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Long-term exposure to low-level air pollution and incidence of asthma: the ELAPSE project

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Long-term exposure to air pollution, especially from fossil fuel combustion sources such as motorised traffic, is associated with the development of asthma in adults, even at levels below the current EU and US limit values and possibly WHO guidelines https://bit.ly/2QW5yA7

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ABSTRACT

Background: Long-term exposure to ambient air pollution has been linked to childhood-onset asthma, although evidence is still insufficient. Within the multicentre project Effects of Low-Level Air Pollution: A Study in Europe (ELAPSE), we examined the associations of long-term exposures to particulate matter with a diameter <2.5 µm ($PM_{2.5}$), nitrogen dioxide (NO_2) and black carbon (BC) with asthma incidence in adults.

Methods: We pooled data from three cohorts in Denmark and Sweden with information on asthma hospital diagnoses. The average concentrations of air pollutants in 2010 were modelled by hybrid land-use regression models at participants' baseline residential addresses. Associations of air pollution exposures with asthma incidence were explored with Cox proportional hazard models, adjusting for potential confounders.

Results: Of 98 326 participants, 1965 developed asthma during a mean follow-up of 16.6 years. We observed associations in fully adjusted models with hazard ratios of 1.22 (95% CI 1.04–1.43) per 5 $\mu g \cdot m^{-3}$ for $PM_{2.5}$, 1.17 (95% CI 1.10–1.25) per 10 $\mu g \cdot m^{-3}$ for NO_2 and 1.15 (95% CI 1.08–1.23) per 0.5×10^{-5} m^{-1} for BC. Hazard ratios were larger in cohort subsets with exposure levels below the European Union and US limit values and possibly World Health Organization guidelines for $PM_{2.5}$ and NO_2. NO_2 and BC estimates remained unchanged in two-pollutant models with $PM_{2.5}$, whereas $PM_{2.5}$ estimates were attenuated to unity. The concentration–response curves showed no evidence of a threshold.

Conclusions: Long-term exposure to air pollution, especially from fossil fuel combustion sources such as motorised traffic, was associated with adult-onset asthma, even at levels below the current limit values.