

Cumulative neighborhood disadvantage and racial disparities in epigenetic aging

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There are persistent racial disparities in a wide range of health outcomes in the United States. Biological aging has been hypothesized to underlie these disparities, with some evidence that racial minorities have faster biological aging than their White counterparts. Studies have attributed racial disparities in biological aging to differences in individual- and familial-level socioeconomic status, health behaviors, and current neighborhood environment. Yet, the extent to which neighborhood disadvantage accumulates to influence racial disparities in biological aging has not been examined. Here, using long-term residential histories and spatiotemporally linked neighborhood measures, we examine the contributions of cumulative neighborhood disadvantage over the life course to racial disparities in epigenetic age acceleration derived from DNA methylation profiles. We found that urban Black individuals generally had significantly greater epigenetic age acceleration than Whites across urban, suburban, and rural areas. On average, Urban Black individuals also had significantly greater cumulative exposure to neighborhood disadvantage over the life course than Whites across urban, suburban, and rural areas. The associations between cumulative neighborhood disadvantage and epigenetic age acceleration, particularly measured by GrimAge EAA and DunedinPACE, were stronger among urban Blacks than Whites, although the differences did not reach statistical significance. Taken together, cumulative neighborhood disadvantage plays a significant role in racial disparities in biological aging, and differential exposure, rather than differential vulnerability, appears to be the primary driver. These findings have important implications for interventions aimed at reducing racial health disparities.

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