Not only are fossil-fuel emissions bad for the planet and for your lungs, but they may also harm your baby's developing brain. A new study published in the journal *Pediatrics* links mothers' exposure to high levels of environmental pollutants during pregnancy to a four-point drop in children's IQ scores by age 5.

"A difference in four points could be educationally meaningful in terms of school success," says Frederica Perera, director of the Columbia Center for Children's Environmental Health and lead author of the study. The effect is comparable, she says, to the damage seen in children exposed to low levels of the toxic metal lead. *(See how to prevent illness at any age.)*

The study focused on exposure to substances called polycyclic aromatic hydrocarbons (PAHs), a by-product of the incomplete burning of gas, diesel, oil and coal. PAHs are released as a vapor and also cling to fine, breathable particles emitted from car and truck engines and coal-fired plants. This kind of pollution is common in urban areas and tends to be particularly bad in poor neighborhoods with heavy car and truck traffic and idling. But, Perera notes, these pollutants are widespread enough to affect populations other than those living in poor, urban areas.

The 249 children in the study are participants in a broader long-term research project, begun in 1998, that follows them from shortly before birth to age 11. To determine prenatal exposure to PAHs and other pollutants, mothers of these children wore special backpacks containing air-sampling equipment for 48 hours during their third trimester of pregnancy, capturing both indoor and outdoor air quality. Based on the results, they were divided into high-PAH-exposure and low-exposure groups. The mothers were healthy, nonsmoking black and Dominican-American women, ages 18 to 35, living in northern Manhattan and the South Bronx — not far from Columbia's Mailman School of Public Health, where Perera is a professor. *(Read "The Risks [and Rewards] of Pills and Pregnancy.")*

Earlier reports from Perera's group had found that higher prenatal exposure to PAHs is associated with lower weight and smaller head size at birth and developmental delays at age 3. Studies of children in
China who live near coal-burning plants have found that PAH exposure is associated with delayed motor development. The current *Pediatrics* study, however, is the first to link exposure to reduced performance on IQ tests. Kids in the low-exposure group scored a mean IQ of 101.6, while the mean score in the high-exposure group was 96.5.

The relationship between PAH exposure and IQ holds up when other possible risk factors are taken into account, including exposure to lead, pesticides and secondhand smoke and the mother's level of education.

"It's surprising that the effects [of prenatal exposure] are so persistent," says Kimberly Gray, an epidemiologist at the National Institute of Environmental Health Studies, which helped fund Perera's study. By following these children through age 11, she says, the Columbia team will be able to look for links to learning disorders and attention-deficit disorder.

Precisely how PAHs might harm the developing brain is unclear, though more than one mechanism may be at work. "We know from many studies that the developing fetal brain is particularly vulnerable to neurotoxic chemicals," says Perera. "One of the reasons is that it is rapidly developing. The defense mechanisms present in the adult are not present in the fetus: these include detoxification and repair enzymes." Exposure to pollution could cause direct genetic damage or epigenetic changes, which are changes in how genes are expressed.

The relationship between environmental exposure and changes in gene expression is a hot area of research, says Gray. And as methods of measuring both indoor and outdoor pollutants improve, the science is moving fast.

The good news, Perera says, is that we know how to reduce these dangerous emissions. "Efforts to reduce diesel truck idling and require cleaner fuels have been effective in reducing pollution," she says. Her own group has seen a modest decline in PAH levels as a result of such policies. "This study shows more needs to be done. We want healthy children, children who can reach their potential."

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