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Early influences on developmental outcomes among children, at age 5, in Australia's Northern Territory

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ABSTRACT

Redressing developmental and school learning inequalities among children requires an understanding of the factors that influence development across population groups. This study utilized the 2009 Australian Early Development Census (AEDC) to explore the association of perinatal health and socio-demographic factors with early development of children in the Northern Territory of Australia. The study cohort included 1110 Aboriginal and 812 non-Aboriginal children, most aged 5 years, whose developmental status was assessed during their first year of full-time school enrollment. Individual-level information was probabilistically linked across three administrative datasets. Logistic regression models were used to estimate the association (odds ratio (OR)) between early life characteristics of children and teacher-rated vulnerability on one or more of five domains of development. The crude OR for developmental vulnerability was much greater for Aboriginal than non-Aboriginal children (OR: 6.93, 95% CI: 5.62–8.56). After adjustment for other variables, the increased risk of developmental vulnerability for Aboriginal children was substantially moderated (OR: 1.68, 95% CI: 1.21–2.32). Influential factors in the adjusted model included: English as a second language (OR: 3.11, 95% CI: 2.27–4.26), gestational age at birth of 34–36 weeks (OR: 2.08, 95% CI: 1.27–3.39) and living in a very remote area (OR: 1.68, 95% CI: 1.19–2.37). There was a gradient in the strength of the association with the level of primary caregiver's education. An additional risk, for Aboriginal children only, was not having attended a day care or pre-school program (OR: 1.43, 95% CI: 1.01–2.04). The study demonstrates the emerging capacity for linkage of data across administrative datasets to inform our understanding of the extent to which multiple factors in early-life operate in their association with children's early development. Our findings are of particular relevance to initiatives to improve outcomes for Aboriginal children by demonstrating that potentially modifiable health and socio-economic factors account for almost all of the difference in developmental vulnerabilities observed between Aboriginal and non-Aboriginal children.

1. Introduction

A child's engagement with formal learning is recognized as fundamental to their health and wellbeing across the life-span (AIHW, 2012) and there is increasing evidence of longer-term adverse health and social consequences of impaired early child development (D'Angiulli, Warburton, Dahinten, & Hertzman, 2009; Hillemeier, Morgan, Farkas, & Maczuga, 2011; Quigley et al., 2012; Silburn et al., 2009). Measures of developmental vulnerability in early childhood highlight wide variations between children (AIHW, 2012; Janus & Duku, 2007) and there is increasing interest in identifying the early influences of children's health, development and well-being in order to inform services needed to better support vulnerable children and their families (Lynch, Law, Brinkman, Chittleborough, & Sawyer, 2010).

1.1. Reducing life-course disadvantage

Australian government policy over the past decade has seen increased investment in early childhood development as a key strategy for reducing disadvantage and building the human capital of the nation (Council of Australian Governments, 2008a). A life-course human development perspective has also been a key feature of national policies seeking to reduce health, education and other life outcome disparities for Aboriginal Australians (Council of

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Australian Governments, 2008b). (Authors' note; the term "Aboriginal" is used in this paper to respectfully include all of Australia's First Peoples including Torres Strait Islanders.) These policy initiatives have been accompanied by parallel investments to build Australia's capacity for national, state/territory monitoring and progress reporting against indicators agreed by all Australian governments (state, territory and federal). These indicators include the annual assessment and public reporting of aggregated literacy and numeracy attainments of primary and secondary school students (ACARA, 2014), and a nation-wide census of the early development of all Australian children enrolled in their first year of full-time schooling at around age 5 years. This census was first implemented in 2009 utilizing the Australian Early Development Index (AEDI), an on-line, teacher-rated measure adapted from the Canadian Early Development Instrument (EDI) in collaboration with its Canadian developers (Janus et al., 2007; Janus, Brinkman, & Duku, 2011). It provides a community-level measure of the status of children's development in five domains of function considered relevant to their making a successful transition into school learning (Janus et al., 2007, 2011; Centre for Community Child Health and Telethon Institute for Child Health Research, 2009). Now named the Australian Early Development Census (AEDC) the instrument contains over 100 items across the domains of physical health and wellbeing, social competence, emotional maturity, language and cognitive skills, and communication skills and general knowledge. (Authors' note; the AEDI was officially renamed the AEDC in July 2014. To maintain consistency with this new nomenclature, this paper hereafter refers to the measure used in the analysis as the AEDC). The AEDC was repeated in 2012 and is now being implemented every three years as one of the progress measures for human capital within Australia's National Reform Agenda (Council of Australian Governments, 2008a).

1.2. Australian Aboriginal children and the AEDC

Importantly, the adaptation process for the development of the AEDC included cross-cultural validation studies to maximize its cultural inclusiveness and measurement equivalence for use with Aboriginal children and English as a Second Language (ESL) children (Brinkman, Sayers, Goldfeld, & Kline, 2009; Brinkman et al., 2007; Silburn et al., 2009). The design of the Aboriginal adaptation process was informed by the guidelines of the International Test Commission for the adaptation of psychometric measures for use with other language and cultural groups (Coyne and Bartram, 2006, Herdman, Fox-Rushby, & Badia, 1998). These identify conceptual, pragmatic, and ethical issues which should be addressed to maximize the cultural inclusiveness and measurement equivalence of the adapted measure and the meaningful interpretation and communication of findings. The AEDC adaption process was overseen by a National Indigenous Reference Group comprising Aboriginal educators, policy makers, and national and state peak-body education organizations. The first stage of adaptation for Aboriginal children involved conducting 85 community and focus group consultations to obtain the views of over 500 Aboriginal teachers, parents, community elders and other Aboriginal education stakeholder in metropolitan, rural and remote communities. These elicited suggestions for how the administration process could be adapted to maximize Aboriginal community support and understanding of the AEDC assessments. They also reviewed the cultural relevance of each item, domain scale and the accompanying explanatory information for teachers. Next, quantitative analysis of the psychometric characteristics of the AEDC was carried out using data from 1474 Aboriginal children and 30,087 non-Aboriginal children already available from the pilot stages of the national rollout of the AEDC (2006–2007). This included Rasch scaling analysis to identify any items having differential response characteristics (i.e., bias) which might require their elimination or adaptation to achieve a satisfactory level of measurement equivalence and multilevel modeling examining the extent of teacher and community level variation. The main modifications to emerge from the adaptation project included:

- The recommended use of Aboriginal school personnel (including Aboriginal Teaching Assistants and Aboriginal & Torres Strait Islander Education Officers) to work with teachers in completing the AEDC checklists for Aboriginal children.
- Modifications to the on-line teacher guide to provide additional information so that specific cultural considerations could be taken into account on certain checklist items.
- Addition of a number of extra checklist items recommended as being of relevance to understanding the particular circumstances of Aboriginal children (e.g., school absence for cultural reasons; proficiency in use of home language; history of otitis media or hearing difficulties) as well as those of all children living in conditions of extreme poverty.

These modifications were then piloted in 49 schools throughout urban, regional, and remote regions of Western Australia. The final version of AEDC used in the 2009 national census included these item and scale adaptations plus a few additional questions applying only to Aboriginal students (e.g., traditional language group).

1.3. Northern Territory children

The Northern Territory (NT) of Australia is situated in the north and central part of Australia and while covering about one sixth of the area of Australia (ABS, 2010) contains the smallest population (243,826 in 2015) (ABS, 2015) and the highest proportion of the population living in remote and very remote areas (ABS, 2013a) among the six states and two territories of Australia. The NT also has a distinctive population structure with the Aboriginal population making up almost 30% of the total NT population compared with 3% of the total Australian population. The Aboriginal population is the most socially disadvantaged population in Australia as a result of the negative impacts of colonization and the compounding effects of low income, poor education, poor health, unemployment, poor housing and a lack of essential services. (ABS, 2013b; Carson, Dunbar, Chenhall, & Bailie, 2007; Zhao, You, Wright, Guthridge, & Lee, 2013). In this context, the NT has two distinct populations of children. Non-Aboriginal children make up about 55% of 5–9 year olds and have health and education outcomes similar to the rest of Australia, while Aboriginal children (including approximately 4% Torres Strait Islander children (ABS, 2007)) make up the balance of 45% in this age group and have much poorer outcomes (AEDI, 2013; Li, Guthridge, d'Espaignet, & Paterson, 2007; McTurk, Nutton, Lea, Robinson, & Carapetis, 2008; Silburn, McKenzie, & Moss, 2010; Silburn, Robinson, Arney, Johnstone, & McGuinness, 2011). In terms of health measures, NT Aboriginal children have a lower average birth weight and higher rates of many childhood diseases, including malnutrition and hearing loss, than non-Aboriginal children. Hospital admission rates among 1–4 year olds are approximately 2.5 times greater among Aboriginal than non-Aboriginal children and infant mortality rates are 2–3 times greater (Li, Guthridge et al., 2007). The extent of these disparities may also be gauged from the results of the 2009 AEDC in which almost two thirds (65.1%) of all NT Aboriginal children assessed were developmentally vulnerable on one or more domains in contrast to 22.6% of their non-Aboriginal counterparts (Centre for Community Child Health and Telethon Institute for Child Health Research, 2009). In 2012, when this same cohort of NT children, most aged 8 years, was assessed in the Australian National Literacy and Numeracy Assessment Program (NAPLAN) 60.4% of Aboriginal students had reading scores below