

Psychosocial stressors linked to higher inflammation in Black pregnant women

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Living in neighborhoods with more white residents and greater lifetime experiences of racial discrimination are linked to increased systemic inflammation during pregnancy among Black women, according to new

research led by a team from Penn State.

The study, [published](#) in *Brain, Behavior, & Immunity—Health*, found that these social-environmental factors were associated with higher levels of a protein that has been connected to chronic stress and an elevated risk of preterm birth. The findings shed light on the distinctive stressors that Black women face and how they may influence [pregnancy](#) outcomes, the researchers said.

"Understanding these unique stressors might give us a better shot at trying to intervene," said Christopher Engeland, professor of biobehavioral health at Penn State and senior author of the paper. "We know that the preterm birth rate is almost two times higher in Black women compared to white women, but it's not fully explained by established [risk factors](#) such as socioeconomic status. We wanted to look at stressors that are both unique to the experience of Black women and potentially related to preterm birth to see if those associations might yield information about this ongoing health problem and could account for some of the disparities in pregnancy outcomes."

Babies born before full-term, or 37 weeks of pregnancy, are at greater risk for death, health complications and disabilities, according to the Centers for Disease Control and Prevention. However, preterm birth rates haven't budged over the last 10 years, hovering between 9.6% and 10.5%. In 2022, 10.4% of babies were born early. Among Black women, the preterm birth rate was 14.6%.

Doctors and researchers don't fully understand all the factors that contribute to preterm birth or the underlying mechanisms, the researchers said. However, inflammation may be an important piece of the puzzle. Generally, in late pregnancy, both [pro-inflammatory cytokines](#) and inflammation increase. This appears to be related to increased prostaglandin synthesis, which is important for inducing

contractions, and the onset of labor, Engeland explained. Cytokines are small proteins that help manage inflammation in the body and can be a marker for inflammation. When [systemic inflammation](#) and pro-inflammatory cytokines are elevated more than normal, this is associated with a higher risk for preterm birth.

When disparities exist within a specific subgroup of individuals, the researchers said it can be informative to look within that subgroup to understand their unique experience and how that may drive the underlying differences in health outcomes. Among Black women, systemic inflammation tends to be higher overall, whether they are pregnant or not, the researchers said. Studies have begun to look at psychosocial and social-environmental factors linked to chronic stress to see if those factors might lead to higher inflammation in the body, and subsequently, risk for preterm birth.

For the current study, the research team was interested in investigating two factors—experiences of racial discrimination and perceived neighborhood [racial composition](#)—and determining if these factors predicted cytokine levels during pregnancy. The prospective study involved a cohort of 545 Black women who were between the ages of 18 and 45 years old and pregnant with only one fetus. They were recruited during their first prenatal visit to clinics in Columbus, Ohio, and Detroit, Michigan, metropolitan areas.

Data were collected at three time points during their pregnancies: 8 to 18 weeks, 19 to 29 weeks and 30 to 36 weeks' gestation. Participants were asked to complete surveys about their lifetime experiences of discrimination, perceived racial segregation, depressive symptoms and demographic characteristics. The researchers also took blood samples to monitor pro-inflammatory and anti-inflammatory cytokines.

The study found that reports of higher lifetime racial discrimination,

higher levels of depressive symptoms early in pregnancy and living in neighborhoods with more white individuals were each associated with higher levels of the pro-inflammatory cytokine macrophage migration inhibitory factor (MIF). They didn't observe a relationship with any other cytokine.

"This particular cytokine has a distinctive relationship with stress. Aside from inflammation, it may be a biomarker of chronic stress and it may have something to do with the mechanism underlying preterm birth," Engeland said. Higher MIF levels are associated with glucocorticoid resistance, which means that our bodies are more prone to mount a more robust inflammatory response, he explained. Previous studies have linked MIF to [chronic stress](#) and preterm birth, which suggests a potential role in adverse pregnancy outcomes.

The researchers said the study is one of the first to examine if and how neighborhood racial composition contributes to systemic inflammation during pregnancy in Black women. The relationship between MIF and neighborhood racial composition was present at all three time points and strongest in late pregnancy. MIF levels also appeared to increase in a stepwise fashion as neighborhood composition changed from mostly Black to some Black to mixed to mostly white neighborhoods.

"It suggests that there's something about living in neighborhoods with a higher proportion of white individuals that's eliciting stress for these African American women who are pregnant. This cytokine seems to be particularly sensitive to it," said Molly Wright, a graduate student at Penn State and lead author of the study. "The fact that we saw this association across all time points suggests that this wasn't a spurious finding."

The findings point to the need to consider neighborhood context, racial discrimination and other distinctive chronic stressors that Black

individuals frequently experience when considering factors that might influence preterm birth risk, according to the researchers. They plan to follow up this study by comparing gestational age at birth and MIF levels within the same cohort of women to determine any relationship to [preterm birth](#).

Other authors on the paper are Carmen Giurgescu, professor and associate dean for research and principal investigator of the broader study, University of Central Florida College of Nursing; Dawn P. Misra, chair of the department of epidemiology and biostatistics, Michigan State University College of Human Medicine; and Jaime C. Slaughter-Acey, currently an associate professor of epidemiology at the University of North Carolina Gillings School of Global Public Health. At the time the research was conducted, Slaughter-Acey was affiliated with the University of Minnesota School of Public Health.

More information: Molly A. Wright et al, Neighborhood racial composition and experiences of racial discrimination: Associations with cytokines during pregnancy among African American women, *Brain, Behavior, & Immunity - Health* (2023). [DOI: 10.1016/j.bbih.2023.100715](#)

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