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Classifying High-Risk Children Born Preterm

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Preterm birth is a major public health issue. The number of infants being born early is increasing,[1] and while medical advances have led to high survival rates, the rate of neurodevelopmental disability remains high and may be increasing in the extremely preterm infant.[2] The ongoing burden to society is huge, and due to the absolute number of children born preterm, it is unsustainable to provide high quality surveillance and early intervention services for all preterm infants.

One option is to offer specialist monitoring and intervention services for the highest-risk infants, with the remainder receiving broad screening. However, identifying the highest risk infants is challenging as enormous variability is observed in even extremely preterm survivors. While we know that specific neonatal factors are related to poorer outcome such as brain injury,[3] severe respiratory illness,[4] and infections,[5] health status following birth is only a moderate predictor of later neurodevelopmental outcome. Clearly socio-demographic and genetics factors are important, contributing to the health of the fetus, preterm birth and child development. The article by Hanly and colleagues[6] in this issue of *Pediatric and Perinatal Epidemiology* provides further evidence of the role of socio-demographic factors in child development.

Using population based linkage data, Hanly and colleagues examined the relationship between gestational age at birth and child development in Australian Aboriginal and non-Aboriginal children. This is an area of interest in the Australian context as Aboriginal children are more likely to be born preterm, have higher rates of developmental delay, and are more likely to experience socio-economic disadvantage.[7] The authors linked perinatal, birth and hospital datasets with the Australian Early Development Census (AEDC) data from 2009 and 2012. The AEDC is a nationwide data collection of child development conducted every 3 years for children in their first year of school. The assessment is performed by the child's teacher and assesses physical health and wellbeing, social competence, emotional maturity, language and cognitive skills, and communication and general knowledge. In this study, analyses were restricted to children (i) born in the state of New South Wales; (ii) who participated in the AEDC (>97%); (iii) enrolled in a public school; and (iv) who were a singleton without special needs (n=97 989). Seven percent of this cohort (n=7079) were Aboriginal.

As expected, the rate of preterm birth was greater in Aboriginal children when compared to the non-Aboriginal group (8.6% versus 4.9%), and Aboriginal children were more likely to have indicators of high social risk including low maternal education, low skilled parental occupation, and residing in remote, regional and disadvantaged areas. More than one in three Aboriginal children were classified as developmentally vulnerable (scoring in the lowest decile on ≥1 AEDC domain) in contrast to one in five non-Aboriginal children. In line

with previous research, the rate of developmental vulnerability increased with decreasing gestational age, but the association was similar for Aboriginal and non-Aboriginal groups. The most important finding was that the increased risk of developmental vulnerability in the Aboriginal group diminished after adjustment for family, demographic, and perinatal factors, and this was found across all gestational age groups. While the analyses were restricted to children who attended public schools and those without special needs, sensitivity analyses revealed the results were robust. In summary, regardless of gestational age at birth, the marked increase in developmental vulnerability in Aboriginal children in this study was largely accounted for by social and demographic factors.

Most of what we know about outcome following preterm birth and risk/resilience factors has been from prospective cohort studies. Cohort studies have the capacity to collect detailed perinatal, neonatal, socio-demographic and outcome data, but following a large cohort throughout childhood is expensive, requires 10 to 15 years of effort, and is compromised by attrition and a lack of statistical power to explore low prevalence outcomes or rare risk factors. For example, the Victorian Infant Collaborative Group (VICS) has been studying geographic cohorts of children born extremely preterm children in the state of Victoria, Australia since the 1970s, however sample sizes of 200-300 survivors has precluded the ability to assess the effect of Aboriginality, among other things. The study by Hanly and colleagues highlights some of the advantages of population based linkage studies. In general, linkage studies enable outcomes and associations to be explored in large, highly representative cohorts, providing sufficient power to investigate associations not otherwise possible with prospective cohort studies. The main disadvantage of linkage studies is that researchers are limited to what they can investigate by the information that is available, which in most cases has been collated for administrative and/or clinical purposes. In the linkage study by Hanly, important socio-demographic data was missing on children who did not attend a government school (approximately 30%), while children with special needs were not assigned a AEDC category. Furthermore, developmental outcomes were restricted to the AEDC data, which is completed by teachers for children in their first year of school, and it is unclear whether this assessment has a high level of agreement with standardised clinical measures, is predictive of later outcomes, or is a valid assessment for Aboriginal

children. Population databases are also likely to under-estimate prevalence, especially mild cases of disorders which are often undiagnosed.

The results from this linkage study are robust, but it is important to remember that the children were assessed during their first year of school. Further research is needed to determine whether the considerable gap between Aboriginal and non-Aboriginal children, largely reflective of socio-demographics factors, remains constant throughout childhood, widens with age, or diminishes with increasing years in the education system. The compounding influence of the child's home and social environment might infer the gap to increase with age, although that may undervalue the importance of the school system to child development.

The major finding from this study was that there are subgroups of preterm children, based on socio-demographic characteristics, that are at heightened risk for developmental problems. It is yet to be determined if Aboriginality has an independent effect, as in this linkage study it was not possible to control for all socio-demographic factors. It is clear though that Aboriginal infants, regardless of gestational age at birth, are at increased risk for developmental problems as they enter school. Thus, socio-demographic characteristics need to be taken into account when classifying high-risk preterm children, in addition to traditional medical/biological factors. It is possible that risk factors have interactive effects,[8] with outcomes being particularly poor for those children who have a specific combination of risk factors.

Early intervention is effective for high-risk infants, but it has been suggested that benefits are greater in children from more disadvantaged backgrounds.[9] So, in addition to striving for less poverty and greater social and economic equity, it is important that intervention services are available for those who need it most; children living in disadvantaged environments. Unfortunately, this is not the case in Australia.[10] The findings by Hanly and colleagues also highlight that specific racial and cultural groups are over-represented in high-risk populations, and accordingly, surveillance and intervention services need to be culturally sensitive.

About the author

Peter Anderson is Professor of Paediatric Neuropsychology at the Monash Institute of Cognitive and Clinical Neurosciences at Monash University. He is Director of the Victorian Infant Brain Studies (VIBeS) team, which has an international reputation for studying the impact brain injury and brain development has on cognitive, motor, educational and behavioural outcomes in high-risk infants. Prof Anderson is a psychologist interested in the cognitive development of children, and for over 15 years has focused on understanding the mechanisms underlying cognitive and learning problems in children born very preterm. His research involves long-term observational studies, longitudinal neuroimaging studies, and randomised controlled trials assessing the long-term benefits and consequences of obstetric, perinatal, and developmental interventions.

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