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Exposure to airborne cadmium and lead and cognitive impairment in an adult population in rural France

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ABSTRACT

BACKGROUND AND AIM - Air pollution affects cognitive function, but the specific components involved remain poorly understood. In the general population-based cohort CONSTANCES, we aimed to estimate the associations between residential exposures to airborne cadmium (Cd) and lead (Pb) and cognitive function in adults. METHODS - 39,638 participants aged over 45 years, and enrolled between 2012-2019, responded to the Mini-Mental State Examination (MMSE), a 30-question test evaluating cognitive function. Participants' exposure to airborne Cd and Pb was assessed from metal concentrations obtained by moss biomonitoring in 2011 in rural and semi-urban France and interpolated by ordinary kriging. To estimate the separate associations of each metal with MMSE score while considering potential nonlinearity, we categorized metal exposures in quartiles, and used linear regressions adjusted for age, sex, education, socioeconomic status, smoking, alcohol use, and occupational exposure to metal dust. RESULTS: The median MMSE score was 28 (IQR: 2); median exposures were 0.17 $\mu\text{g.g}^{-1}$ dry weight of moss (IQR: 0.09) and 3.2 $\mu\text{g.g}^{-1}$ (IQR: 2.2) for Cd and Pb, respectively. Using the first quartile as reference, Cd exposure was associated with poorer MMSE scores following a U-shape curve, with betas (95% CI) of -0.28 (-0.33, -0.23), -0.20 (-0.25, -0.15), and -0.05 (-0.10, -0.01) for the second, third, and fourth quartiles, respectively. Pb was associated with poorer MMSE scores only for the third quartile (-0.10 (-0.16, -0.05)), with an unclear nonlinear pattern. CONCLUSIONS - These first results suggest a cross-sectional association between cognitive function and exposure to airborne Cd, but not as much with airborne Pb. Further analyses will bring more insight, especially using a more recent exposure assessment, and including other metals and urban areas.

KEYWORDS: Heavy metals; Neurodegenerative outcomes; Environmental epidemiology

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