Impact of neighborhood disadvantage on a child's brain

Neighborhood disadvantage can lead to suboptimal health outcomes in children. Is this true for brain structure and neurocognition?

Where a child lives can impact, among other things, his or her nutrition, exposure to pollutants, and quality of education. Neighborhood disadvantage is a major social determinant of health. For children who live in a suboptimal neighborhood, is there a link to neurocognition and brain structure, even after controlling for family socioeconomic status?[1]

Investigators ran a cross-section study that looked at baseline data from the Adolescent Brain and Cognitive Development study, which is a cohort study that was run at 21 sites in the United States. Participants in the study were children who were aged 9.00 to 10.99 years at the time of enrollment. The child and caregiver had a baseline visit between October 2016 and October 2018. The National Institutes of Health Toolbox Cognition Battery was used for measuring neurocognition. The brain structure was assessed with T1-weighted magnetic resonance imaging.

There were 8598 children included who had an average age of 118.8 months. Investigators found that every 1-unit increase in the neighborhood disadvantage factor, which was determined by US Census data, was tied to lower performance on 6 of 7 subtests like List Sorting Working Memory (unstandardized B = −0.7; 95% CI, −1.0 to −0.3; false discovery rate (FDR)–corrected $P < .001$) and Flanker Inhibitory Control and Attention (unstandardized B = −0.5; 95% CI, −0.7 to −0.2; FDR–corrected $P = .001$), in addition to all composite measures of neurocognition, such as the Total Cognition Composite (unstandardized B = −0.7; 95% CI, −0.9 to −0.5; FDR-corrected $P < .001$). Furthermore, such an increase was linked to lower subcortical volume (unstandardized B = −113.9 mm3; 95% CI, −198.5 to −29.4 mm3; FDR-corrected $P = .03$) in addition to lower whole-brain cortical surface area (unstandardized B = −692.6 mm2; 95% CI, −1154.9 to −230.4 mm2; FDR-corrected $P = .007$). These links remained after adjusting for perceptions of neighborhood safety and were constant across metropolitan areas.

Investigators concluded that neighborhood disadvantage was linked to smaller cortical surface area and subcortical volume as well as lower neurocognitive performance in young people. These findings illustrate that addressing neighborhood disadvantage in these areas could be a promising way to improve the development and cognitive health in children and teenagers.

Reference

1. Hackman D, Cserbik D, Chen J, et al. Association of local variation in neighborhood disadvantage in metropolitan areas with youth neurocognition and brain structure. *JAMA Pediatr*. 2021;175(8):e210426. doi:10.1001/jamapediatrics.2021.0426