



Editorial

Is Social Inequality in Cognitive Outcomes Increased by Preterm Birth-Related Complications?

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The study by Benavente-Fernández et al¹ investigated the association of maternal education as a marker of socioeconomic status (SES) and complications related to very preterm birth, such as chronic lung disease (CLD), intraventricular hemorrhage (IVH), and reduced white matter volume (WMV), with cognitive development in preschool-aged children. The study found that within the very preterm group, maternal education at time of birth was similar in effect size to indicators of brain injury, such as WMV or IVH. In plain language, having a mother with a primary- or secondary-school education, compared with a mother who has a postgraduate education, has the same adverse association with the intelligence of offspring as if the child had experienced severe IVH or CLD. In contrast, maternal education was not found to be associated with motor development. Rather, being small for gestational age and having severe IVH, CLD, or reduced WMV were the best predictors.

Childhood IQ measurements are highly predictive of adult IQ in very preterm children.² They are also important predictors of later educational outcome, social status, and wealth in both very preterm and term children.³ The findings by Benavente-Fernández et al¹ are consistent with results from a 2015 systematic review,⁴ which showed that a low level of parental education is among the strongest predictors of poor overall cognitive outcomes in very preterm children. Similarly, the adverse association of moderate to severe brain injury with intelligence from childhood to adulthood has been consistently reported in longitudinal studies.⁵ In contrast, SES has been previously found to be a poor predictor of motor development.⁴

This raises a number of questions regarding the underlying mechanisms or processes of these associations and how they may inform prevention and intervention science. First, is high SES a universal protective factor or, alternatively, a resiliency factor? A universal protective factor would lead to better outcomes independent of whether a child has experienced neonatal risk. Thus, if high SES is a protective factor, then it would be associated with higher intelligence in high-risk (eg, very preterm) and low-risk (eg, term) children. Conversely, if high SES is a resiliency factor, then those exposed to risk would benefit disproportionately more from growing up in a high-SES family. Statistically, this may be shown as an interaction effect between maternal education and brain injury on intelligence score. Previous research that compared those born at high risk, ie, very preterm, with those born at term⁶ found that high SES was a protective factor for both very preterm and term children and adults. The study by Benavente-Fernández et al¹ indicates that high SES may have been protective, whether children had brain injury or not. However, those who experienced brain injury had the greatest association with low SES, ie, they had the lowest IQ scores. This indicates a double jeopardy for those who already have socioeconomic disadvantage. These findings are consistent with a view that high-risk neonates are more sensitive to social risk factors. Thus, inequality in cognitive development in those born into low-SES households may be further compounded by experiencing moderate to severe brain injury.

A second question is how high SES provides protection to both healthy children and children born at high risk. Socioeconomic status is a multifactorial construct that includes markers such as parental education, income, occupation, and social status. If not all markers can be measured in a composite score, then parental education appears to be the single best prognostic factor of cognitive outcome.⁴ Socioeconomic status may have different mechanisms of transgenerational transmission to offspring. Low SES or parental education is not only associated with more disadvantages in

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housing, income, occupation, and neighborhood, but it is also associated with poorer access to high-quality education. Furthermore, poorer maternal education is associated with poorer health behavior before and during pregnancy and beyond. Another mechanism of transmission is genetics, with IQ being moderately heritable.¹ Last but not least, parental education is associated with parenting.⁷ Thus, a multitude of factors, from better health behavior to housing, living in better neighborhoods, parenting, and access to higher-quality education, are more frequent in high-SES households. But which of these factors is most relevant for protection?

Let us consider 2 factors that are modifiable: parenting and education. Preterm birth and related complications are associated with long initial hospitalization and increased stress for parents. Despite the deck stacked against them, parents of very preterm children are as sensitive in their parenting as parents of term children.⁸ When parenting has been studied in relation to outcomes such as academic achievement,⁹ it has been found that highly sensitive parenting allows high-risk, very preterm children to gain academic achievements similar to low-risk, term children. However, if the parenting is less than optimal, then very preterm children do much worse compared with term children, who are much less vulnerable to poor parenting.¹⁰ Thus, very preterm children appear to require optimal rather than just average parenting to reach cognitive outcomes comparable with term children. When we consider education, children born extremely or very preterm are much more likely to receive special, small group, or 1-to-1 education and psychological interventions.¹¹ And still, these children are less likely to achieve the SES of their parents and show poorer outcomes on markers of wealth, such as educational level, income, and employment.^{3,12} Furthermore, although there is consistent evidence that improved parenting and improved early education (often delivered together) improve long-term cognitive and academic outcomes in term children with socioeconomic disadvantage,¹³ the same has not been found for those born with very low birth weight or of very low gestational age.¹⁴

Where do we go from here? First, cognitive outcomes of very preterm children have not improved over several decades, despite large improvements in survival.¹⁵ Thus, it is necessary to consider factors beyond initial neonatal care that improve cognitive outcomes, such as social, family, and parenting factors. Second, based on findings from perinatal surveys¹⁶ in several countries, it has been clear since the 1970s that family and social factors play a major role in developmental outcomes of children born at high neonatal risk. It was argued that family, social, and caretaking factors should be studied as intensively as reproductive risk factors.¹⁶ It is thus a very poor state of affairs that, more than 40 years later, most follow-up studies of neonates requiring intensive care did not even measure or consider the effects of social or family factors. For example, of 70 studies that reported on cognitive outcomes after very preterm birth, only 15 measured or reported on maternal education by 2018.¹⁵ Third, it will not be enough to report on some broad social or family factors in future cohort studies. If we want to understand how social, family, and parenting factors influence cognitive development, we need to measure them (eg, parenting) in as much detail as perinatal complications (eg, brain scanning) today. This requires better working together across disciplines from neonatologists to psychologists in the design of follow-up studies and the funding of assessment of family, parenting, and educational factors. To understand and develop appropriate interventions for the cognitive development of our most at-risk children, we need to understand how reproductive and caretaking risk factors work together. Otherwise, we continue to allow social inequality to be piled on those born at high neonatal risk.

ARTICLE INFORMATION

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