

Air pollution and poverty stack the deck for ADHD

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Scientists at the Columbia Center for Children's Environmental Health (CCCEH) at the Mailman School of Public Health report the first evidence that prenatal exposure to polycyclic aromatic hydrocarbons (PAH)—carcinogenic and neurotoxic combustion byproducts commonly found in urban air—combines with material hardship to significantly increase ADHD symptoms in children. Results are online in the journal *Environmental Research*.

In the latest paper from the ongoing, longitudinal Mothers and Newborns Study in low-income communities of color in New York City, scientists assessed levels of the babies' [prenatal exposure](#) to PAH by measuring a molecular marker of exposure in maternal blood collected at delivery. Mothers reported their experience of material hardship (lack of adequate food, housing, utilities, and clothing) at multiple time points, from pregnancy to when their child was age 9, at which time researchers assessed the child's ADHD behaviors.

Among 351 children in the study sample, those with higher prenatal PAH exposure generally had more ADHD symptoms than those with low PAH exposure, with the greatest difference in symptoms in children experiencing persistent hardship from pregnancy through childhood.

The new paper is the first to look at the combined effects of PAH exposure and material hardship on ADHD, building on prior research looking at PAH and socioeconomic stress separately. Previously, CCCEH researchers reported that children exposed prenatally to higher

levels of PAH and whose mother reported material hardship scored significantly lower on IQ tests at age 7, compared with children born to mothers with greater economic security and less [exposure](#) to the pollutants.

During the prenatal period, the fetus is undergoing rapid development, making it highly susceptible to DNA damage and other effects of pollutants such as PAH. PAH can cross the placenta and fetal blood-brain barrier and trigger inflammation that is toxic to the developing brain. Psychosocial stress also promotes inflammation and can be damaging to neurodevelopment. The researchers believe the combination of psychosocial and physical "toxicants" may amplify each other through common inflammation pathways.

Approximately 11 percent of American [children](#) ages 4-17 have been diagnosed with ADHD. Symptoms of hyperactivity, impulsivity, and inattention often persist and may lead to poor performance in the academic and occupational settings throughout the adult years.

"There is no single trigger for ADHD," says first author Frederica Perera, director of CCCEH and professor of Environmental Health Sciences at the Mailman School. "Air pollution and economic hardship are part of a mix of genetic, environmental, and social factors contributing to childhood behavioral problems, including ADHD. Children would be best served by a multifaceted response that combines economic assistance for women with policy interventions to reduce [air pollution exposure](#) in urban areas, especially in low-income communities of color."

Provided by Columbia University's Mailman School of Public Health

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