

## Talking Back to Noble and Colleagues (2015)

### You might have heard...

Media reports claimed that research shows that “poor children have smaller brains” (Layton, 2015b) and “poverty shrinks brains from birth” (Reardon, 2015). Many of those reports cite a 2015 study by Kimberly G. Noble and a team of researchers.

### What did the researchers actually do?

Noble et al. (2015) attempted to draw a relationship between SES and brain structure among 1,099 people, ages 3-20. Using MRI scans, they measured parts of the surface area of the brain and the thickness of the layer of cells immediately beneath the surface (cortical thickness). They then related these measures to SES, parental education, and parental income.

- From prior studies, researchers established that IQ measures correlated with cortical thickness (higher surface area and thinner cortical tissue correlates to higher measures of intelligence).
- Noble et al. used correlational statistics to test relative differences and similarities in brain anatomy based on SES. Additionally they tested for possible effects of the participants' age, sex, Genetic Ancestry Factor, and the MRI site.
- Finally, to confirm previous findings which showed a relationship between SES and cognitive assessments, they compared the brain measurements and SES with participants' performance on assessments of attention, working memory, vocabulary, and oral reading of a word list.

### What did they really find?

The researchers' conclusions were mixed. They found a statistically significant relationship between surface area and income, but did not find the same relationship for income and cortical thickness.

- Parental education, one aspect of SES, was related to cortical surface area in regions of the brain associated with language reading, various executive functions, and spatial ability.
- Parent income was also related to cortical surface area, with the largest differences amongst those in the lowest income families.
- Parental income was “borderline significantly associated” with cortical thickness, but parental education was not associated with cortical thickness at all.
- Noble et al. confirmed previous work, finding a statistically significant relationship between parental income and all four cognitive assessments (attention, working memory, vocabulary, and oral reading of a word list)
- The findings discussed in this study did not vary based on race (Genetic Ancestry Factor).

In this type of study, researchers build conclusions by layering mathematical relationships together. They linked parental income to features of the brain, then linked those same physical features to performance on certain tests. Then they claimed that a relationship between income, the brain, and ability may partially explain differences in cognition.

## Some limitations of the study

- The authors of this study state that their results should not imply “an immutable trajectory of cognitive or brain development.” While the findings do suggest that poverty can be detrimental for brain development, the researchers clearly explain that this study did not show that children born into economically disadvantaged families grow up with lower cognitive abilities.
- A correlational study of this type cannot prove causality. It cannot be used to say that poverty causes differences in brain structure or cognitive ability. Other studies, primarily done in animals, have shown that material consequences of extreme poverty such as malnutrition and exposure to toxins have an effect on brain development, but that is not the focus of this study.
- Since the authors used a correlational design, only relative differences and similarities are reported. There are no tangible measurements (e.g. actual thickness of grey matter in square millimeters, actual items correct on the cognitive assessments) to ground the differences found. This leaves open questions about the practical significance of the results.
- Participants family incomes ranged from \$4,500- \$325,000 per year, with an average of \$97,640. Remarkable differences in lifestyle would be expected between people living in extreme poverty and wealth. Some participants were much more likely to experience food and/or housing insecurity, exposure to environmental toxins, and limited access to medical care. Based on this study, it is impossible to say which if any of these factors impacted the differences they found, though the research does suggest that those living in the most extreme poverty had the strongest effects on their cortical surface area.
- The researchers use Genetic Ancestry Factor, a measure based on genomic DNA, as a proxy for race. While genetics is related to ancestry, race is a highly complicated and contextually contingent social construction. Therefore, the findings cannot really be used to draw conclusions about interactions between race, poverty, and cognition.

## What are the issues with media accounts of this study?

- Journalists often used sensational, inaccurate, “click-bait” type titles that oversimplified the research and positioned poor children in deficit ways. For example, many titles made claims like, “New brain science shows that poor kids have smaller brains than affluent kids,” (Layton, 2015b), which present an oversimplified and misconstrued finding as fact.
- Several of the media pieces give cursory attention to the limitations of the study. *The Washington Post* and *Forbes* spend all but the last sentence talking about the evidence that poor kids aren't as smart, then quote one of the researchers, who contradicts the rest of the article: “It's important for the message not to be that if you're poor your brain is smaller and will be smaller forever” (Rodgers, 2015).
- Journalists included claims and evidence that could not be traced back to the original study. Some solicited opinions from outside “experts.” Layton in *The Washington Post*, quotes Charles Murray, author of *The Bell Curve*, a book controversial because of its statements about genetics and racial superiority. These added sources often added race into the narrative even though the study's findings actually did not find a relationship between Genetic Ancestry Factor and brain structure.

## References

- Noble, K. G., Houston, S. M., Brito, N. H., Bartsch, H., Kan, E., Kuperman, J. M., . . . Sowell, E. R. (2015). Family income, parental education and brain structure in children and adolescents. *Nature Neuroscience*, 18(5), 773-780. **Available online at** <http://tinyurl.com/Noblestudy2015>

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