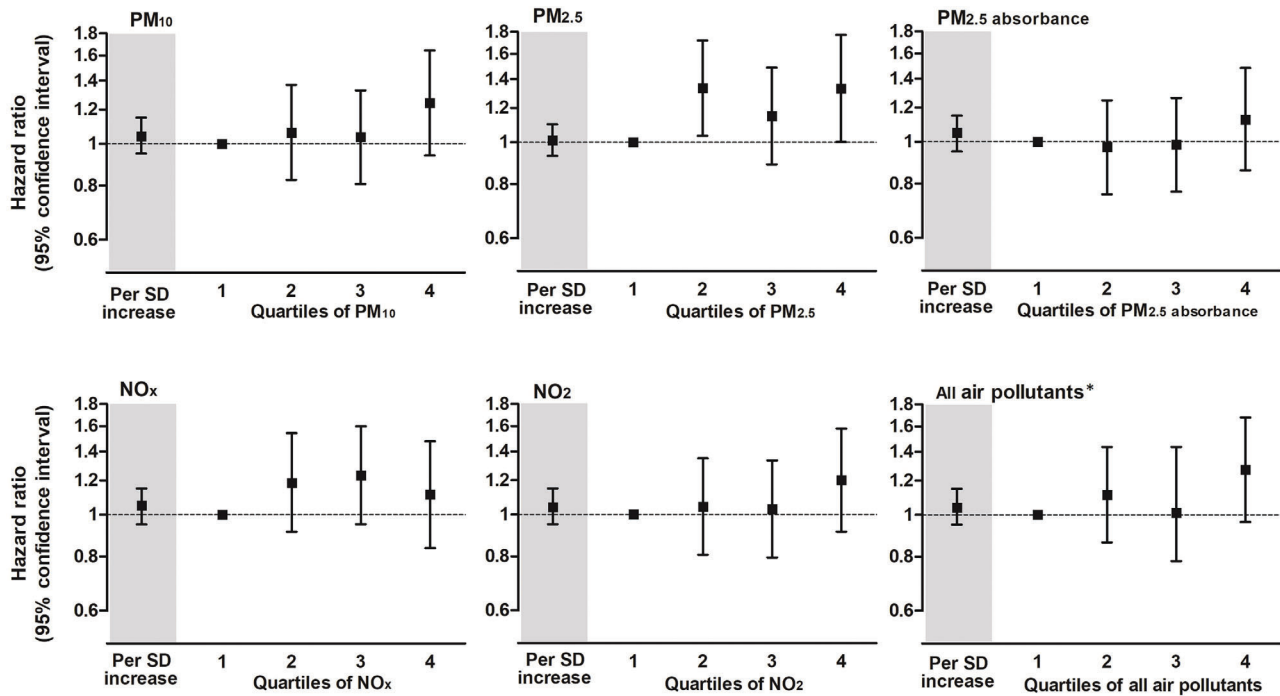
## Abstract

**Background:** Air pollution has been suggested to increase the risk of dementia, by triggering neuro-inflammation, oxidative stress, and cerebrovascular damage. However, studies on the association between exposure to air pollution and the risk of dementia yielded inconsistent results. We therefore determined exposure to air pollution in association with the risk of dementia and cognitive decline in the population-based Rotterdam Study.

**Method:** Between 2009 and 2010, we determined air pollutant levels at participants residential addresses using land use regression models. Determined air pollutant levels included particulate matter with an aerodynamic diameter of less than 10 µm (PM<sub>10</sub>) and 2.5 µm (PM<sub>2.5</sub>), a proxy of elemental carbon (PM<sub>2.5</sub> absorbance), nitrogen oxide (NO<sub>x</sub>), and nitrogen dioxide (NO<sub>2</sub>). As the individual air pollutant levels were highly correlated with each other ( $r = 0.71-0.98$ ), we obtained the first unrotated component of a principal component analyses (PCA) for all air pollutants. We followed participants up for dementia until 2018 and determined cognitive performance during two subsequent examination rounds. Using Cox proportional hazard models and linear mixed models, we determined the association of exposure to air pollution with the risk of dementia and cognitive decline.

**Result:** Of the 7511 non-demented participants at baseline (median age 68 years, 58.6% women), 545 developed dementia during a median follow-up of 7 years. Mean ± standard deviation (SD) levels per µg/m<sup>3</sup> were 26.1 ± 1.0 for PM<sub>10</sub>, 16.8 ± 0.4 for PM<sub>2.5</sub>, 1.5 ± 0.1 for PM<sub>2.5</sub> absorbance, 46.1 ± 12.2 for NO<sub>x</sub>, and 32.6 ± 3.4 for NO<sub>2</sub>. The individual air pollutant levels were not significantly associated with the risk of dementia, neither was the first unrotated component of a PCA for all air pollutants (hazard ratio [95% confidence interval] per SD increase: 1.04 [0.95-1.15], **Figure 1**). Air pollutant levels were also not associated with decline in cognitive function.

**Conclusion:** Exposure to air pollution was not statistically significantly associated with the risk of dementia or cognitive decline. Yet, observed effect estimates were in the hypothesized direction and variability in pollutant levels may have been too limited to identify meaningful associations.



**Figure 1. Exposure to PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>2.5</sub> absorbance, NO<sub>x</sub> and NO<sub>2</sub> in association with the risk of dementia.**

Abbreviations: NO, nitrogen oxide; PM, particulate matter; SD, standard deviation.

\*The first unrotated component of a principal component analyses for all air pollutants