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Fine particulate matter and the risk of autism spectrum disorder

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Highlights

- A case-control study of childhood autism and $PM_{2.5}$ air pollution was conducted.

- Daily $PM_{2.5}$ was linked to residences of cases and controls prenatally to age two.

- There was increased risk for childhood autism (OR=1.51, 95% CI=1.01–2.26).

- Prenatal and postnatal exposure to $PM_{2.5}$ is associated with increased risk of ASD
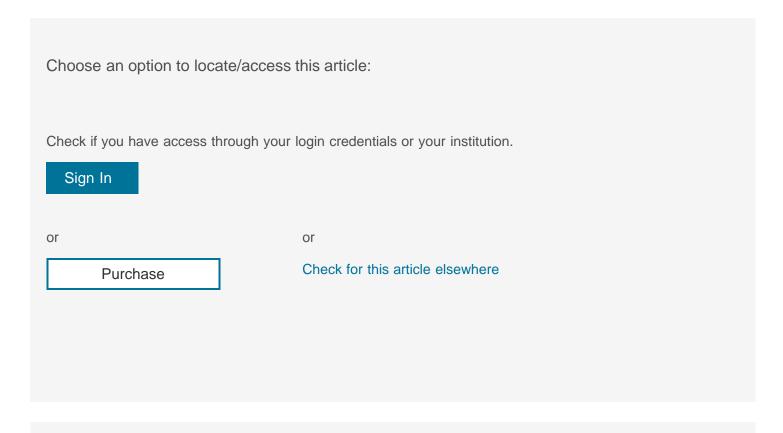
Abstract

The causes of autism spectrum disorder (ASD) are not well known. Recent investigations have suggested that air pollution, including $PM_{2.5}$, may play a role in the onset of this condition. The objective of the present work was to investigate the association between prenatal and early childhood exposure to fine particulate matter ($PM_{2.5}$) and risk for childhood ASD. A population-based case-control study was conducted in children born between January 1, 2005 and December 31, 2009 in six

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counties in Southwestern Pennsylvania. ASD cases were recruited from specialty autism clinics, local pediatric practices, and school-based special needs services. ASD cases were children who scored 15 or above on the Social Communication Questionnaire (SCQ) and had written documentation of an ASD diagnosis. Controls were children without ASD recruited from a random sample of births from the Pennsylvania state birth registry and frequency matched to cases on birth year, gender, and race. A total of 217 cases and 226 controls were interviewed. A land use regression (LUR) model was used to create person- and time-specific $PM_{2.5}$ estimates for individual (pre-pregnancy, trimesters one through three, pregnancy, years one and two of life) and cumulative (starting from pre-pregnancy) key developmental time periods. Logistic regression was used to investigate the association between estimated exposure to $PM_{2.5}$ during key developmental time periods and risk of ASD, adjusting for mother's age, education, race, and smoking. Adjusted odds ratios (AOR) were elevated for specific pregnancy and postnatal intervals (pre-pregnancy, pregnancy, and year one), and postnatal year two was significant, (AOR=1.45, 95% CI=1.01–2.08). We also examined the effect of cumulative pregnancy periods; noting that starting with pre-pregnancy through pregnancy, the adjusted odds ratios are in the 1.46–1.51 range and significant for pre-pregnancy through year 2 (OR=1.51, 95% CI=1.01–2.26). Our data indicate that both prenatal and postnatal exposures to $PM_{2.5}$ are associated with increased risk of ASD. Future research should include multiple pollutant models and the elucidation of the biological mechanism for $PM_{2.5}$ and ASD.

Keywords

Autism spectrum disorder, ; Case control study, ; Fine particulate matter, ; Geographic information systems, ; Land use regression, ; Odds ratio, ;

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