Our **Children**
Our **Communities**
Our **Future**

Research Snapshot

Perinatal predictors of child development

Background

The Australian Institute of Health and Welfare defines the perinatal period as the time between the end of the 20th week of pregnancy and the 28th day after birth. Perinatal data are routinely collected in each Australian state and territory though there is some variation in the data collected between jurisdictions.

Research has shown that certain characteristics of mother and child in this perinatal period can predict later development outcomes for the child. This information on the early determinants of children's health, development and wellbeing is of particular interest to governments to inform the services provided to support children and their families.

Aim

This Research Snapshot aims to summarise some of the recent research linking perinatal characteristics to later child development and educational outcomes.

Key findings

The ability to link together government administrative records for individuals through data linkage has allowed for researchers to track an individual's trajectory through life. In the early child development domain, researchers have linked together perinatal datasets with later development and educational outcomes to examine a child's developmental trajectory from birth through to school. These data linkage projects also allow us to examine which factors measured in the perinatal period are predictors of later development and school achievement for a child. To the extent that perinatal characteristics are predictors of these later outcomes, we can try to target interventions from the beginning of a child's life or prior to their birth in order to improve their developmental trajectories from the very beginning. We may also be able to develop risk profiles for later developmental issues based on perinatal characteristics and provide extra resources to those children who have an elevated risk of experiencing poor developmental or educational outcomes.

Gestational age

There is good evidence that a child's gestational age is strongly linked to their later developmental and educational trajectories. Data show that compared to those children born before full-term (< 37 weeks gestation), children born at term perform better in tests of numeracy, reading and writing in Grade 3 and children born very preterm (≤32/33 weeks gestation) generally performed most poorly.

Birth weight and other birth measurements / anthropometry

Various physical measurements of a child at the time of their birth have also been shown to be related to their later development and education. For example, greater birth weight, birth length, head circumference and size for gestational age are associated with better school performance, Early Development Instrument (EDI) performance and fewer behavioural issues at age 6. Research has also found that early initial increases in weight and head circumference in the time following birth has a positive effect on children's later educational performance and behaviour. Higher Apgar scores (an indicator of newborn health status) after birth are also associated with better reading and writing performance in Grade 3.

Demographic and health characteristics of the mother

A mother's age and the number of previous children the mother has have been linked to a child's later development. Having an older mother is associated with better EDI results, writing, literacy and numeracy performance. Generally, children whose mothers were aged 20 or less at the time of giving birth were most at risk of poor later outcomes. Children with three or more siblings have also been found to be at risk of being developmentally vulnerable on one or more domains. Being the firstborn child, however, has been linked with better later literacy and numeracy performance.

Other research has shown that a mother's relationship and work status in the perinatal period may also, under certain conditions, be associated with the later development of her child. For example, the children of single and/ or unemployed mothers are likely to have poorer later development outcomes than other children.

Socio-economic factors are also related to later school performance. Family-level socio-economic adversity is strongly related to a child scoring poorly on the EDI. As well, area-level socio-economic disadvantage has been shown to be related to a child's EDI performance as well as reading and writing performance in Grade 3. Children born in more advantaged areas generally show better development and educational performance than those born in disadvantaged areas.

Finally, another key predictor of later child outcomes is the smoking status of the child's mother during her pregnancy. Smoking in pregnancy has been found to be related to poorer literacy and numeracy performance at kindergarten and Grade 3. Smoking in pregnancy is also likely to impact birth characteristics of the child, including birth weight and gestational age, which then also influence the later development of the child.

Identifying the key perinatal risk factors for vulnerability on the AEDC

In Canada, researchers have worked to predict later risk of EDI vulnerability from data collected in the perinatal period. They have established that four key risk factors— being born prematurely, at low birth weight, a long stay in hospital after birth and a stay in intermediate or intensive care for more than 3 days at birth—can predict a child's later EDI performance at age 5.

This work is currently being extended in South Australia with researchers attempting to identify key risk factors for later AEDC developmental vulnerability from the perinatal data routinely collected by midwives and neonatal nurses at birth. These potential risk factors will include biological characteristics as in Canada, as well as demographic and socio-economic characteristics at the time of birth. This snapshot will be updated when results of this work become available.

Being able to identify combinations of factors identified in the perinatal period that put children at risk for poor development and educational outcomes allows for early intervention on the basis of these risk factors. By targeting services to these at-risk children early we can try to reduce the proportion of children experiencing poorer outcomes later.

Implications

For Policy and Practice

The linking of perinatal data with the AEDC as well as later school and health records is likely to lead to a better understanding of the drivers of development, along with better quantification of the risk and protective factors associated with children's developmental trajectories. Such information should lead to better planning and targeting of community health and development services which will lead to better outcomes for children, and more effective services and policies. The data show that a child's development and educational trajectory has its beginnings in the perinatal period and before the birth of the child meaning that any interventions or targeting of services must begin early.

For Research

The increasing ability to link administrative datasets provides many research opportunities. Linking administrative datasets through the lifespan, from birth through to AEDC and school outcomes as in the research presented here, and onwards to school completion and tertiary education and employment pathways is a valuable research asset. Such linkage allows us to follow individuals throughout their lives and illuminate the pathways leading to a variety of human development outcomes.

For further information

Details of the research paper

This snapshot is based on the following journal articles/reports. These are recommended as further reading for interested parties. If you would like further details about this Research Snapshot and this research area more generally, please contact Associate Professor Sally Brinkman **Sally.Brinkman@telethonkids.org.au**

Malacova E, Li J, Blair E, Mattes E, de Klerk N, Stanley F. Neighbourhood socioeconomic status and maternal factors at birth as moderators of the association between birth characteristics and school attainment: a population study of children attending government schools in Western Australia. J Epidemiol Community Health. 2009;63(10):842-9.

Chan E, Quigley MA. School performance at age 7 years in late preterm and early term birth: a cohort study. Archives of Disease in Childhood—Fetal and Neonatal Edition. 2014;99(6):F451-F7.

Moore EA, Harris F, Laurens KR, Green MJ, Brinkman S, Lenroot RK, et al. Birth outcomes and academic achievement in childhood: A population record linkage study. Journal of Early Childhood Research. 2014;12(3):234-50.

Santos R, Brownell M, Ekuma O, Mayer T, Soodeen R. The Early Development Instrument (EDI) in Manitoba: Linking Socioeconomic Adversity and Biological Vulnerability at Birth to Children's Outcomes at Age 5. Winnipeg, MB: Manitoba Centre for Health Policy, 2012.

Yang S, Fombonne E, Kramer MS. Duration of gestation, size at birth and later childhood behaviour. Paediatric and Perinatal Epidemiology. 2011;25(4):377-87.

Smithers LG, Lynch JW, Yang S, Dahhou M, Kramer MS. Impact of Neonatal Growth on IQ and Behavior at Early School Age. Pediatrics. 2013;132(1):e53-e60.

About research snapshots

AEDC snapshots provide a brief and accessible overview of research being undertaken in relation to the AEDC. The AEDC programme is funded by the Australian Government. For further up-to-date information consult the AEDC website and its many resources: **www.aedc.gov.au**.

About the organisation

The Telethon Kids Institute is one of the largest, and most successful medical research institutes in Australia, comprising a dedicated and diverse team of more than 500 staff and students. Established in 1990, the Institute was among the first to adopt a multidisciplinary approach to major health issues: clinical research, laboratory sciences and epidemiologists all under the one roof, to tackle complex diseases and issues in a number of ways. At the Telethon Kids Institute, we are committed to ensuring that the benefits of our research are translated into real therapies and policies to improve the health and wellbeing of children.