Adolescents from disadvantaged neighborhoods show gene regulation differences

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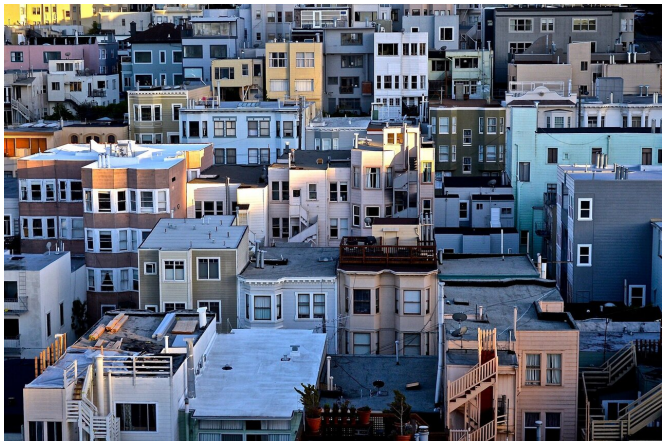

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The neighborhood a child grows up in may influence their health for years to come in previously invisible ways.

A long-term study of 2,000 children born in England and Wales and followed to age 18 found that young adults raised in communities marked by more economic deprivation, physical dilapidation, social disconnection and danger display differences in the epigenome—the proteins and chemical compounds that regulate the activity of their genes.

The researchers say the study lends support to the hypothesis that gene regulation may be one biological pathway through which neighborhood disadvantage "gets under the skin" to engender long-term health disparities.

The differences were identified in genes previously linked to chronic inflammation, exposure to tobacco smoke, outdoor air pollution, and lung cancer and may put these people at risk for poorer health later in life. Epigenetic differences remained even after taking into account the socioeconomic conditions of children's families, and were seen in young adults who did not smoke or display evidence of high inflammation.

"These findings may help explain how long-term health disparities among communities emerge," said Aaron Reuben, a Ph.D. candidate at Duke who was the study's lead author. "They also tell us that children who look the same physically and are otherwise healthy may enter adulthood wired at the cellular level for different outcomes in the future."

It's not possible to know yet whether these differences are lasting or could be modified, Reuben said. "That is something we will need to continue to evaluate."

The study, appearing this month in the journal *JAMA Network Open*, drew from diverse data sources to characterize the physical, social, economic, and health and safety characteristics of children's neighborhoods across their childhood and adolescence. Data were gathered from local government and criminal justice databases, systematic observation of neighborhood conditions (via Google Street View) and detailed surveys of neighborhood residents. Researchers combined this high-resolution multi-decade neighborhood data with epigenetic information derived from blood drawn from participants at at age 18.

"The research is an important reminder that geography and genes work together to shape our health," said Avshalom Caspi, the Edward M. Arnett Professor of Psychology & Neuroscience at Duke and a senior author on the study.

In a journal commentary that accompanied the

study, psychiatric epidemiologist at Harvard Medical School Erin Dunn noted that neighborhood-induced gene regulation differences "are likely implicated in many adverse health outcomes, spanning from mental health disorders to cancer, obesity, and metabolic diseases." She writes, "I hope that studies like this by Reuben and colleagues will prompt researchers to explore these complex concepts and to bridge social determinants of health with epigenetic processes."

More information: Aaron Reuben et al, Association of Neighborhood Disadvantage in Childhood With DNA Methylation in Young Adulthood, *JAMA Network Open* (2020). DOI: 10.1001/jamanetworkopen.2020.6095

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