
A big bank balance leads to big-brained babies

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This is according to the world's largest study of child brain structure and socioeconomic status. The results also reveal a link between brain surface area and the education levels of a child's parents.

Previous research has shown that factors such as a parent's job, education and income correlate with a child's intelligence, but determining the cause hasn't been easy.

"Children from lower income families have shown on average more difficulties with language functioning, school performance and other metrics of cognitive development," says [Elizabeth Sowell](#) at the Children's Hospital Los Angeles in California. "This is not to say that all economically disadvantaged children perform worse than all children with greater financial resources, but it is likely that resources afforded to the more affluent impact the way the brain develops."

Insulation boost

To better understand this relationship, Sowell and her colleagues used MRI scans to examine the brain structure of more than 1000 children between the ages of 3 and 20 living in the US.

Both parental education and income predicted the size of a child's brain surface area, and the effect was most noticeable in regions related to language, reading and spatial skills. Sowell says this may reflect greater insulation of the connections between different brain areas. Nerves

transmit electrical impulses between brain cells and are insulated with a fatty layer called myelin – the better insulated a nerve, the faster it is able to transmit these impulses.

The children also completed four tests of cognitive ability and, as expected, on average those from wealthier backgrounds did better. When the data from the scans and tests were fed into a statistical model, it suggested that brain surface area partially accounts for the relationship between family income and a child's test performance.

Unlike previous, smaller studies, this research used DNA taken from saliva samples to control for genetic influences. This was important because ethnicity is related to socioeconomic status in the US, and a person's genetics can also lead to variation in the shape and size of different brain regions that was not relevant to this study.

But [Franck Ramus](#) of the École Normale Supérieure in Paris says the researchers did not go far enough to account for the effect of genetic variation. "It leaves open the possibility that at least part of the associations observed might not be an environmental effect."

Stress or stimulation

Although the findings provide the strongest evidence yet of a relationship between brain surface area, cognitive ability and socioeconomic status, the mechanism that links them is unknown, and the results do not suggest that a child's development is cast in stone by their family circumstances.

"Experimental evidence in humans is lacking," says Ramus, adding that this would require randomly allocating young children to strictly controlled environments. "That's not possible for obvious reasons," he says. However, animal experiments have shown that stressful or stimulating early environments can affect brain growth and development. "There are good reasons to believe that at least some of the correlations reported in this study reflect a genuine causal relationship."

Two pathways might explain the relationship between socioeconomic status and brain structure, says Kimberly Noble of Columbia University in New York, who worked on the study.

More money may enable parents to better support their child's cognitive development, allowing them to buy more nutritious food, for example. It may also mean parents are less stressed and can devote more time to their children. "We believe these differences are likely to be most influential early in childhood, when the brain is most malleable to experience," says Noble.

While the relationship between parental education and child brain surface area was linear, there were much bigger differences between the brains of children from lower income families than wealthier ones. If the patterns observed do reflect a causal relationship, Noble says it suggests that interventions targeting the most disadvantaged families are likely to have the greatest impact.

"It's important to understand the relationship between socioeconomic status and intelligence because it plays a role in the persistence of poverty across generations," says [Martha Farah](#) at the University of Pennsylvania, Philadelphia, who describes the work as very thoughtfully and carefully done. "Escaping poverty is a challenge, but that challenge is all the more daunting if you're facing it with less than your full cognitive potential."

