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Toxic combination of air pollution and poverty lowers child IQ

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Children born to mothers experiencing economic hardship, who were also exposed during pregnancy to high levels of PAH (polycyclic aromatic hydrocarbons), scored significantly lower on IQ tests at age 5 compared with children born to mothers with greater economic security and less exposure to the pollutants. The findings by researchers at the Columbia Center for Children's Environmental Health (CCCEH) at the Mailman School of Public Health appear in the journal *Neurotoxicology and Teratology*.

PAH are ubiquitous in the environment from emissions from motor vehicles, oil, and coal-burning for home heating and power generation, tobacco smoke, and other combustion sources.

The researchers followed 276 mother-child pairs, a subset of CCCEH's ongoing urban birth cohort study in New York City, from pregnancy through early childhood. Mothers self-reported maternal material hardship during pregnancy and at multiple time points through early childhood. Material hardship is a measure used to assess an individual's unmet basic needs with regard to food, clothing, and housing. The Columbia researchers, led by Frederica Perera, PhD, DrPH, director of CCCEH, previously reported that that prenatal exposure to airborne PAH during gestation was associated with development delay at age 3, reduced verbal and full scale IQ at age 5, and symptoms of anxiety and depression at age 7.

At child age 7 years, researchers used the Wechsler Intelligence Scale

for Children to assess IQ. PAH-DNA adducts in cord blood provided an individual measure of prenatal exposure to the pollutants. The researchers observed that, among children whose mothers reported greater material hardship, the group with high levels of PAH-DNA cord adducts significantly scored lower on tests of full scale IQ, perceptual reasoning, and working memory compared to those children with lower levels of adducts. Statistically significant interactions were observed between both prenatal and recurrent material hardship and high levels of cord adducts on children's working memory scores. The same significant relationships between adducts and IQ were not observed in the low material hardship group.

The findings add to other evidence that socioeconomic disadvantage can increase the adverse effects of toxic physical "stressors" like air pollutants. The present results suggest the need for a multifaceted approach to reduce PAH exposure and alleviate material hardship in order to protect the developing fetus and young child.

"The findings support policy interventions to reduce air pollution exposure in urban areas as well as programs to screen women early in pregnancy to identify those in need of psychological or material support," says Perera, senior author of the paper.

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