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Intergenerational and early life influences on the well-being of Australian Aboriginal and Torres Strait Islander children: overview and selected findings from *Footprints in Time*, the Longitudinal Study of Indigenous Children

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Abstract

Footprints in Time: The Longitudinal Study of Indigenous Children (LSIC) is a national study of 1759 Australian Aboriginal and Torres Strait Islander children living across urban, regional and remote areas of Australia. The study is in its 11th wave of annual data collection, having collected extensive data on topics including birth and early life influences, parental health and well-being, identity, cultural engagement, language use, housing, racism, school engagement and academic achievement, and social and emotional well-being. The current paper reviews a selection of major findings from *Footprints in Time* relating to the developmental origins of health and disease for Australian Aboriginal and Torres Strait Islander peoples. Opportunities for new researchers to conduct further research utilizing the LSIC data set are also presented.

Introduction

The cultures of Aboriginal and Torres Strait Islander peoples (also referred to as Indigenous)[a] are among the longest surviving cultures in the world. Before British colonization of the Australian continent in the late 1700s there were at least 260 distinct language groups, each with their own distinct history, culture, and social, religious and spiritual activities.[1] The contemporary population is comprised of an estimated 649,171 persons (91% of whom identify as Aboriginal, 5% Torres Strait Islander and 4% both) and constitutes ~3% of the total Australian population.[2]

Similar to other colonized Indigenous populations internationally, Aboriginal and Torres Strait Islander peoples overall, have a large disparity in health outcomes when compared with non-Indigenous peoples. For example, the burden of disease among the Indigenous population is 2.3 times that of non-Indigenous Australians.[3] For Indigenous families, these statistics are reflected in lower life expectancy, higher rates of infant and maternal mortality, and a higher prevalence of low birth weight and adult obesity.[4] A developmental origins of health and disease framework emphasizes that genetic and environmental factors are associated with health outcomes.[5] For Aboriginal and Torres Strait Islander peoples the environmental aspect is imbued with social and cultural factors. In Australia, there is a specific Indigenous societal positioning inclusive of a history of trauma resulting from colonization, dispossession of lands, destruction of culture, disruption of family and community life, and multi-level racism.[6–9] As a result, poorer health outcomes are intricately entwined with deeply embedded socio-economic disadvantage and political and cultural marginalization.

Exploring influences on Aboriginal and Torres Strait Islander children's health needs to be framed within Indigenous standpoints, rather than a purely medical focus. Indigenous perspectives on health and well-being typically involve not only physical health, but include Indigenous-specific factors such as connection to Country and the environment; connection to family and community; sense of Indigenous identity and culture; self-determination and autonomy; and spiritual well-being.[6,7,10,11]

The general health literature increasingly postulates that understanding the influence of culture on health and well-being is fundamental for all children.[12] Understanding the influence of culture is arguably a particularly vital endeavour for Indigenous peoples, with both Australian and international literature highlighting the importance of cultural, family, and

[a]In this article the term Indigenous is used interchangeably with the term Aboriginal and Torres Strait Islander peoples for ease of reading purposes and it is acknowledged that Aboriginal and Torres Strait Islander is the preferred terminology of Aboriginal and Torres Strait Islander people.

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community factors for the health and well-being of Indigenous children and mothers pre- and post-birth.[13–16] Involvement in cultural and community activities has been demonstrated as key for developing connection to culture, self-identity and confidence, which in turn has been shown to be associated with improved resilience and overall well-being for Indigenous children.[6,17–21] However, in Australia, with the exception of a small number of quantitative studies,[6,17] most of this evidence is qualitative,[13,14] with the lack of quantitative data identified as a significant gap in the research literature.[22]

This paper contributes to filling this gap in quantitative evidence about the contribution of social and cultural factors to the development of Aboriginal and Torres Strait Islander children. The first aim of this paper is to review a selection of literature on what has been learned about early life influences on the well-being of Aboriginal and Torres Strait Islander children from *Footprints in Time*, the Longitudinal Study of Indigenous Children (LSIC).[23] This data set, now in its 11th annual wave of data collection, provides a robust platform for investigating elements related to the physical and social and emotional well-being (SEWB) of Aboriginal and Torres Strait Islander children across the early and middle childhood and adolescent years. The second aim is to identify the opportunities that this unique, but currently under-utilized, data set presents for further exploration.

LSIC

The LSIC is a national study of 1759 Indigenous children living in diverse social and cultural environments across urban, regional and remote Australia.[24,25] Research questions guiding the study were designed in partnership with the LSIC Steering Committee, a group of academics consisting of a majority of Aboriginal and Torres Strait Islander people, who retain on-going responsibility for ensuring the relevance and appropriateness of the study's topics, content and implementation for its participants. Deliberately designed to be broad and positively focussed, three of these overarching research questions are directly applicable to the developmental origins of health and disease:

- What do Aboriginal and Torres Strait Islander children need to have the best start in life to grow up strong?
- What helps Aboriginal and Torres Strait Islander children to stay on track or get them to become healthier, more positive and strong?
- What is the importance of family, extended family and community in the early years of life and when growing up?

A purposive sampling method was used to recruit Aboriginal and Torres Strait Islander children, in two age-cohorts, aged 6–18 months and 3½−5 years, from 11 sites across Australia (Fig. 1).[24] Potential participants were identified through Indigenous identification in Australian Government administrative data sets (Centrelink and Medicare) and the sample was supplemented by word of mouth within Indigenous communities. Greater detail regarding study design and sample are available elsewhere.[24,26] While not a random sample, LSIC participant locations are generally representative of the population distribution of Aboriginal and Torres Strait Islander children across levels of remoteness in Australia, where ~75% of LSIC children live in urban and regional areas and just under 25% of children live in more remote, predominantly Aboriginal population, communities.[27]

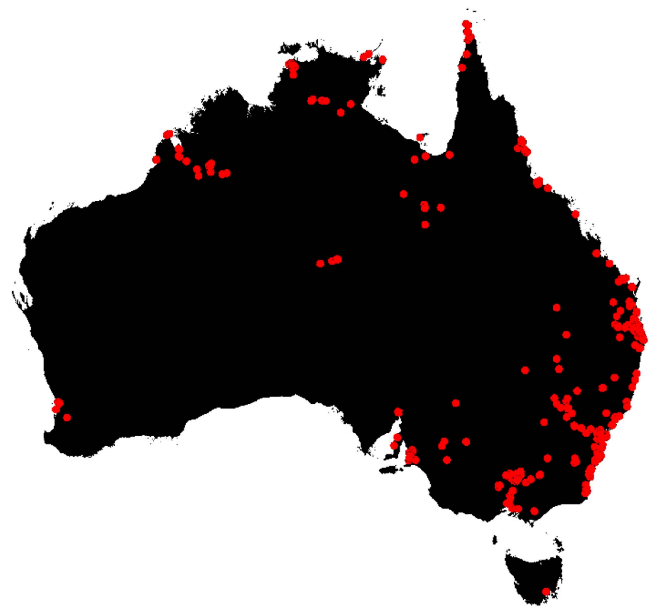

Figure 1. Location of the Longitudinal Study of Indigenous Children (LSIC) families ($n = 1255$) participating in LSIC Wave 8.

Every year Aboriginal and Torres Strait Islander interviewers conduct face-to-face interviews with the participating children and one or two of their caregivers. While all children in the study are Aboriginal and Torres Strait Islander, not all caregivers are Indigenous. The primary caregiver is most often the child's mother, but in some cases is the child's father, grandmother, aunty or another caregiver who knows the child well. In Wave 1, 1671 families participated,[24] with an additional 88 families joining the study in Wave 2,[25] providing a total sample of over 1700 Aboriginal and Torres Strait Islander children and their families. Over 1230 families have participated in each annual survey, representing an over-time retention rate of over 70%.

LSIC collects standard health measures such as measured weight and height and self-reported medical conditions, then also asks participants about a range of topics including, but not limited to: identity, cultural engagement, language use, community strengths and problems, housing, life stressors, racism, SEWB and distress, health service use, family and household relationships.[24,28] LSIC children also complete age-appropriate assessments on vocabulary, reasoning, reading and mathematics. In the first years of the study, primary caregivers were asked about pregnancy and the birth of the child, including birth weight, gestational age, drug and alcohol exposures, and health conditions during pregnancy, breastfeeding, weaning, hospitalization, sleep routines, playgroup and childcare. Later Waves of the study have then focussed on children's growth and development.

It is a proud culture and a strong culture[b]

The LSIC data set also includes a small number of 'free-text' items which contextualize some of the quantitative data.[29,30] These free-text items include responses to 'What are (*child's name*) strengths?' and 'How do you (will you) teach (*child's name*) how to deal with racism?' which can be thematically analyzed in their own right.[31,32]

[b]Response of 12-year-old LSIC participant to the question: 'What do you want other people to know about what it means to be Aboriginal?'

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LSIC participants

The LSIC children are diverse, both culturally and geographically. More than 80 Aboriginal or Torres Strait Islander tribal groups, language groups or clans are identified among the LSIC children, with the most commonly identified being Wiradjuri, Arrernte, Yorta Yorta, Gamilaroi and Waanyi.[24] LSIC children speak 52 different Indigenous languages and two creoles; 37 of these languages are classified as endangered, having very few speakers, or no longer spoken.[33] Table 1 details baseline socio-demographic characteristics of participating children and their primary caregivers as established in Waves 1 and 2 of LSIC.

Table 1. Socio Demographic Characteristics of LSIC Participants in Wave 1 and 2

Characteristic	n	%
Study child identity		
Aboriginal	1532	87.1
Torres Strait Islander	116	6.6
Aboriginal & Torres Strait Islander	111	6.3
Primary caregiver identity		
Aboriginal	1315	74.8
Torres Strait Islander	119	6.8
Aboriginal & Torres Strait Islander	75	4.3
Non-Indigenous	250	14.2
Sex of primary caregiver		
Female	1716	97.6
Male	43	2.4
Study child age turned in 2008 (wave 1)		
Under 1	43	2.4
1 year	780	44.3
2 years	187	10.6
3 years	62	3.5
4 years	569	32.3
5 years	117	6.7
6 years	1	0.1
Study child sex		
Female	887	50.4
Male	872	49.6
Remoteness area of study child home		
Major cities	434	24.7
Inner Regional	421	23.9
Outer Regional	230	13.1
Remote	265	15.1
Very Remote	406	23.1
Missing data	3	0.2
Languages spoken in the home (wave 3, n = 1404)[a]		
English/Aboriginal English	1403	99.9
An Indigenous language	234	16.7
A creole	200	14.3
A foreign language	24	1.7

[a]Sums to >100% as multiple languages could be spoken at home

The literature on early life influences impacting well-being

The following section overviews published literature related to early life influences on well-being using data from LSIC. Nutritional factors and weight status (breastfeeding and obesity) are explored first followed by investigation of socio-emotional, cultural and societal positioning factors (experience of major life events, cultural factors and the influence of racism and discrimination).

Breastfeeding

Exclusive breastfeeding in the first 6 months of life is recommended for optimal infant health and development; the World Health Organization (WHO) has set global targets to raise the prevalence of exclusive breastfeeding from current levels (38%) to 50%.[34] Optimal breastfeeding practices, recommended by the WHO, include continued breastfeeding for up to 2 years of age and beyond. Australian studies of non-Indigenous women show that maternal attitude towards pregnancy, psychological adjustment and early breastfeeding difficulties are significant predictors of exclusive breastfeeding intention and duration.[35] Australian studies with sub-samples of Aboriginal and Torres Strait Islander women, however, demonstrate a variance in breastfeeding patterns from the non-Indigenous Australian results.[36,37]

These differing results are replicated in studies undertaken using the LSIC data. Bennetts Kneebone found that in the LSIC cohort, any breastfeeding (with or without complementary feeding of formula and/or solids) was significantly more likely for mothers who: lived in remote compared with non-remote areas, were partnered *v.* single, and had education beyond year 10 *v.* year 10 or below. Breastfeeding without introducing formula (with or without introduction of solids) for 6 months or more was more likely in remote *v.* non-remote areas, for mothers aged over 25 years *v.* younger, and for those who had not experienced postnatal depression. As shown in Fig. 2, LSIC mothers in medium sized (4–5 person) and larger (6–22 person) *v.* smaller (<4 persons) households had significantly longer breastfeeding duration, which held even after adjusting for remoteness, postnatal depression, living with partner, being a young mother, smoking during pregnancy, and mother's education.[38]

A recent study by Dunbar and Scrimgeour on the introduction of alternative milk formulas for LSIC babies, found that 'a gradual move from breastfeeding started from two months of age with over half of the cohort drinking formula milks by six months'.[39] 'Not having enough breast milk' was the most common reason LSIC new mothers gave for stopping breastfeeding.

Obesity

The rising prevalence of child obesity is of national and international concern for health and longevity[40,41] with obesity in childhood associated with an increased risk of obesity in adulthood, which has multiple comorbidities including cardiovascular diseases, diabetes and some cancers.[42–44] Obesity has been shown

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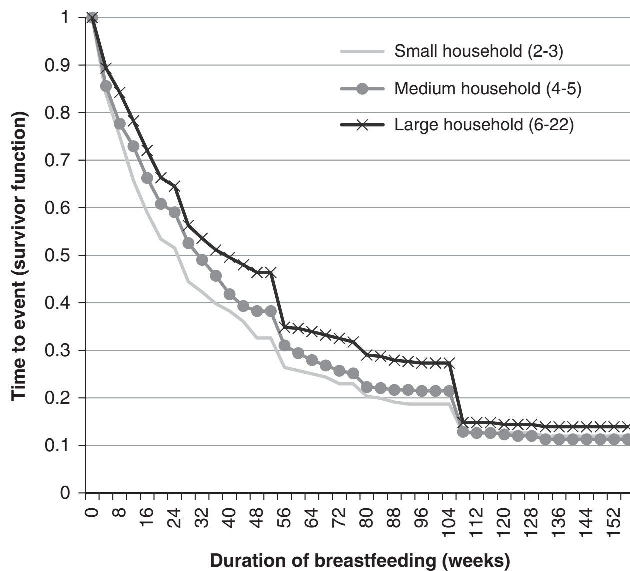

Figure 2. Proportion of the Longitudinal Study of Indigenous Children (LSIC) mothers breastfeeding by child's age (in weeks) for mothers in small, medium and large households (of those who breastfed at all).

to disproportionately impact Indigenous children compared to non-Indigenous children in countries including Australia, Canada, New Zealand and the United States.[4,45]

Research by Thurber *et al.*[46] indicates that LSIC children born large for their gestational age, and who were exposed to smoke *in utero*, had a significantly higher body mass index (BMI) at age 3–8 years. Findings were also consistent with an increased BMI for children whose mothers had diabetes or gained 'too much' weight during the child's pregnancy.[46] Maternal risk factors for high birth weight and high child BMI (i.e. obesity, smoking and diabetes during pregnancy) are common in the Indigenous Australian population;[47–53] these factors are therefore likely to contribute to the high prevalence of overweight and obesity observed among Aboriginal and Torres Strait Islander children.[53]

Longitudinal analysis of LSIC data by Thurber *et al.*[54] has also identified a high prevalence of obesity among Aboriginal and Torres Strait Islander children in the first years of life, and a rapid onset of overweight and obesity from age 3 to 9 years. In addition, this research identified the potential role of sugar-sweetened beverage consumption in contributing to the rapid development of obesity among Aboriginal and Torres Strait Islander children.[54] Thurber *et al.* have also explored the social, cultural and environmental context of dietary behaviours, with analysis showing that sugar-sweetened beverage consumption is shaped by social and environmental factors such as housing and parental education,[55] and that many social, cultural and environmental barriers prevent optimal intake of fruits and vegetables.[56]

Major life events and mothers' mental health

SEWB for Aboriginal and Torres Strait Islander children and families encompasses mental health as well as broader components such as spiritual, cultural and social well-being, and overall community well-being.[57–59] The concept of SEWB is viewed generally as more relevant to Aboriginal and Torres Strait Islander peoples than the concept of mental health in that it recognizes the underlying trauma and impact of Indigenous history within the Indigenous mental health burden.[60,61] Other Australian research from an urban Aboriginal cohort indicates that children experiencing higher numbers of major life events are more likely to have social and emotional difficulties, as measured by the Strengths and Difficulties Questionnaire (SDQ).[62]

LSIC collects data annually from the participating child's primary caregiver on the number of major life events experienced by the family during the previous 12 months. These events include financial stress, relationship dissolution, caregivers losing or gaining work, serious illness or death of a close relative or friend. Twizeyemariya *et al.*[63] found that more than 60% of LSIC children had experienced three or more stressful life events in at least one wave of data collection (2008–2011). Results from Kikkawa indicate that LSIC children who experienced more major life events were at a significantly higher risk of experiencing social and emotional difficulties.[64] Research by Kikkawa also established that higher levels of maternal mental health are associated with improved child SDQ (lower risk of social and emotional difficulties)[64] for LSIC children, independent of the number of life events experienced.[64]

Culture and racism

Studies among Indigenous populations in the United States and Canada have shown that increased cultural participation promotes resilience and is a protective factor for Indigenous health and well-being.[65,66] In Australia, Lovett has established that, for LSIC children, greater attendance at cultural events and time spent with Indigenous family members living outside of the child's household is associated with higher levels of resilience.[67] Martin analyzed caregivers' free-text responses to the question: 'What is it about being Aboriginal or Torres Strait Islander that will help your child grow up strong?'[68] Subsequent analysis identified eight key themes: family, culture, personal traits (such as respect for elders), identity, heritage, relationships, history and land/country. Similarly, Armstrong *et al.*[69] identified that stronger parent/caregiver cultural identity is associated with better social, emotional and behavioural outcomes for LSIC children. In addition, Dockery identified that for LSIC children, a measure of strong kinship was associated with better child health and school attendance.[22]

Exposure to racism both directly and indirectly (e.g. vicarious racism, second-hand exposure to racism) has been shown in Australian literature to have lasting negative consequences across health and well-being, educational and social outcomes for Aboriginal and Torres Strait Islander people.[70–72] The pervasive pejorative impact of racism on Indigenous children and families is also demonstrated in analyses of LSIC data. Shepherd *et al.*[73] found the experience of direct racial discrimination was reported for 14% of LSIC children and nearly half (45%) of the children's families. Both primary caregiver's and children's experience of racism were associated with poorer mental health, sleep difficulties, obesity and asthma among LSIC children. Longitudinal analyses also identified that primary carers' higher cumulative exposure to racism was associated with increased odds of poor mental health, sleep difficulties and asthma for LSIC children aged 5–10 years. A study by Bodkin-Andrews *et al.*[74] found that racism experienced by Aboriginal and Torres Strait Islander primary caregivers, their child, or their family was associated with reduced global health scores and increased levels of anger, worry and depression for the primary caregiver.

Using LSIC data in your research

Over the past decade the Council of Australian Governments has jointly agreed to health, education and employment targets to close

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the gap between Indigenous and non-Indigenous Australians.[75] The Australian Institute of Health and Welfare estimates that social determinants of health such as income, education, overcrowding and employment, are responsible for nearly a third (34%) of the health gap, and that risk factors disproportionately affecting Aboriginal and Torres Strait Islander peoples such as smoking, alcohol consumption and obesity, explain an additional 19–30% of the health gap.[76] There is a strong need to understand why these gaps persist within the Aboriginal and Torres Strait Islander population.

There is an increasing emphasis in Australian public policy on the need to focus on protective factors and build on strengths.[77] Cultural determinants of health have to date been under-researched (including in comparison to social determinants) and offers the chance to focus on strengths and protective factors such as identity and belonging,[78] and to further address the impact of societal issues such as racism. As a longitudinal data source collecting a breadth of data across health, social, cultural and environmental factors, LSIC – purposefully designed according to strength-based principles – provides the opportunity to further disentangle these relationships and identify points of intervention.

As argued by Walter *et al.* for researchers using data from LSIC, '[O]ur shared overwhelming desire is to make the future for Aboriginal and/or Torres Strait Islander children better'.[79] There is, therefore, an imperative for more researchers, especially Indigenous researchers, to use LSIC data to help Indigenous children to 'grow up strong'. Strengths of the LSIC data include the study's high retention rate; the collection of a broad range of measures across social, cultural and environmental determinants of health and well-being; the collection of qualitative and quantitative data; and the focus on strengths of Aboriginal and Torres Strait Islander children, families and communities. These characteristics of the study reflect the consultation and engagement processes that occurred during study development and continue throughout the study.[28,33,79]

As a longitudinal study that is now in its 11th year of annual data collection,[23] LSIC is accumulating a wealth of meaningful information about the health and well-being of Indigenous children, their caregivers and communities. This information provides the opportunity to identify what contributes to Indigenous children 'growing up strong' holistically and over time. Data from Waves 1 to 9 are currently available to researchers,[80] enabling investigation of a vast number of research topics.

More than 300 researchers have licenses to use LSIC data, with all researchers invited to apply for access. Further information about the study can be found at http://www.dss.gov.au/lsic. In addition to security and confidentiality protocols that apply, prospective LSIC data users are required to consider and acknowledge their standpoint (worldview) before applying to use LSIC data.[81–83]

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Ethical Standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national guidelines on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Ethical clearance for the study is obtained for each pilot, run each year in preparation for the following wave of data collection, and each main wave of data collection from the Australian Government Department of Health Human Research Ethics Committee. Additional ethics clearance is also sought from jurisdictional ethics committees in most States and Territories and, in relation to teacher surveys, from State and Territory Government Departments of Education and relevant bodies representing independent schools. Researchers using the data often seek ethical clearance for their specific projects from their own institutions.

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