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Air pollution exposure during pregnancy is linked with greater risk of depression among Latinas

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Low-income Hispanic/Latina women who are exposed to higher levels of air pollution during mid-pregnancy are at greater risk of depression

one year postpartum, according to a USC MADRES Center for Environmental Health Disparities study.

The research, published recently in the journal *Environmental Health*, followed 180 women from early pregnancy to one year after giving birth, tracking their exposure to nitrogen dioxide, ground-level ozone and particulate matter—such as emissions from vehicles, factories and power plants—using ambient monitoring.

"Depression is often an underdiagnosed and undertreated health outcome among people of color, and air pollution is a potentially modifiable exposure in contrast to individual risk factors," said lead author Tracy Bastain, Ph.D., MPH, an environmental epidemiologist and associate professor of clinical population and public health sciences at Keck School of Medicine of USC. "This study underscores the need to better understand the impact of environmental risk factors during critical periods of exposure."

Depression affects about 280 million people a year and, at its worst, can lead to suicide, according to the World Health Organization. Unlike the usual fluctuations in mood in daily life, it is a serious health condition with symptoms such as poor concentration, feelings of excessive guilt or low self-worth, hopelessness, disrupted sleep, and changes in appetite or weight.

Depression is twice as prevalent among women, and women from historically marginalized communities including Hispanic populations face significant barriers to accessing mental health services, including cultural stigma around mental illness, a lack of health insurance or inadequate coverage for mental health care services, and limited availability of bilingual mental health care professionals.

"Evidence is increasing that air pollution may affect depression risk by

activating neuroinflammatory pathways from inhaled pollutants," Bastain said. "Our results suggest that the prenatal period may be a period of susceptibility for maternal depression as normal adaptive changes during pregnancy—such as increases in respiration rate—that are designed to support the growing fetus may actually increase maternal vulnerability to the harmful effects of air pollution."

The study drew from the MADRES ongoing prospective pregnancy cohort of more than 800 mostly low-income Latina women recruited from community health prenatal care providers in Los Angeles between 2015 and 2020. Other studies from this cohort have examined childhood obesity and its disproportionate effect on low-income, urban minority communities in Los Angeles. MADRES is short for the Maternal And Developmental Risks from Environmental and Social stressors.

Andrea Calderon, a research coordinator for the study, said that many participants shared their struggle to manage a growing family and work, or the loss of income due to staying at home with their children because of the high costs of childcare. Many were visibly distressed and didn't realize they could be depressed and in need of professional support, she said.

"The pandemic added another layer of stress because many kids were at home," Calderon added.

Minority communities, including Hispanic and Black populations, are more likely to be exposed to harmful pollution because where they live and work is closer in proximity to pollution sources.

Using air quality monitoring data from the U.S. EPA Air Quality System, the researchers assigned daily estimates of nitrogen oxide (NO_2), ozone (O_3) particulate matter known as PM2.5, and PM10 to the residential locations for each study participant during their pregnancy.

Nitrogen dioxide is part of a family of gases that are formed when fuel is burned at high temperatures in cars, coal power plants and factories. Ground-level ozone is created when nitrogen dioxide reacts with volatile organic compounds in heat and sunlight. Particulate matter comes from a range of sources including gasoline combustion, forest fires and smoke from industrial facilities.

"It has been a huge privilege to be able to see mothers through their pregnancy and get to know their children in their first year of life," said Calderon, a master's of public health candidate and mother of a four-month-old boy who began working with MADRES in 2017 as an intern while completing her undergraduate degree.

"A lot of our participants are foreign-born, so when I interviewed them, I saw my mom, and when I interviewed women who were my age, also first-generation about to have their first child, I saw myself."

More information: Theresa M. Bastain et al, Prenatal ambient air pollution and maternal depression at 12 months postpartum in the MADRES pregnancy cohort, *Environmental Health* (2021). DOI: 10.1186/s12940-021-00807-x

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