Sociomarkers and Connectomes: Neurodevelopmental Imprints in Adolescent Brains'

Neural consequences of social disparities are not yet rigorously investigated. How socioeconomic conditions influence children's connectome development remains unknown. This paper endeavors to gauge how precisely the connectome structure of the brain can predict an individual's social environment, thereby inversely assessing how social influences are engraved in the neural development of the adolescent brain. The analysis has been performed over an integrated dataset consisting of brain imaging data and household level socioeconomic conditions from the Adolescent Brain and Cognition Development (ABCD) data (9,099 children residing in the United States) - and local poverty prevalence and neighborhood education level from the US census data. Using this uniquely integrated database, we found that social conditions both at the household and neighborhood levels are significantly associated with specific neural connections. Solely with brain connectome data, we train a linear support vector machine (SVM) to predict socioeconomic conditions of those adolescents. Hispanic participants achieved higher accuracy rates than White and African American children, except for the household Income level. Hispanic participants exhibited the highest accuracy rate of 0.71 and the best AUPRC of 0.77 for predicting neighborhood level educational attainment. Accuracy 0.85 for the household income and neighborhood education dual combination cases and 0.81 for the household education and neighborhood education dual condition. Furthermore, we identified 8 significant connections that critically contribute to predicting social environments in the parietal lobe and frontal lobe. Insights into social factors that contribute to early brain connectome development is critical to mitigate the disadvantages of children growing up in unfavorable neighborhoods.