Faculty of Health Sciences

The Socioeconomic Pattern of Health and Developmental Outcomes among Aboriginal and Torres Strait Islander Children

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature: ……………………………………………

Date: 23/9/2012

Dedication

This thesis is dedicated to my late father, Keven.

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Abstract

The pervasive health and social disadvantage faced by Aboriginal and Torres Strait Islander peoples is an acknowledged part of Australian society. The contemporary data reveal striking inequalities between Indigenous and non-Indigenous Australians in most measurable aspects of wellbeing across the life cycle. This reflects a post-colonial history of marginalisation and exclusion from mainstream society, dispossession of traditional lands, forced separation from family and kinship networks, and racism. Despite an increased awareness and disapproval of these inequalities in health, the inequalities persist.

The lack of progress in the face of public disapproval and progressive government support underscores the fact that we still do not adequately understand the fundamental causes of Indigenous ill health and disease. A small body of research in Australia has highlighted that socioeconomic status (SES) accounts for a portion of the gap in health but this does not imply that they account for health differences within Indigenous population groups. A robust international literature has consistently shown that socioeconomic factors influence population health. These factors reflect the way in which society is ordered according to wealth, prestige, power, social standing or one’s control over economic resources, and their pattern of association with health has almost always depicted better health for those who are better off—that is, the health of population groups normally follows a gradient pattern. Despite the ubiquity of this observation in the empirical literature, there is uncertainty as to whether it applies to Aboriginal and Torres Strait Islander populations in Australia.

Accordingly, this thesis has aimed to assess the pattern of socioeconomic disparities in the health and development of Indigenous populations in Australia, with a specific focus on children. The three key objectives were to:

- Describe the developmental status of Indigenous children and the mechanisms that influence this status;
- Determine the pattern of association between socioeconomic factors and physical and mental health outcomes; and

- Reveal the significant differences (and similarities) in the socioeconomic pattern of child health between Indigenous and non-Indigenous populations, and articulate these in terms of their direction, shape and magnitude.

The objectives of the study were primarily assessed using a quantitative analytic framework applied to four existing population-representative datasets: the 2008 *National Aboriginal and Torres Strait Islander Social Survey*, the 2000–2002 *Western Australian Aboriginal Child Health Survey*, the 2004–05 *National Aboriginal and Torres Strait Islander Health Survey* and 2004–05 *National Health Survey*. Simple univariate and cross-tabulation data were used to describe population characteristics, while the relationships between socioeconomic indicators and health outcomes were assessed using a range of regression techniques. Multilevel models are an important feature of this study, and have enabled a more accurate estimation of the effects of individual and area-level measures of SES on health. Generalised Additive Models were used to account for the possible non-linear nature of associations between continuous SES variables and physical health outcomes, with results presented as non-parametric spline curves. The mechanisms linking SES and mental health were explored using a stepwise approach to the regression analysis. All data in all chapters were weighted to reflect population benchmarks.

The findings highlighted that there were significant socioeconomic disparities in the health of Indigenous children in Australia, although the direction, shape and magnitude varied, by both socioeconomic measure and health outcome. While the socioeconomic patterns of Indigenous child health are not universal, they are more consistent for mental than physical health. In addition, the thesis has shown that both conventional and alternative notions of SES can influence health patterns. The largest disparities in child physical health were observed for area-level SES indicators, while housing characteristics and area-level SES both had a strong direct effect on child mental health.

The thesis has demonstrated that the patterns of socioeconomic disparities in child health differ markedly in Indigenous and non-Indigenous populations—at least in non-remote settings. It was not uncommon for the magnitude of disparity to be larger in the Indigenous population. These findings lend support to the notion that

socioeconomic factors have a differential impact on the health of Indigenous and non-Indigenous populations. The implication of this for policy is that a single approach to stimulating socioeconomic conditions will not have equal benefits to child health outcomes in Indigenous and non-Indigenous populations. While the evidence here underscores the validity of the well-worn edict that “one size does not fit all” in Indigenous health policy, it also reinforces the need to examine health disparities *within and across* Indigenous and other population groups in order to better inform policy and practice

Collectively, the results have provided clear evidence that socioeconomic factors matter to both the physical and mental health of Aboriginal and Torres Strait Islander children. The diversity of findings implies that SES factors are one facet of the unique and complex set of factors that influence Aboriginal child health and wellbeing.

This thesis has made several original contributions to the literature on social inequalities in Indigenous health in Australia and the broader field of social determinants of health. It is one of the few studies internationally to explicitly look at the socioeconomic patterning of health in an Indigenous population, and the first to examine these patterns among Indigenous children using population-representative data. In doing so, the study has begun to bridge the knowledge gap on social inequalities in Aboriginal health in Australia, and will facilitate a better grasp of the complex underlying mechanisms that determine Aboriginal health.

For policy, this knowledge can lead to more effective government decision-making in terms of targeting social determinants of health that are of particular significance for Aboriginal populations. It is hoped that the findings of the thesis can provide directions for future research and insights to policy that will, ultimately, increase the pace of change toward health equity in Australia.

Contents

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Published works

Material forming part of this thesis

Published journal articles

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Abbreviations

ABS	Australian Bureau of Statistics
ACCARE	Aboriginal Collaborative Council Advising on Research and Evaluation
CD	Collection District
CSEBD	Clinically significant emotional or behavioural difficulties
CURF	Confidentialised Unit Record File
dmft	Decayed, missing and filled teeth in deciduous dentition
DMFT	Decayed, missing and filled teeth in permanent dentition
ICD-10	International Classification of Diseases 10th Revision
IRISEO	Biddle's Index of Relative Indigenous Socioeconomic Outcomes
LORI	Level of Relative Isolation
NATSIHS	National Aboriginal and Torres Strait Islander Health Survey
NATSISS	National Aboriginal and Torres Strait Islander Social Survey
NHS	National Health Survey
OR	Odds ratio
RADL	Remote Access Data Laboratory
SDQ	Strengths and Difficulties Questionnaire
SEIFA	Socio-Economic Indexes for Areas
SES	Socioeconomic status
SEWB	Social and emotional wellbeing
WAACHS	Western Australian Aboriginal Child Health Survey
WAAHIEC	Western Australian Aboriginal Health Information and Ethics Committee

CHAPTER 1

INTRODUCTION TO THESIS

1.1 Statement of the problem

Socioeconomic factors have consistently been shown to influence population health.[1, 2] These factors reflect the way in which society is ordered according to wealth, prestige, power, social standing or one's control over economic resources.[3] The pattern of association between socioeconomic status (SES) and health has almost always depicted better health for those who are better off, regardless of how SES is defined or measured—that is, the health of population groups normally follows a gradient pattern,[4] at all stages of the life course.[5-7] Despite the ubiquity of this observation in the empirical literature, there is uncertainty as to whether it applies to the Indigenous peoples of Australia—Aboriginal and Torres Strait Islander peoples.[8, 9]

Indigenous status is typically used as a covariate to explain differences in population health by SES, and scant attention has been paid to the potential moderating effect of Indigenous status on the SES–health relationship. As a result, there is limited empirical evidence on the direction, shape or magnitude of socioeconomic disparities in the health of Indigenous Australian children or adults. Moreover, the extant literature covers only a narrow range of health and SES indicators, with little consistency in scope or analytical approach.

Nevertheless, there is a theoretical basis for expecting that the association of traditional SES indicators with health will be different in an Indigenous context. First, exclusion and discrimination, which are implicated in the production of relatively flat gradients among African American populations in the United States,[10] are often entrenched in the lives of Indigenous peoples and may limit the health benefits that normally accrue from improved SES. Second, profound marginalisation, which many Indigenous cultures have faced over generations, can constrain human development, placing children at a disadvantage from the earliest stages of life and limiting the acquisition of skills that can be drawn upon for the benefits of health at every level of

SES. Third, there may be social factors other than SES that exert a greater influence on Indigenous health, including the wellbeing of the community and kinship network, cultural continuity, and connection to traditional lands that enables Indigenous people to maintain spirituality central to the Indigenous notion of health.[11-13]

There are important implications of improving our understanding of how socioeconomic disparities in health are patterned within Aboriginal and Torres Strait Islander populations. The magnitude and shape of disparities can provide insights into the relative importance of social conditions to health outcomes and may facilitate a better grasp of the complex underlying mechanisms that link SES to Indigenous health.[14, 15] Moreover, there are critical policy implications of improving our knowledge in this area. If the relationships between aspects of SES and health differ in Indigenous and non-Indigenous populations then policies aimed at reducing socioeconomic disadvantage will have unequal effects on health. And if these relationships are relatively weak in Indigenous populations then investments aimed at stimulating employment, income and education, for example, are unlikely to lead to substantial improvements in Indigenous population health outcomes or significantly reduce health disparities between Indigenous and other populations. This implies that policy responses that are suitable for the general population would need to be modified in order to benefit the health of Indigenous peoples.

1.2 Aim of the study

This study has a singular aim:

> *To assess the pattern of socioeconomic disparities in the health and development of Aboriginal and Torres Strait Islander children in Australia.*

1.2.1 Scope

The study has a population health focus with a broad scope. It is focused on the population of Indigenous children in Australia as a whole so that any new knowledge can be applied at a population level and may be applicable to Indigenous children in a range of contexts and across metropolitan, rural and remote regions. The drawback to this broad focus is that it can mask differences and nuances that exist at a finer level of geography. In order to address this, the thesis includes some consideration of smaller population sub-groups (Western Australia) and the impact of geography (relative isolation and remoteness from services) on the broad-level findings.

The concepts of health and socioeconomic status are also broadly framed in this study. The thesis acknowledges, and is guided by, the holistic notion of Indigenous health in defining health and its determinants (see Chapter 2). It also attempts to define status according to conventional ideas of social position and class and in ways that may be more relevant to Aboriginal and Torres Strait Islander society. In relation to both health and socioeconomic constructs, however, limitations in the available data narrow the scope of examination (see Chapter 4). Accordingly, these core constructs are operationalised within the confines of the information base, and according to the most prominent health and socioeconomic problems facing Indigenous children in the extant literature (see Chapter 2).

1.3 Overview of the thesis

This thesis is submitted in the form of a typescript (traditional thesis format) in accordance with Curtin University's research policies and procedures (specifically Rule No. 10 Made Pursuant to Statute No. 12 – Enrolment) and guidelines for thesis production. While the thesis is presented in a traditional format, a number of the chapters have been developed for publication. Copies of published and in press articles are included in Appendix A.

This introduction provides an outline of the problem being addressed in this thesis and the overall aim of the study. Chapters 2 and 3 provide the context for the thesis. Chapter 2 provides a summary of the demographic, health and social status of Indigenous populations in present-day Australia, and discusses how these have been moulded by historical events and circumstances. Chapter 3 examines the factors and processes that shape the health and development of Aboriginal and Torres Strait Islander children, with a particular focus on socioeconomic determinants of health. In addition, the chapter describes the theoretical underpinnings of the relationship between SES and health and our understanding of this relationship in Indigenous contexts. The empirical evidence on this topic in Aboriginal and Torres Strait Islander populations is then reviewed.

Chapter 4 discusses the design of the research study. It outlines the overall methodology and the broad methods that are common to each sub-study. More detailed methods specific to each sub-study are contained in subsequent chapters.

The results of the study are presented and discussed in Chapters 5–9. Chapter 5 describes the health and developmental circumstances of Aboriginal and Torres Strait Islander children using a broad framework for human development. Chapter 6 tests whether socioeconomic factors are associated with Indigenous child population health and development. Chapters 7 and 8 provide a fuller examination of the relationship between SES and the physical and mental health of Indigenous child populations, using a robust and representative Western Australian survey. Chapter 9 compares the socioeconomic pattern of health among Indigenous and non-Indigenous children of Australia.

Chapter 10 brings together the findings of the empirical analyses contained in Chapters 5–9 in the context of the existing literature on this topic (Chapter 3), and discusses the overarching implications and significance of the study. The chapter also considers the strengths and limitations of the study and future directions in research on this topic. It should be noted that a discussion section is provided prior to the conclusion of each results chapter, with the main points consolidated and summarised in Chapter 10. I have presented the information this way to improve the flow of ideas between chapters. I recognise that this necessitates some repetition in Chapters 5–9, however, I believe this approach has, on balance, created a more coherent narrative through the thesis.

1.4 Terminology

There are a number of issues relating to terminology used in this thesis. Most of these are addressed within the thesis proper but one is central to the thesis and worth stating up-front. The term ‘Aboriginal’ is used throughout this thesis to refer to the original inhabitants of the Australian continent—Aboriginal and Torres Strait Islander peoples. The term is used for the purpose of brevity and in preference to ‘Indigenous’. While I view ‘Aboriginal’ as a more specific term to ‘Indigenous’, I recognise that it is a generic term that excludes any description of language group or country, and that it is not the preferred term among all Aboriginal and Torres Strait Islanders.

CHAPTER 2

HISTORY AND THE CONTEXT OF CONTEMPORARY ABORIGINAL HEALTH

2.1 Introduction

The health and wellbeing of Aboriginal peoples has been profoundly shaped by the circumstances of the past, and most particularly by the events and conditions in Australia since colonisation in the late 18th Century. As such, contemporary Aboriginal population health cannot be understood without some appreciation of history. This chapter is the first of two background chapters to the thesis. It provides a summary of the demographic, health and social status of Aboriginal populations in present-day Australia, including a comparison of how Aboriginal populations fare relative to non-Aboriginal populations in key statistical indicators. What follows is a discussion of how some of the critical events in Australian history continue to impact on the health and wellbeing of Aboriginal populations today. While the focus of this chapter is on national data and events, there is some exposition of the Western Australian circumstance in order to provide context to all facets of this study.

2.2 The unique demographic profile of Aboriginal Australia

The Australian Aboriginal culture is one of the oldest continuing cultures in the world.[16] Aboriginal peoples today, like their descendants over the past ~50000 years, represent a diverse set of groups that are distributed across all parts of the Australian landscape.[17] There is considerable demographic diversity in the living circumstances of Aboriginal families and communities: some population groups are contained in discrete communities in isolated parts of the country, others are part of towns or more populous rural centres—or concentrated on the fringe of these places, while many are scattered through large urban centres and cities.[18]

Deriving an accurate estimate of diverse Aboriginal population groups over time has been obscured by issues of exclusion and identification. While Australia has conducted a regular census since 1901, Aboriginal peoples did not form part of official population counts until the 1970s.[19, 20] The quantity and quality of data on Aboriginal populations in Australia improved dramatically in the latter half of the 20th Century, however, most data collections have relied on respondents to self-identify as an Aboriginal person, and therefore on their own view of their Aboriginal status independent of community views or acceptance. The propensity to identify as an Aboriginal person has changed markedly in major Australian data collections over time, partly as a result of changing social attitudes and improvements in the quality of statistical processes.[21] Furthermore, collections that do not rely on self-identification as the basis for assessing Aboriginal status—notably some of the population data collected via administrative processes—can be subject to bias and often provide incomplete information on status.[22] In summary, while statistical collections now routinely include all cultural groups—including Aboriginal peoples—it is not uncommon for Aboriginal people to be misclassified and this typically leads to an undercount or underestimation of the size of Aboriginal population groups.[23]

In addition to the general difficulties in estimating the size of Aboriginal populations, characterising differences across space has been problematic for a number of reasons. First, Aboriginal populations tend to be highly mobile, particularly in the short-term in more remote settings, making it difficult to attribute a specific place of residence for the purposes of geographic classification.[17] Second, and more broadly, Aboriginal Australia is a complex network of inter-connected groups,[24] and the differences that exist by language, tribal group, location of traditional country and other factors do not concord neatly with a single contiguous geographic classification. Third, the relatively small size of Aboriginal populations generally creates a statistical barrier to estimating the population at finer levels of geographic disaggregation.[25] The consequences are that while we are now generally better placed in Australia to measure and describe broad Aboriginal populations, we do not fully capture the (often extensive) diversity of circumstances within Aboriginal Australia.

2.2.1 Population size

The most recent population counts indicate that there were 548370 Aboriginal persons resident in Australia in 2011. The vast majority of Aboriginal persons identified as being of Aboriginal origin only (90%), with smaller proportions describing themselves as Torres Strait Islander origin only (6%) or both Aboriginal and Torres Strait Islander origin (4%).[26]

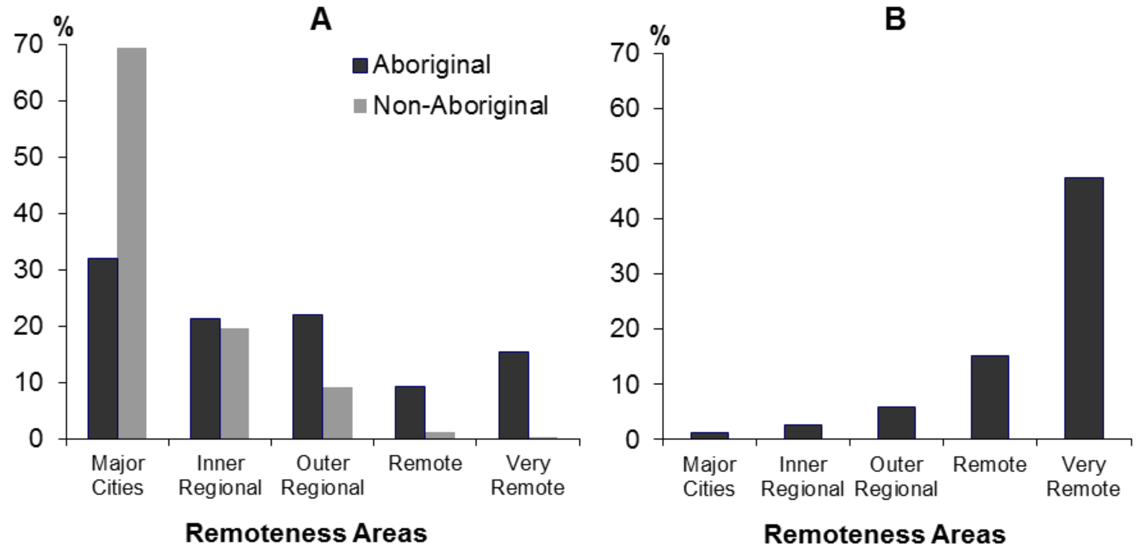
Aboriginal peoples are a minority group in Australia, accounting for 2.5% of the total Australian population.[26] In addition to population size, there are substantial differences in the distribution and structure of Aboriginal and non-Aboriginal populations.[18]

Despite the statistical deficiencies mentioned above, official statistics indicate that the Aboriginal population has grown in recent decades, and at a faster rate than that of non-Aboriginal Australia.[19] While it is difficult to ascertain the size of the Aboriginal population in earlier periods, evidence suggests that it declined substantially following colonisation in the late 18th Century, as a result of the introduction of new diseases and appalling treatment by white settlers.[27, 28]

2.2.2 A complex network of Aboriginal peoples

There are Aboriginal communities in all Australian States and Territories with the largest shares of Aboriginal people in New South Wales (31%), Queensland (28%), Western Australia (13%) and the Northern Territory (10%).[29]

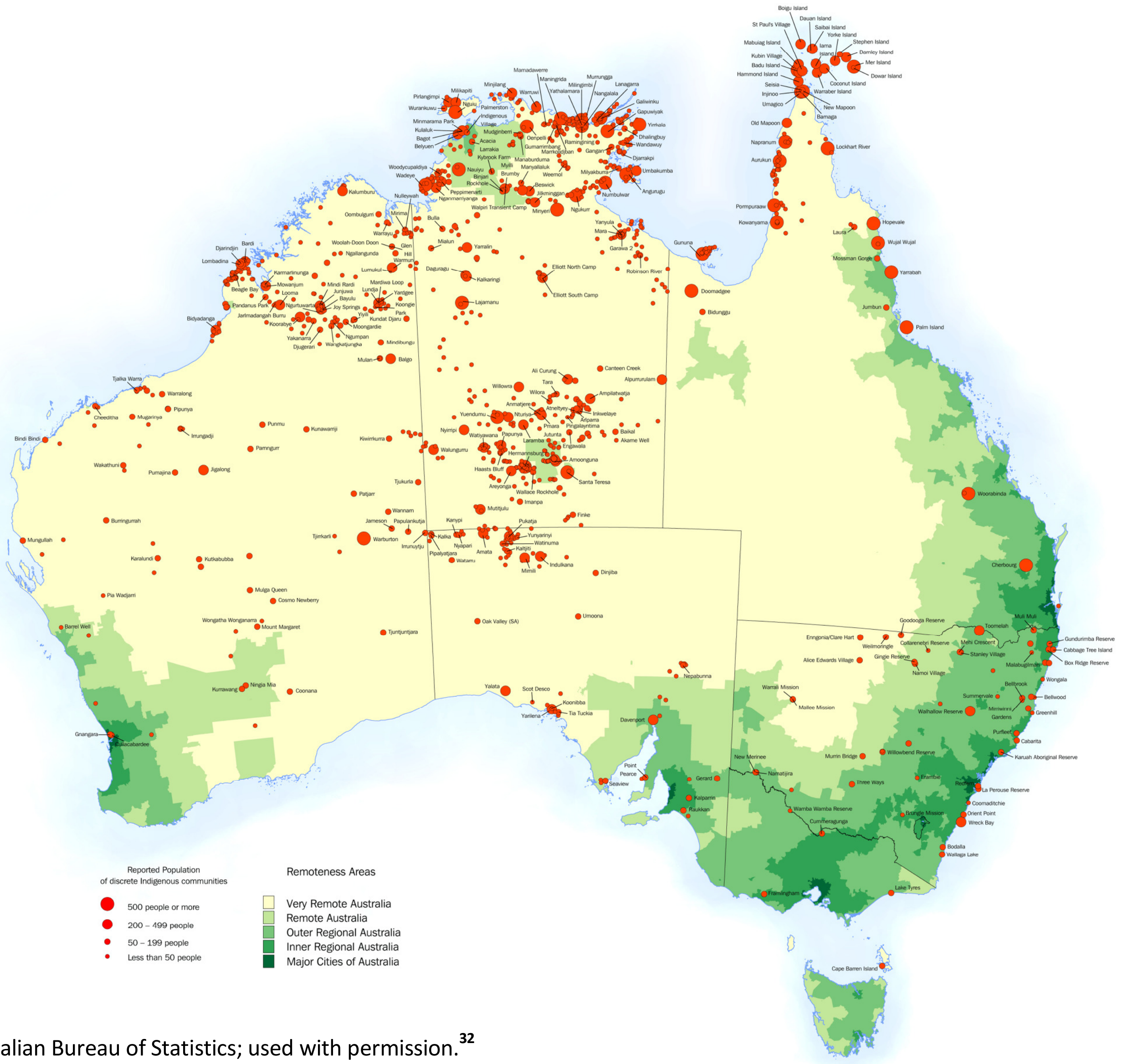
Overall, while the highest proportion of Aboriginal (32%) and non-Aboriginal (69%) people live in the major cities of Australia, Aboriginal people are more likely to live in remote areas than other Australians. A quarter of Aboriginal persons were living in regions classified as either Remote or Very Remote in 2006; the same was true of only 1.7% of non-Aboriginal people (Figure 2.1A).[18]



Note: Data for this figure sourced from Australian Bureau of Statistics.[30]

Figure 2.1: Population distribution—A. Aboriginal and non-Aboriginal persons, by Remoteness Areas; B. Proportion who were Aboriginal, by Remoteness Areas, 2006.

This remoteness profile varies by State and Territory—in Western Australia, for instance, 42% of Aboriginal peoples live in a Remote or Very Remote setting.[18] A substantial proportion of these people live in one of (more than) 250 discrete Aboriginal communities scattered across a vast land area of 2.5 million square kilometres.[31] The complex network of Aboriginal communities across areas of geographic remoteness in Western Australia and other States and Territories of Australia is highlighted in Figure 2.2.



Note: Map sourced from Australian Bureau of Statistics; used with permission.[32]

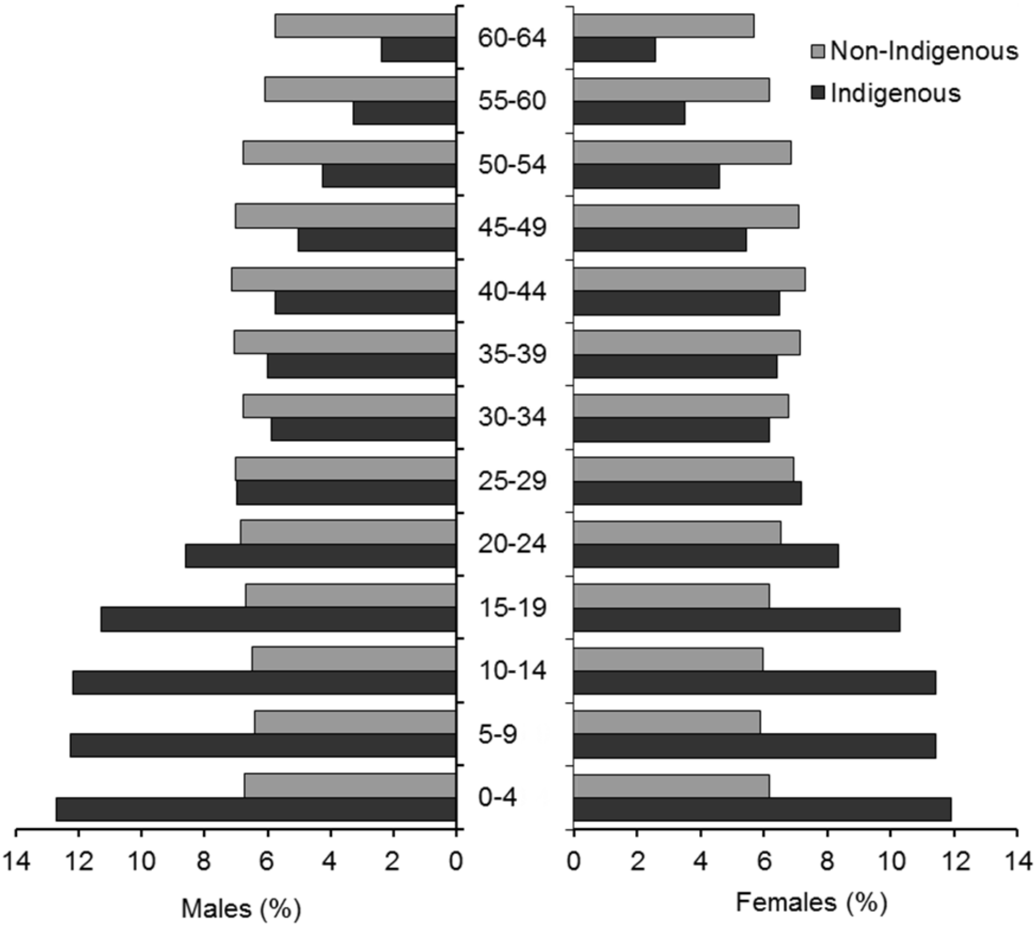
Figure 2.2: Discrete Aboriginal communities by size and remoteness, Australia, 2006.

Living in more remote settings in Australia is generally linked to poorer health, housing and education.[33, 34] Fewer (and lower quality) services and social supports, labour market opportunities, and community problems and resultant stresses, are frequently cited as explanations for poorer outcomes in more isolated and remote communities.[33, 35, 36] In remote Aboriginal communities, however, these risks can be compounded by a lack of access to basic essential services such as safe and reliable water and power supplies and sewerage infrastructure.[32]

Aboriginal people make up relatively small proportions of the total population in Major cities (1.2% of the population are Aboriginal) and Regional (8%) and Remote areas (15%), but constitute almost half of Very Remote Australia (47%) (Figure 2.1B). These Very Remote settings are, typically, the areas where Aboriginal communities maintain a greater connectedness with traditional culture, land and ways of life—factors which are known to have a protective effect on community and individual wellbeing.[37-40]

2.2.3 A younger age profile

The Aboriginal population has a significantly younger age profile than the non-Aboriginal population, reflecting considerably lower life expectancy and higher fertility. The majority (55%) of Aboriginal people were under 25 years of age, with relatively small proportions in older age brackets (only 4% are 65 years and over).[26] The shape of the age profile for non-Aboriginal people stands in stark contrast, featuring a more even spread of the population across the spectrum of ages albeit a relatively narrow base—consistent with the constrictive age pyramid structures typical of developed countries (Figure 2.3).[41]



Note: Data for this figure sourced from Australian Bureau of Statistics.[26]

Figure 2.3: Age profile of Aboriginal and non-Aboriginal populations, 2011.

2.3 Pervasive disparities in contemporary health

2.3.1 The Aboriginal concept of health

Any discussion of Aboriginal health needs to acknowledge that the concept of health has different meanings in Aboriginal and non-Aboriginal Australia. Aboriginal peoples, like Indigenous populations in many other countries, have a holistic view of health that goes beyond individual physical and mental wellbeing to include aspects of spirituality, connection to land, and the social, emotional, and cultural wellbeing of the community.[42-44] Notwithstanding these broad binding features of Aboriginal health, there may be variations in the definition of health in different Indigenous cultural groups.[42]

The general notion that Aboriginal health is holistic is well accepted in Australia but the concept has not been wholly operationalised in Australia's data collection infrastructure.[45] Recent major policy strategies, reporting frameworks and funding initiatives for health appear to have been developed to genuinely reflect the Aboriginal viewpoint.[46-48] However, data limitations and the complexities in defining and measuring Aboriginal conceptions of health mean that frameworks still often rely on mainstream indicators.

2.3.2 Indicators of disparity

The available data illustrate that it is an almost universal truth that Indigenous peoples of the world have poorer health than their non-Indigenous counterparts.[11, 49] Although a lack of high-quality data limits an accurate assessment of the health disparities between Indigenous and non-Indigenous populations in many countries,[50] the disparities in Australia, for example, are well documented and striking.[51, 52] Life expectancy for Australian Aboriginal peoples is between 10 and 12 years lower than for non-Aboriginal people,[53] a signal that Indigenous health problems in Australia are pervasive and potentially worse than those of Indigenous populations in other developed countries.[30, 54-56]

The poor health status of Australian Aboriginals is evident across the life cycle, including the earliest stages of life. Aboriginal children are more likely than non-Aboriginal children to be born at sub-optimal weight, die in infancy, suffer from a range of long-term health conditions, and be hospitalised.[52, 57-60] Some conditions affecting Aboriginal children are scarcely encountered outside of Third World countries (such as rheumatic fever) and, too often, child illnesses, hospitalisations, disabilities and deaths are caused by potentially preventable events (such as injury, poisoning, abuse and neglect).[52]

2.4 Entrenched socioeconomic disadvantage

The socioeconomic disadvantage faced by Aboriginal peoples is well documented. There is a plethora of government statistical[31, 53, 61, 62] and academic research[35, 63-65] reports that have highlighted the existence of deep-rooted disadvantage—in relative and absolute terms—over time and across generations.

This section will provide a snapshot of key data and discuss some of the reasons for the pervasive disadvantage in Aboriginal society, and outline the difficulties in measuring socioeconomic status (SES) in Aboriginal populations. As a precursor to this discussion it is worthwhile clarifying the meaning of the term ‘socioeconomic status’ and what it purports to measure.

2.4.1 Defining socioeconomic status

SES is a multidimensional construct that encompasses the overlapping concepts of social stratification and social class, which collectively describe the way in which society is ordered according to wealth, prestige, power, social standing or one’s control over economic resources. There are a number of definitions of social class, although they have their underpinnings in Marxian, neo-Marxian and Weberian theories.[3] Definitions based on Marxian theories broadly centre on social groups that are formed based on people’s structural location within the economy, e.g. employee, unemployed, owner.[66] Weberian notions of social stratification, however, emphasise the interplay between wealth, prestige and power, where individuals (or groups of individuals) are ranked based on control over resources.[3, 67] Analysis based on Weberian class concepts tends to feature measures of either material wellbeing or prestige. Material wellbeing includes absolute measures (e.g. income) and indirect markers (e.g. education). Prestige is a relative concept that captures a person’s rank in the social hierarchy with respect to access and consumption of resources (e.g. occupational class), and often forms the basis of examinations of the psychosocial influences on health.[66]

Income, education and occupation are seen as the traditional measures of SES[68] and are especially prominent in the public health literature since the initiation of the now famous British Whitehall studies in the 1960s.[69] However, a wide array of measures fall within the broad constructs of SES, including characteristics of individuals, families, households, and neighbourhoods and communities. Research using SES has increasingly aimed to jointly examine variables at each of these levels to attain a comprehensive picture of socioeconomic position. And while there are benefits in obtaining information on multiple indicators of SES, caution needs to be exercised in variable selection as socioeconomic context can vary depending on the analytic setting. This is particularly important in studies involving different ethnic and cultural groups because an SES measure might be meaningful and appropriate in some groups but not in others.[66]

In Australia, the concepts of SES, social class and poverty may be less relevant to Aboriginal populations, and therefore traditional measures of these concepts may have limited applicability in Aboriginal contexts.[9, 70, 71] There are a number of reasons for this. First, the view of Aboriginal peoples on the formal labour market, and their participation and attachment to it, is distinct to other Australians. Aboriginal people are far more likely to be unemployed or not engaged in the labour force, and to be reliant on government transfer payments as their main source of income.[31] Aboriginal people who live in more remote settings are often involved in informal productive activities which may provide in-kind remuneration.[64] Second, the concept of income can have a different meaning among Aboriginal Australians. Individually earned income (and other material resources) is more often shared among a broader kinship network when compared with other Australian families and, as such, is a less individualistic construct.[72] Sharing of this nature reflects the importance of reciprocity in Aboriginal communities, and can have implications for the status and identity of an Aboriginal person within their family and community.[73] Third, standard indicators of educational attainment typically ignore knowledge that is valued in Aboriginal society but acquired outside of Western education systems.

The disadvantage faced by Aboriginal peoples differs to other segments of Australia, in its extent and scale, and it distinguishes the Aboriginal population as an almost separate society.[74] The literature is replete with examples of Aboriginal population groups over-represented in the lower levels of all constructs of SES. Poor SES outcomes extend to measures of education (including the domains of attainment,[53, 61, 62, 64, 65] performance[53, 61] and attendance[53]), income,[53, 61, 62, 64, 65] employment outcomes,[53, 61, 62, 64, 65] occupational class,[64] overcrowding[61, 64] and home ownership.[53, 62, 64, 65] Furthermore, disparities in SES between Aboriginal and non-Aboriginal populations apply across the life course[75] and tend to be more pronounced in remote areas.[76, 77] Many of the poor outcomes listed here give rise to other forms of disadvantage leading to substantial proportions of the Aboriginal population experiencing multiple forms of socioeconomic disadvantage.[35, 75] For example, low educational attainment can lead to difficulties in securing meaningful work and consequent disengagement from the labour market and financial difficulties.

The substantial gaps in socioeconomic outcomes between Aboriginal and other Australians have persisted over time, despite modest improvements in most standard indicators in recent decades.[62, 65] The trends over time signal that disadvantage is deeply entrenched in the lives of Aboriginal people and families,[78] and, for many families, likely to have been passed down through generations.[79] This has occurred despite the government's focus on practical reconciliation since the mid-1990s and considerable policy effort aimed at improving Aboriginal education, employment and housing.[78] The persistence of these trends in the face of long-term remedial efforts of governments make it clear that Aboriginal disadvantage is complex and perhaps the distal result of processes that began with the exclusion and marginalisation of Aboriginal peoples in Australia during colonisation over 200 years ago.[64]

Some of the pragmatic, conceptual and measurement complexities that have been discussed here in relation to SES pose a challenge to assessing the pattern of SES-health relationships in Aboriginal populations. These issues, along with the geographic diversity of Aboriginal people in Australia (see earlier section on *The unique demographic profile of Aboriginal Australia*), need to be accounted for when comparing outcomes across SES categories. The over-representation of Aboriginal peoples in the lower levels of SES is particularly important in the context of this study because it can reduce statistical power for comparing outcomes across SES levels.

2.5 History and its legacy for health

The current poor social, economic and health circumstances of Aboriginal peoples have their origins in the historical events and processes that followed Australia's colonisation. Clearly, the history of Aboriginal peoples and their relationship with non-Aboriginal Australia since 1788 is complex and cannot be dealt with in detail here. What is intended is a brief overview of history since colonisation, with a prime focus on its legacies for the health of Aboriginal children. Accordingly, the circumstances described below apply generally to the Aboriginal population, although the lived experience through time will be different in each family group and community. Further, this section presents only a cursory summary of Aboriginal culture as a scaffold for understanding history and its impact on current circumstance; the complexity of Aboriginal cultures are expertly detailed in other documents, such as texts by Berndt & Berndt and Flood.[80, 81] While the summary here mostly conveys a message of trauma, grief and loss, it is acknowledged that this period is also overwhelmingly characterised by the resilience of Aboriginal peoples and their ability to survive and triumph in extreme adversity.

The available evidence suggests that, prior to colonisation, Aboriginal peoples were free from disease and generally had a balanced diet and good health.[81] Traditionally, Aboriginal peoples were relatively mobile and lived a semi-nomadic, hunter-gatherer lifestyle. Children were cared for and their development was guided by a strong kinship system and a culture that provided a strong sense of meaning, particularly through connection to land.[80]

The arrival of European colonists in 1788 marked the beginning of drastic decline in the health of many Aboriginal groups. The detrimental and traumatic effects on Aboriginal populations were already being felt in the ensuing decades, as frontier settlement pushed into the Australian Aboriginal landscape, leading to violent conflict and dislocation of Aboriginal peoples from traditional country. While violence and acts of genocide are part of the early account of colonisation and had an immediate impact on population size and health, they form one part of the historical legacy. The effects of colonisation on Aboriginal life have been cumulative, inter-generational and pervasive,[28] and have a range of key features,[82] including:

- discrimination and racism
- forced removal of children from families
- dislocation from traditional lands
- violence and genocide
- introduction of new diseases
- imprisonment
- changes in diet
- government policies of control, exclusion and segregation.

European settlers have been attributed with introducing a number of new diseases that had a severe detrimental effect on Aboriginal populations, including measles, tuberculosis, influenza and others. The introduction of smallpox around the time of colonisation had a particularly devastating effect on Aboriginal mortality,[83] although its origins are contested. While smallpox may have not been introduced by European settlers,[84] its spread is likely to have been exacerbated by policies that segregated Aboriginal people with disease from mainstream communities.[20]

There have been dramatic and sustained changes in the diet of Aboriginal peoples over the course of the last 200 years, from the traditional diet that included a balance of lean meat and plant foods high in fibre and carbohydrates to a Westernised diet high in fat, sugar and processed foods.[85] These changes are seen in urban and remote areas: Aboriginal people exploited as cheap labour on cattle stations and missions would typically have food rations with excessive amounts of starch, sugar and meat, and insufficient nutrient value.[83] While traditional food preferences are retained by some Aboriginal people,[85] the population-level shifts in food consumption patterns have resulted in (or at least are heavily implicated in) the high rates of obesity, diabetes, kidney disease and cardiovascular disease seen today.[52]

The high rates of imprisonment of Aboriginal people (especially men) today are among the most alarming statistics of the Aboriginal circumstance. Aboriginal persons are more than ten times more likely to be imprisoned than non-Aboriginal persons,[86] reflecting the enduring nature of Aboriginal disadvantage. However, there is a strong historical context to the nature of Aboriginal imprisonment, as Aboriginal over-representation in all levels of the criminal justice system has been a constant across time. Imprisonment has always been the central tool of punitive action by non-Aboriginal institutions and is consistent with the processes of dispossession and control that are a feature of post-colonial Australia.[87] Prison was originally a foreign concept to Aboriginal peoples and was a punishment that was particularly harsh on Aboriginal men, with ramifications for their own wellbeing and their ability to protect their family and hunt for food.[82]

There are perhaps no better examples of the deliberate and systematic disempowerment of Aboriginal people by white Australia than the suite of legislation enacted (mostly) in the beginning of the 20th Century, following Australia's federation in 1901. Each State and Territory had an Act that aimed to control, and was punitive toward, Aboriginal peoples. The legislation in Western Australia (*Aborigines Act 1905*) was particularly oppressive and openly racist. It established the role of a 'Chief Protector' with legal guardianship over all Aboriginal people.[88]

These policies impacted the lives of virtually all Aboriginal people in Australia in some way.[88] Their effects on the wellbeing of children were direct and unequivocal, as they gave rise to the widespread removal of children from their natural family and traditional lands.[89] The Chief Protector had the ability, through legislation, to systematically remove 'half-caste' children from their families on the assumption that they would have a better life in Western society and to remove other Aboriginal children if they felt it was in their best interests.[88] Wholesale numbers of children were segregated from mainstream society, and placed on reserves and in missions and often subjected to considerable hardships. The policies and practices of forced removal of children has been the subject of a relatively recent landmark national enquiry, which found that up to one in ten Aboriginal children were removed in the first half of the 20th Century.[90] The practices of forced separation became less common in the 1970s, coinciding with the repeal of legislation such as the aforementioned *Aborigines Act 1905* and a policy shift toward self-determination.

The effects of forcibly removing children from their natural families have been profound and enduring. This was made poignantly clear in the stories contained in the *Bringing Them Home* report, which linked forced removal to trans-generational trauma, feelings of helplessness, and loss of control in the lives of Aboriginal people and placed these realities into the public consciousness.[90] The first-hand accounts in this report are now supported by empirical evidence. Those who were forcibly removed as a child have poorer overall health[91] and higher rates of psychological distress.[92] Furthermore, the current generation of children are more likely to have emotional and behavioural difficulties if they have a family history of forced separation.[93]

The issues of violence, imprisonment, control, segregation and forced removal from family and traditional country, discussed above, have been in part fuelled by a persistent undercurrent of racism in Australian society. Racism in its various forms is still evident today,[35, 94] although it may manifest in more subtle ways. For example, providing culturally inappropriate or insensitive public services can exclude Aboriginal people from accessing, for example, effective health care—this is a form of institutionalised racism that would be more likely to take the form of outright refusal of entry in past generations. This is one way in which racism in contemporary Australian society influences the state of Aboriginal health[95, 96] and reinforces existing socioeconomic disadvantage.[97, 98] These features of society reflect an ongoing lack of trust between Aboriginal and non-Aboriginal peoples, and are a barrier to the process of healing and reconciliation in Australia.

Racism and the cumulative effects of historical legacies are implicated in the stress profile of Aboriginal peoples today, which is unique in its occurrence and distribution. Stress has been shown to be highly prevalent across the spectrum of Aboriginal society today, impacting those with low and high status alike.[35] The stresses that are faced by children commonly include serious events such as the death of a close family member.[82] Stress events such as these, if they occur often enough in early life, can have a damaging effect on the developing brain of a child and alter the functioning of important bodily systems, with negative consequences for health throughout life.[99] At the same time, stress can also affect the ability of adults to perform their role as parents in addition to disrupting community cohesion and the wider supports for optimal child development.[100]

In summary, and as expressed by Mitchell, “for most of the last two centuries, white Australia has been bad for Indigenous Australia’s health.”[83(p42)] The effects of the historical legacy extend to all dimensions of the holistic notion of Aboriginal wellbeing, including psychological, social, spiritual and cultural aspects of life and connection to land. These all impact on and shape the development of Aboriginal people and increase risks for child health and developmental problems from the very early stages of life. There are danger signs even prior to conception, with future mothers in poor health[94] and at an increased risk of substance use.[101] While policies and culturally competent processes are evolving to appropriately and effectively meet the needs of Aboriginal people, the rate of change is still unacceptably low. Fresh insights are needed in research, policy and practice settings, and this, unequivocally, needs to be grounded in an appreciation of history. It is clear that there is a genuine desire in Australian society to achieve the government's "closing the gap" goals[47]—but to achieve health and economic equity there must be an equality of respect and tolerance, and an acknowledgement of difference.

2.6 Conclusion

This chapter has highlighted that the colonisation of Australia by white settlers in the 18th Century has had a detrimental effect on the health of its Indigenous occupants. The effects are persistent over time—extending to the present day—and reflect a history of profound dispossession, exclusion, discrimination, marginalisation and inequality, in various forms. The vicious cycle between these experiences and inequalities across the spectrum of health and social conditions has served to perpetuate the disadvantage faced by Aboriginal Australians. The ongoing effects of colonisation appear to have been particularly harmful to the social and emotional wellbeing of Aboriginal Australia and have created a burden that can extend across generations of Aboriginal families.

I have outlined that historical circumstances that are unique to Aboriginal peoples have had an enduring effect on the health status of Aboriginal populations today. This history provides a context for us to understand the complex set of factors that affect Aboriginal health but does not reveal the scope of present-day health determinants, the relationships between them, or their relative contributions to health outcomes. What are the most salient drivers of Aboriginal population health, including child health? Are the key drivers of the health of mainstream populations also relevant in Aboriginal populations?

CHAPTER 3

WHAT SHAPES THE HEALTH AND DEVELOPMENT OF ABORIGINAL CHILDREN?

3.1 Introduction

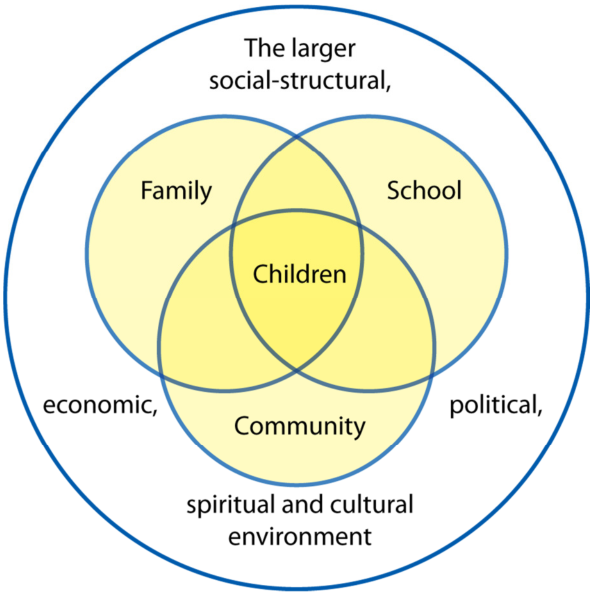
It was suggested in Chapter 2 that contemporary Aboriginal population health needs to be understood in the context of a history of dispossession, exclusion, discrimination, marginalisation and inequality. In addition to historical events and the role of heritage and culture, the health of Aboriginal peoples is shaped by a range of social and economic determinants. This chapter is the second (of two) background chapters to the thesis. It describes the factors and processes that influence the health and development of Aboriginal children using a broad framework for human development. The chapter then focuses on the core health determinants of interest in this thesis: socioeconomic factors. The theoretical underpinnings of the relationship between socioeconomic status (SES) and health are described, along with the existing viewpoints on this relationship in Aboriginal contexts. The empirical evidence on the SES-health relationship in Aboriginal populations is then reviewed. It should be noted that the scope of the review has been extended beyond children, to include all age groups, as the literature on children was negligible.

3.2 Background

3.2.1 Early development in the course of human development

Healthy development in early life is important for all children. The empirical literature now provides abundant evidence confirming that a child's developmental pathway shapes the subsequent course of their life. Child development is influenced by processes that take place prior to conception, in utero, infancy and beyond. Exposures in the earliest stages of life—such as the effects of maternal drug use, for example—can affect early brain development and play a critical role in shaping health prospects and life chances into adulthood.[4]

The evidence-base supporting healthy child development has been built-up over the course of decades, from research fields as diverse as neurobiology, psychology and social sciences, and confirms that children and their development have many spheres of influence—as depicted in Figure 3.1. A child's immediate family and the household environment have the most direct impact on their development, although extended family networks, schools, formal services, neighbourhood characteristics and elements of the broader social, economic and political society, can all impact on a family's ability to provide the necessary support to a child's development.[102, 103]



Source: Reproduced from Jessor.[102]

Figure 3.1: Children within contexts of influence.

The experiences of children at home and in daycare from birth to age of entry into kindergarten play a substantial role in their development, particularly in early cognitive and language development and in emotional and behavioural regulation. Young children who are well nurtured do better in school and develop the skills needed to take their place as productive and responsible adults.[104]

Understanding the relationships between the factors that influence child development and their timing is important if communities and governments are to take appropriate action to ensure a fair start for all children. Nurturing children in their early years is vital for attacking the worst effects of disadvantage. Governments around the world are now seeking better ways to re-invest in their human service infrastructure to better meet the needs of children in order to bring about population-level improvements in health and human capability. The emerging consensus is that the greatest gains in overcoming disadvantage are likely to be achieved through universal preventions which give all children a better start in life. This is the preferred policy approach to reducing poverty, advocated by international agencies such as UNICEF and the World Bank and this approach has been termed 'human development through early child development'.[105]

Human development is broadly about expanding human capabilities, so that individuals can participate economically, socially and civically and choose lives that they value. Childhood is centrally located in models of human development, as it represents a critical period where skills are acquired and accumulated for benefit throughout the lifecourse. In the progression from childhood onwards there is a general consensus of evidence that human capability is optimised when individuals:

- are able to regulate their emotions
- are able to engage in exploratory behaviour
- are able to communicate effectively
- are self-directed
- have intellectual flexibility
- possess some degree of introspection, and
- possess self-efficacy in meeting life's challenges.

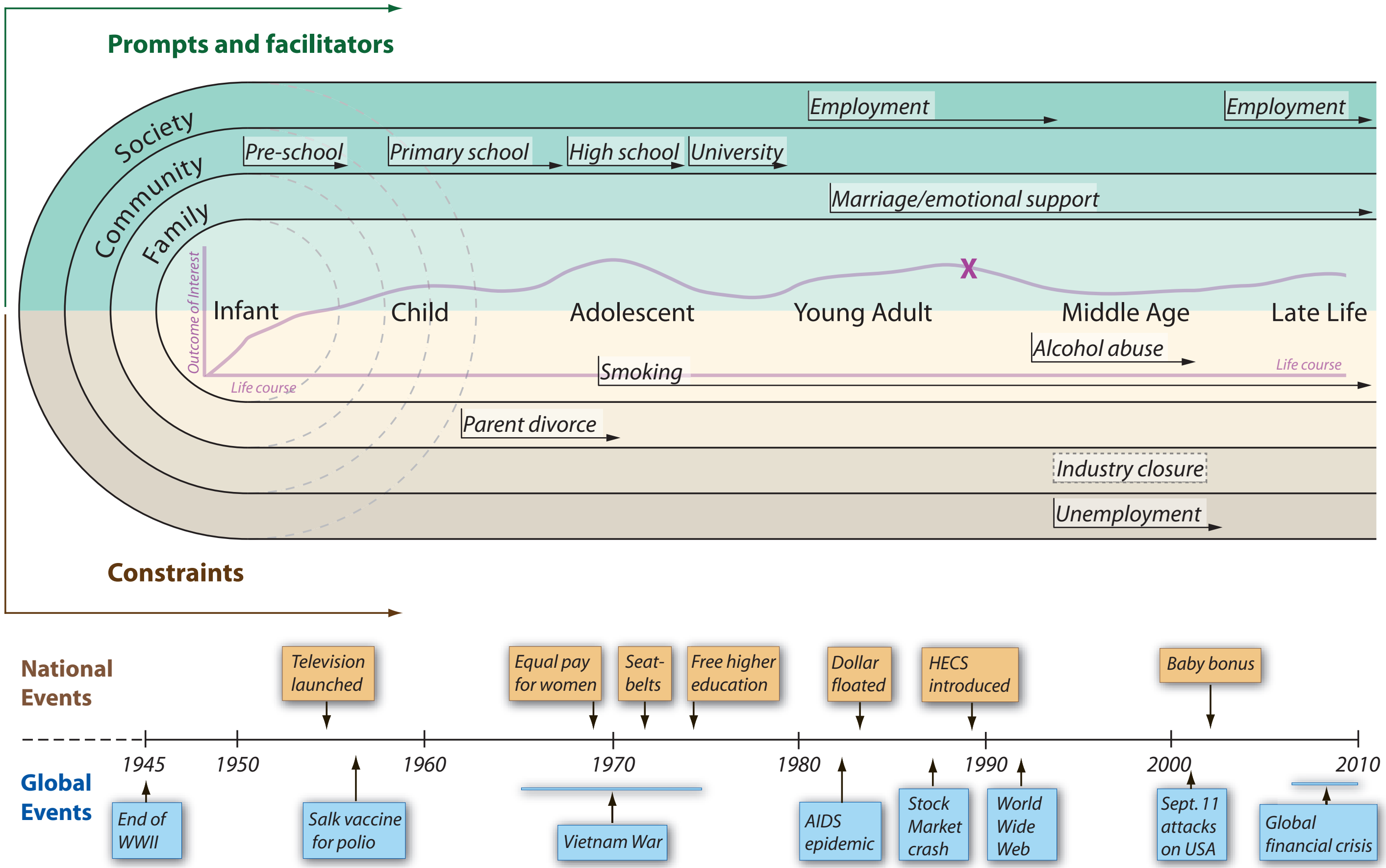
How these seven 'strengths' develop in childhood are critical in enabling onward capability—in essence, those that start at a low 'threshold' are likely to lose opportunities for further development at later stages in life.[106]

Quite importantly, the evidence in the child development literature supports a relatively *small* set of mechanisms that change developmental strengths. These mechanisms work in one of three ways—they either prompt, facilitate or constrain the development and maintenance of strengths:

- Developmental 'prompts' are particularly critical in the initiation of the acquisition and accumulation of skills. The developmental prompts of these skills include biology (including genes), expectations (socialisation), and opportunities (social structure and resources).

- Developmental 'facilitators' increase leverage from developmental prompts. These facilitators include: at least average intelligence; an easygoing temperament; emotional and other support in the face of challenge; and good language development.
- Developmental 'constraints' are those influences that impede or diminish the effects of the prompts or interact with the facilitators. These constraints include multiple accumulative stress, 'chaos' (i.e. war, social upheaval) that prevents the establishment of developmental stability, social inequality, and social exclusion.

It should be noted that these mechanisms operate similarly among Aboriginal and non-Aboriginal children, albeit in vastly different population contexts. They also operate across the lifecourse. Figure 3.2 offers a lifecourse perspective on child development in the context of a selection of global and national events from 1945 to present, and highlights the variation in a hypothetical outcome of interest from birth to late life. The outcome could take many forms including specific health conditions, general health status, mental health, and any of the developmental strengths cited above. The variation in the outcome of interest can be thought of as the variation in the lifecourse of an individual life or as a time series of the population estimate over the relevant period. The occurrence of parental divorce, the onset of smoking and alcohol abuse, the sudden closure of an industry and unemployment are included as examples of exposures of interest. All of these exposures (and the outcome) can be influenced by broader, macrosocial factors—these include global and national events that occur over time, such as the introduction of free higher education in the 1970s or the emergence of the World Wide Web in the 1990s.[107]



Source: This figure has been reproduced, with modifications, from Zubrick et al.[107] It is reprinted with permission of the Australasian Epidemiological Association (see Appendix D).

Figure 3.2: Child development in the context of the lifecourse.

3.3 Theoretical frameworks linking SES and health[1]

As noted in the previous section, social factors feature prominently in theoretical frameworks of healthy child development. Their role in determining health has been discussed and acknowledged for centuries.[108] There is now a robust international literature that supports the notion that health inequities are the result of factors and processes that fall outside of the conventional domains of health. They are heavily influenced by the structures of society and the social conditions in which people grow, live, work, and age—or what are now popularly known as the 'social determinants of health.'[2]

The pattern of association between social class (or status) and health is typically characterised by poorer health for those at lower levels of the social hierarchy[69, 109]—that is, health outcomes follow a social gradient. Importantly, social gradients reflect more than differences between the high and low ends of the distribution—at any point along this continuum, people will tend to have poorer health than those above them (Figure 3.3). This observation is not limited to a subset of measures, but extends to most measurable socioeconomic constructs (such as poverty, employment, occupational status, education, housing, and income)[2] and across a range of health outcomes (including most aspects of physical and mental health).[109, 110]

Despite the ubiquity of these observations, providing an explanation for the social gradient has proven to be a challenge.[111] Researchers continue to shed light on the pathways to disease and poor health, and how these can differ between population groups. In particular, there is growing understanding of how psychosocial factors and the social environment (in addition to poor material conditions and health-related behaviors) can affect physical and mental health and resultant longevity.[2, 112]

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[1] Material in Sections 3.3–3.5 has been reproduced from the following published paper, with permission (see Appendix D): Shepherd CCJ, Li J, Zubrick SR. Social Gradients in the Health of Indigenous Australians. Am. J. Public Health. 2012; 102(1):107-117.

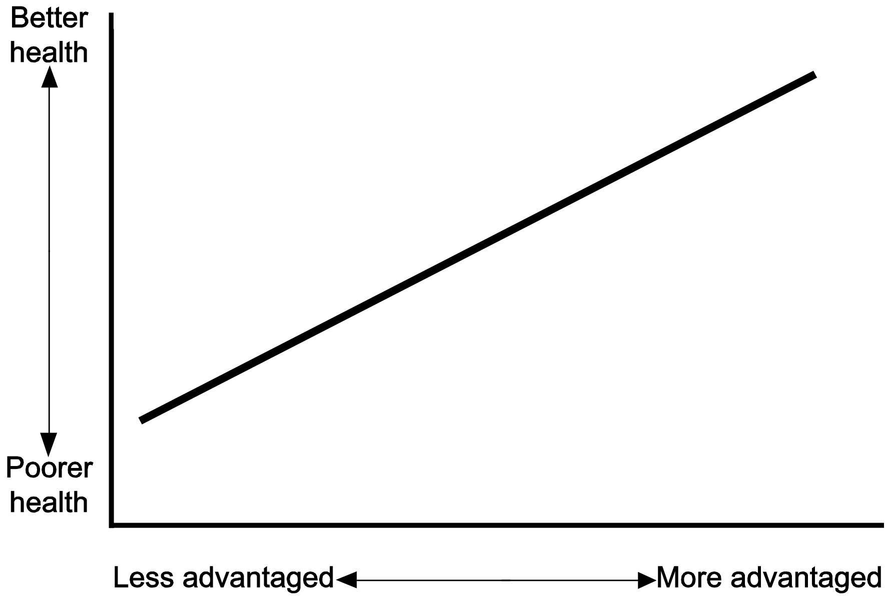


Figure 3.3: The social gradient.

Krieger outlines three causal frameworks that underpin the relationship between social inequalities and health outcomes, each with a different emphasis on social and biological factors.[113] Psychosocial theories focus primarily on factors in the social environment that influence susceptibility to disease and illness; they point to stress as the link between lower perceived social standing and behaviors and choices that pose a risk to health.[114] Theories of the social production of disease place greater emphasis on economic and political determinants, where the most important influences on health tend to be more distal factors that shape material wellbeing and principally have an indirect effect on health outcomes. Ecosocial theories and frameworks attempt to integrate theories of the social production of disease with biological explanations of disease by considering the dynamic interrelationship among social, biological, and ecological attributes and their joint and cumulative impact on health.[113] Although social gradients are clearly implicated in these theories and frameworks, no single theory accounts for the graded relationship between SES and health.[115]

3.4 The relationship between SES and health in an Aboriginal context

Amid the theoretical frameworks and emerging evidence, there is uncertainty whether the social gradients observed in the general population hold true for Aboriginal populations.[8, 9, 63, 116] Aboriginal status is typically used as a covariate to explain differences in population health by SES, and scant attention has been paid to the potential moderating effect of Aboriginal status on the SES–health relationship. Moreover, there are inherent difficulties in comparing Aboriginal outcomes across SES levels. Key among these is the over-representation of Aboriginal peoples in the lower levels of all constructs of SES, which reduces statistical power for comparing outcomes across SES levels and potentially obscures the nature of the SES–health relationship.

A recent study highlights that socioeconomic variables (such as weekly cash income, source of cash income, and completed years of schooling) explain between one third and one half of the gap in self-assessed health status between Australian Aboriginal and non-Aboriginal people.[117] Although socioeconomic factors assume some significance in explaining these health disparities, they do not necessarily account for health differences within Aboriginal population groups.

Nevertheless, there is a theoretical basis for expecting that the association of traditional SES indicators with health will be different in an Aboriginal context. First, exclusion and discrimination, which are implicated in the production of relatively flat gradients among African American populations in the United States,[10] are often entrenched in the lives of Aboriginal peoples[50] and may limit the health benefits that normally accrue from improved SES (or lead to lower SES which, in turn, has a detrimental impact on health and wellbeing). Second, profound marginalisation, which many Indigenous cultures have faced over generations, can constrain human development, placing children at a disadvantage from the earliest stages of life and limiting the acquisition of skills that can be drawn upon for the benefits of health at every level of SES. Third, there may be social factors other than SES that exert a greater influence on Aboriginal health, including the wellbeing of the community and kinship network, cultural continuity, and connection to traditional lands that enables

Aboriginal people to maintain spirituality central to the Indigenous notion of health.[11-13]

Knowledge of possible differences in the relationship between SES and health in Aboriginal populations has clear ramifications for both research and policy. For research, this knowledge will help broaden the scope of the field of social gradients in health with the recognition of social factors that may play a critical role in Aboriginal health but fall outside the traditional domains of social determinants of health. For policy, this knowledge can lead to more effective government decision-making. In Australia, for example, both federal and state governments have committed to closing the gap in key health and social indicators between mainstream and Aboriginal populations within a generation.[47] Although a worthy aspiration, this commitment is in part predicated on the assumption that the relationship between policies governing education, employment, and income transfers, on the one hand, and health outcomes, on the other, operate similarly in the Aboriginal and non-Aboriginal populations. If, in reality, there is a weak association between education and health among Aboriginal populations, then government investment in education, although generally beneficial, is unlikely to result in a significant improvement in Aboriginal population health or a substantial reduction in health disparities between Aboriginal and non-Aboriginal peoples. The implications in this scenario are that marginalised Aboriginal populations are likely to get “trapped” in poor health and that the policy expectation is unachievable unless efforts are devoted to addressing other, more salient, drivers of ill health.[118]

3.5 Review of existing literature

This review seeks to assess the evidence for the direction and strength of the relationship between SES and Indigenous health—with an emphasis on social gradients in health—and to comment on their potential implications for onward research and policy. I focus on research on Australian Aboriginal populations, which provide the most robust evidence base for the examination of this topic.

3.5.1 Definition of Indigenous status

In the context of this review, it is important to recognise that there is no globally accepted definition of what constitutes an “Indigenous” population. Nor is there agreement on whether a definition is even needed. The current view of the United Nations is that “a single definition will inevitably be either over- or under-inclusive, making sense in some societies but not in others.”[119(p6-7)] Self-identification is therefore seen as a more relevant means of determining the Indigenous status of an individual.[120, 121] However, despite the ongoing debate, there is general agreement on the core aspects of the concept of “Indigenous.” Most agree that Indigenous communities and peoples are those that:

1. demonstrate historical continuity (and have occupied land) prior to colonisation or invasion;
2. consider themselves distinct from the societies that now prevail on ancestral land;
3. have a distinct culture and language;
4. tend to form nondominant parts of society and have a unique geographic dispersion; and
5. preserve and maintain their ancestral land and culture.[50, 121, 122]

This description applies to hundreds of separate cultures, incorporating approximately 370 million people across 90 countries.[119]

3.5.2 Search strategy and selection criteria

I used a variety of information sources, including major citation databases and relevant Web sites (data providers, academic institutions, and reference sources). Searches were limited to articles published in April 2010 or earlier and were conducted with no language restrictions.

ISI Web of Science and OVID platform databases (MEDLINE, EMBASE, Global Health, and PsycINFO) were the prime sources of academic literature. Generic keywords for the target population group included “Indigenous,” “Aboriginal,” “Aborigines,” and “Torres Strait Islander.” Population keywords were linked with a combination of subject matter terms, such as “gradient,” “social gradient,” “health inequality,” "socioeconomic," "socio-economic," "determinant," "social status," "social class," and "health."

I accessed the substantial body of gray literature on Aboriginal health issues via the Indigenous Australian Health*InfoNet*, a range of index databases on Informit and other relevant Web sites. Consultation with experienced Aboriginal health researchers netted a number of other relevant published reports and unpublished work.

I included studies in the review if they (1) featured an examination of the relationship between at least one socioeconomic factor (preferably with at least three categories) and a health outcome, health risk factor, or health care action (i.e., seeking or accessing health care); (2) included some quantitative assessment of this relationship; and (3) described this relationship within an Aboriginal Australian population group.

I focused on the nature of the association between health and SES and considered the direction of the association, the statistical significance of the original study findings, and, to a lesser degree, effect size. I present results as reported in the original study. The wide range of health (outcome variables) and socioeconomic variables (main predictors) used in eligible studies precluded use of formal meta-analytic techniques. Instead, I provide a narrative synthesis of review findings, supplemented with an aggregate overview of effect estimates.

3.5.3 Review findings

Search results

The electronic search of ISI Web of Science and OVID platform databases identified 774 articles. After screening titles and abstracts, I identified 61 articles as potentially relevant; nine satisfied the criteria for inclusion in this review, three of which duplicated the findings of another study. I included another nine articles after an electronic search of sources of Aboriginal research and gray literature. One article was sourced from the library of the researcher.[93] After I removed duplicates,[123-125] a total of 16 studies, reports, and books satisfied the criteria for inclusion in this review. Data on each study's design, sample, measurement of SES and health, and results are summarised in Table 3.1.

Population groups and study designs

Most studies had at least one methodological limitation relating either to study design, scope, sample size, or analytic techniques. The majority of the study samples consisted of over 1000 Aboriginal people (14 studies, or 88%) and, typically, were representative of populations of Aboriginal and Torres Strait Islander peoples at a national (ten studies) or State or Territory (three studies) level.

Seven studies examined outcomes for all adult age groups and five focused on children. Four studies examined outcomes for all age groups. Differences in target populations may be a source of heterogeneous results, as the literature suggests that the strength and shape of social gradients differ by age group.[69]

All studies used a data source with an observational design and most (13 studies) were cross-sectional, with two cohort studies (both retrospective) and one ecological study. The ecological study in this review was limited to assessing the associations between SES and health at an aggregate geographic level. Many of the cross-sectional data sources used in review studies have considerable breadth, and although their designs are unable to discount reverse causation, they enable adjustment for covariates in the analysis of SES–health relationships. Five cross-sectional studies adjusted for the effects of demographic (e.g. age and gender) and other known covariates (e.g. health service access and health history),[91, 93, 126-128] whereas two adjusted for demographic variables only.[129, 130] Only one of the two cohort studies accounted for covariates.[131] In the context of this review, it is important to note that overall only two studies assessed the impact of cultural factors in mediating the relationship between SES and health.[91, 93] Hypothetically, multivariate analyses of variables that measure intrinsic characteristics of an Aboriginal culture can help to determine whether an observed social gradient is attributable to that culture or explained by more generic forces. In contrast, nine studies (56%) exclusively examined bivariate relationships between SES and health variables using simple cross-tabulation or correlation techniques; studies from the gray literature were more likely to solely use these techniques (70%) than those sourced from the academic literature (33%).

Health outcomes

Because a number of studies reported multiple outcomes, the 16 in-scope studies provided findings on 60 separate associations between SES and health. Most of these associations (42, or 70%) examined a health outcome, with 13 (22%) focused on a health risk factor and five (8%) on a health care action measure. Health outcomes were predominantly an aspect of physical health (40 associations) as opposed to mental health (two associations).

Many (62%) of the health outcome measures were derived from self-reports, which included measures of general health, disability and long-term illness, respiratory problems, gastrointestinal infections, arthritis, diabetes, kidney disease, cancer, back pain, hearing and sight limitations, mental health, and problems with heart and circulatory system. Many of the health measures were simple indicators of the presence or absence of a disease or an event and did not include any information on severity, duration, or age of onset or occurrence.

Socioeconomic status measures

The studies identified by this review used a wide range of SES indicators, including those that measure the SES characteristics of individuals (seven studies), families and households (seven studies), and neighborhoods and communities (six studies). Few studies examined multiple SES indicators simultaneously, and only one used a multilevel framework to adequately measure the effects of SES at various levels.[93] I note that most (n=10) in-scope studies used only indirect markers of material wellbeing (e.g. education and labor force status) and two focused solely on absolute measures (e.g. income and home ownership); four studies made use of both types of measures.

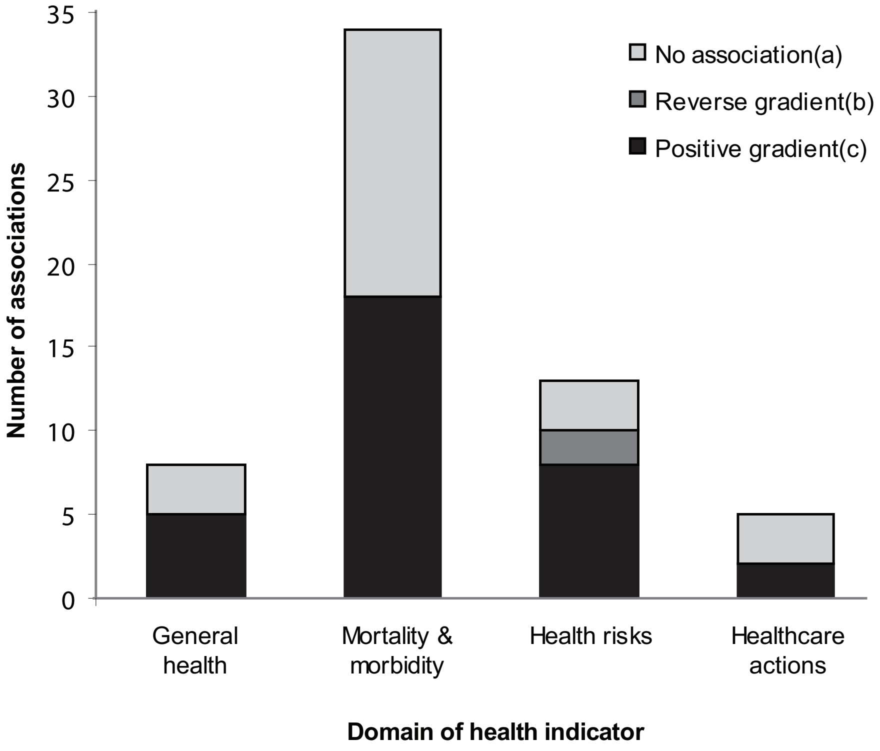
Evidence of social gradients in Aboriginal health

The majority of studies (ten of 16) reported a positive gradient in some aspect of health—that is, better health was associated with higher SES. Two studies highlighted a U-shaped relationship between education and health. Three studies found, exclusively, no relationship between health and SES, and two reported inconclusive evidence (e.g. a trend that was not statistically significant).

There were 33 separate associations that exhibited a statistically significant positive gradient. Most of the associations with general health (62%), health risk factors (62%), and indicators of mortality and morbidity (53%) displayed a positive gradient. Only two of the five effect estimates for health care actions (40%) were in a positive direction (Figure 3.4).

The majority of estimates based on multivariate regression models exhibited a positive gradient (61%)—that is, a positive effect remained after control for at least one additional variable; adjusting for additional variables generally diluted the strength of the association between SES and health—or 'flattened' the social gradient. In comparison, 51% of bivariate associations displayed a positive gradient.

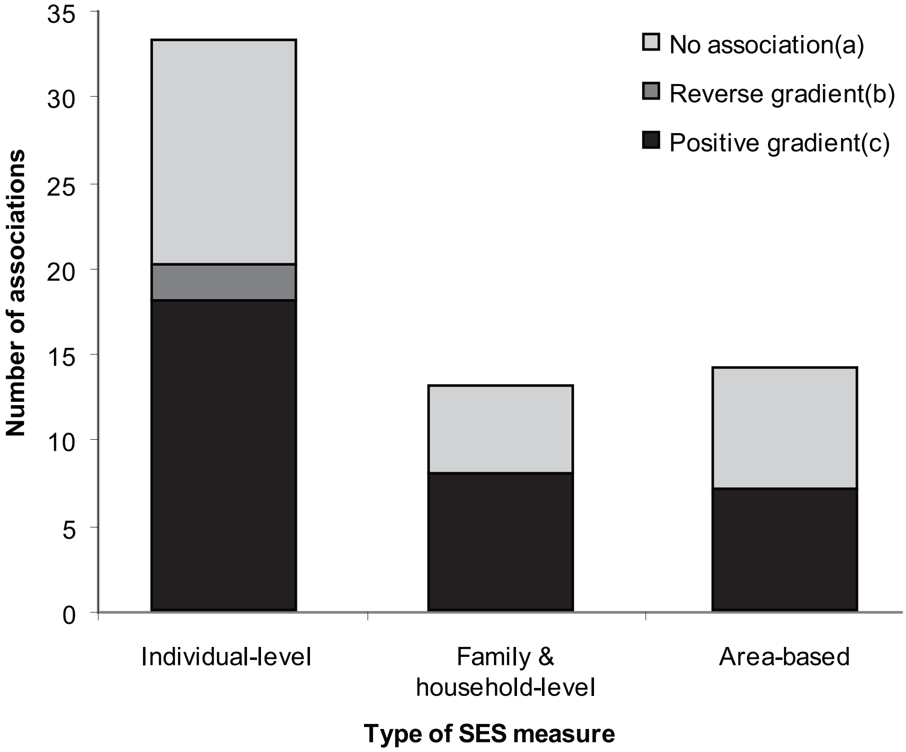
Objectively measured health variables more commonly revealed a positive relationship with SES (69%) than self-reported measures (52%).



(a) Includes cases where no relationship was found between SES and health, the trend was not statistically significant, or there were too many methodological limitations to support definitive conclusions. (b) Better health was associated with lower SES. (c) Better health was associated with higher SES.

Figure 3.4: Nature of the associations between SES and health in Australian Aboriginal populations, by domain of health indicator.

There is evidence to suggest that social gradients in Aboriginal health exist at all three levels of SES: individuals, families or households, and neighborhoods or communities (Figure 3.5). When no association was found between SES and health, the SES indicator was more often an indirect marker of material wellbeing than an absolute measure.



(a) Includes cases where no relationship was found between SES and health, the trend was not statistically significant, or there were too many methodological limitations to support definitive conclusions. (b) Better health was associated with lower SES. (c) Better health was associated with higher SES.

Figure 3.5: Nature of associations between SES and health in Australian Aboriginal populations, by type of SES measure.

3.5.4 Summary of original study findings

I provide a narrative synthesis of review findings in this section, using original study results.

General health

Four studies examined general health status, with all using a self-rated measure.[91, 129, 132, 133] Three studies found a positive relationship with SES for adults, which included measures of education, labor force status, and home ownership.[91, 132, 133] The evidence for household income was weaker. Gray et al. showed that Aboriginal persons in high-income families generally had slightly better health after adjusting for age, although the differences were not statistically significant.[129] The results of Cunningham et al. also highlighted a positive gradient with household income, although this association was attenuated after adjustment for demographic, socioeconomic, and cultural factors.[91] In summary, although self-rated general health is consistently associated with education, labor force status, and home ownership, the evidence for household income is inconclusive.

Mortality

Two studies examined indicators of mortality, with both finding a positive association with area-based measures of SES.[134, 135] One study examined administrative mortality data across four States and Territories of Australia; it found that Aboriginal people living in the most disadvantaged areas had higher death rates than Aboriginal people living in the least disadvantaged areas: 1.5 times higher (P<.001) for males and 1.6 times higher (P<.001) for females.[134] The other study focused on life expectancy and reported a positive association (although not a continuous gradient) in bivariate analyses.[135]

Physical morbidities and birthweight

Three studies used nationally representative samples to examine disability and long-term health conditions in adults, with mixed results.[132, 133, 136] There was no association with self-reported household income in a study by Hunter.[136] One study found a positive gradient with labor force status[132]; another suggested that labor force status was largely unrelated to the presence of disability or a long-term condition, although these findings are suggestive of variation by gender and geographic location.[136] One study reported a generally positive gradient by education, although those with a nonschool qualification had an elevated likelihood of this outcome relative to those who had only completed their secondary schooling.[132]

Two studies examined kidney disease, with both finding a positive association.[133, 137] Registry notifications of end-stage renal disease were strongly correlated with household income (r=0.71, P<.001), overcrowding (r=0.84, P<.001), and a composite index of relative disadvantage (r=0.88, P<.001) in an ecological study.[137] A national cross-sectional survey highlighted that the self-reported prevalence of this relatively uncommon outcome was higher among those not engaged in the labor force (4.1%; 95% confidence interval [CI]=3.0%–5.2%) than among employed adults (1.7%; 95% CI=1.1%–2.3%).[133]

The two studies on ear and hearing problems were inconclusive.[128, 133] One study found the prevalence of self-reported ear and hearing problems to be similar across labor force status categories in a simple cross-tabulation.[133] The other study showed that both the occurrence of recurring ear infections (parent reported) and hospital admissions for ear infections (objectively reported) had a weak positive association with area-based SES in multivariate analyses, although the effects were statistically insignificant.[128]

The two studies that examined diabetes showed consistent evidence of a positive gradient.[126, 133] Cunningham et al. demonstrated strong associations between an objective test of diabetes and self-reported measures of housing tenure, household income, employment status, and an area-based index of disadvantage among urban Aboriginal people in the city of Darwin, and a weaker, statistically insignificant, positive association with education.[126] The broader, national study of the self-reported prevalence of diabetes highlighted a positive gradient with labor force status.[133]

Two studies examined respiratory infections and conditions, with mixed results.[128, 133] A large study of Aboriginal children in the State of Western Australia showed a positive, but not continuous, gradient between area-based SES and the prevalence of both parent-reported recurring chest infections and objectively reported hospital admissions for non-wheezing lower respiratory infections; no association was found with hospital admissions for either upper respiratory infections or wheezing lower respiratory infections.[128] The other study reported no association between asthma and labor force status in a nationally representative sample of Aboriginal adults.[133]

One study examined oral health and highlighted a positive gradient among Aboriginal children in the Northern Territory of Australia.[138] The study analysed the number of decayed, missing, and filled teeth in the deciduous and permanent dentition of children aged four to 13 years on the basis of dental examinations, with consistent patterns in the bivariate relationship with area-based SES.[138]

The single study on gastrointestinal infections was inconclusive.[128] Although it showed a positive association with an area-based index of disadvantage, the pattern was neither continuous nor statistically significant.[128]

The single study on birthweight was inconclusive.[131] This study used data collected at a large urban hospital and lacked sufficient power to compare values across the full spectrum of SES. Although it reported a lower mean birthweight for babies in families living in the most disadvantaged areas (for lowest quintile, mean=3101g; 95% CI=2868g–3333g) compared with all others (mean=3413g; 95% CI=3254g–3572g), the finding was not statistically significant.[131]

The evidence for other physical morbidities was sourced from a single study.[133] This national study focused on the labor force status of Aboriginal adults and reported a positive gradient for self-reported arthritis, eye and sight problems, and heart and circulatory problems; inconclusive evidence for back pain and problems; and no association with the relatively rare outcome of cancer.[133]

Mental health

The single study on mental health was inconclusive.[93] There was no association between parental education and a child being at high risk of clinically significant emotional and behavioral difficulties. There was a positive gradient for family financial strain that was mostly explained by demographic factors, the physical and mental health status of the primary caregiver, and exposure to people experiencing problems with alcohol.[93]

Health risk factors

Four studies assessed the relationship between SES and smoking,[130, 132, 133, 135] three of which showed a consistent positive gradient with self-reported smoking status.[130, 132, 133] Two of these studies applied different analytic techniques to the same nationally representative data source and revealed that unemployed persons and those with less education were the most likely be smokers.[130, 132] One study showed a general trend for higher rates of smoking during pregnancy among those living in more disadvantaged areas, although the statistical significance of the effect was not reported.[135]

Both of the studies that examined alcohol consumption found the lowest prevalence of risky alcohol consumption among adults who were not engaged in the labor force, suggesting a reverse association between this behavior and SES.[132, 133]

One study calculated body mass index based on self-reported height and weight and found that the prevalence of overweight or obesity was unrelated to labor force status in a simple cross-tabulation.[133]

Health care actions

Two studies examined health care actions, with mixed results.[127, 133] One study found a U-shaped relationship between (1) any of eight health care actions taken for children and (2) the education of the mother after controlling for demographic factors, health status indicators, and objective measures of health service access. In this study, health care actions were highest among Aboriginal children whose mothers had less than 14 years (odds ratio [OR]=1.6; *P*<.05; reference category=14 years) and 17 or more years (OR=1.4, *P*<.05) of formal education.[127] The other study assessed four separate actions among Aboriginal adults in bivariate analyses and found that persons in the labor force were more likely than others to have been admitted to a hospital and to have visited a general practitioner or specialist; there was no association between visiting a casualty–outpatient service or a dentist and this measure of SES.[133]

The impact of cultural factors

Only two studies assessed the joint impact of cultural factors and SES on health,[91, 93] and they reported contrasting results. Cunningham et al. broadly showed that cultural factors affected the general health of Aboriginal peoples in Australia above and beyond the effects of SES. Identifying with a clan, tribe, or language group appeared to be protective of health for males, whereas recognising an area of land as traditional country or homelands (among males only) and being taken away from the family as a child (among females only) were associated with worse health.[91] Zubrick et al. highlighted that the mental health of Aboriginal children in the State of Western

Australia was not independently associated with either SES, the language spoken by the primary caregiver, or children's participation in cultural activities.[93]

Table 3.1: Summary of results from studies examining the relationship between health and socioeconomic status (SES) in Australian Aboriginal populations.

Authors and Year of Publication	Study Type	Year of Study	Aboriginal Sample Size[a]	Scope (Age)	Outcome Variables	SES Variables	Pattern of Association Between SES and Health[b]
Cass et al., 2004[137]	Ecological	1993/98	36 areas	All ages	End-stage renal disease (registry notifications)	Area-based measures (unemployment; household income; overcrowding)	Positive gradient[c]
Cunningham et al., 2008[126]	Cross-sectional	2003/05	777	15–64	Diabetes (oral glucose tolerance test)	Housing tenure; household income; employment; education	Positive gradient; inconclusive with one SES measure[d]
Cunningham et al., 1997[91]	Cross-sectional (secondary analysis)	1994	8782 (nationally representative)	≥15	General health (self-rated)	Labor force status; home ownership; education; household income	Positive gradient; inconclusive with one SES measure[d]
Glover et al., 2004[134]	Retrospective cohort	1997/99	4378 (total population data in 4 States/ Territories)	All deaths	Mortality (registrations)	Area-based measure (relative disadvantage)	Positive gradient[c]
Gray and Boughton, 2001[127]	Cross-sectional (secondary analysis)	1994	15700 (nationally representative)	0–14	Health care actions (self-report)	Parental education	U-shaped
Gray et al., 2002[129]	Cross-sectional (secondary analysis)	1995	1536 (nationally representative —nonurban areas)	All ages	General health (self-rated)	Household income	Inconclusive
Oddy et al., 2008[128]	Cross-sectional (secondary analysis)	2000/02	5289 (representative of WA)	0–17	Chest, ear, and gastrointestinal infections and hospitalisations (self-	Area-based measure (relative disadvantage)	Mixed findings (chest and gastrointestinal

					report and administrative data)		infections); inconclusive (ear infections)[d]
Australian Bureau of Statistics, 2004[132]	Cross-sectional	2002	9400 (nationally representative)	≥15	General health; disability; smoking; alcohol consumption (self-report)	Education; labor force status	Positive gradient (general health, disability, smoking); reverse gradient (alcohol consumption)[c]; some U-shaped associations with education
Australian Bureau of Statistics, 2006[133]	Cross-sectional	2004/05	10439 (nationally representative)	≥15	General health; long-term conditions; health care actions; obesity; smoking, alcohol consumption (self-report)	Labor force status	Positive gradient (general health, some health care actions, smoking, and a range of long-term conditions); reverse gradient (alcohol consumption); no association (asthma, cancer, obesity, some health care actions)[c]; inconclusive (back problems, ear or hearing problems)
Thomas et al., 2008[130]	Cross-sectional (secondary analysis)	2002	9400 (nationally representative)	≥15	Smoking (self-report)	Household income, education, labor force status, financial stress, housing tenure	Positive gradient[d]

Hetzel et al., 2004[135]	Various sources (secondary analysis)	1997/ 2001	Various[e]	Various[f]	Life expectancy (derived measure using death registrations); smoking in pregnancy (self-report)	Area-based measure (relative disadvantage)	Positive gradient (life expectancy); inconclusive (smoking in pregnancy)[c]
Jamieson et al., 2006[138]	Cross-sectional (secondary analysis)	2002/03	4414 (representative of NT)	4–13	Oral health (examination)	Area-based measure (relative disadvantage)	Positive gradient[c]
Hunter, 1999[74]	Cross-sectional (secondary analysis)	1994	3433 households (nationally representative)	≥15	Long-term health problems (self-report)	Household income	No association
Hunter, 2000[136]	Cross-sectional (secondary analysis)	1994	3433 households (nationally representative)	≥15	Long-term health problems (self-report)	Labor force status	Inconclusive
Titmuss et al., 2008[131]	Retrospective cohort	2002	1706	All births	Birthweight (measured)	Area-based measure (relative disadvantage)	Inconclusive
Zubrick et al., 2005[139]	Cross-sectional	2000/02	5289 (representative of WA)	0–17	Mental health (validated measure)	Parental education; financial strain	Inconclusive

Note: WA=State of Western Australia; NT=Northern Territory of Australia.

[a] Numbers refer to persons unless otherwise stated.

[b] A ‘positive gradient’ is defined as better health for those with higher SES (i.e., a positive association); a ‘reverse gradient’ is defined as better health for those with lower SES (negative association); ‘inconclusive’ is defined as a trend or effect that was not statistically significant or a study with too many methodological limitations to support definitive conclusions.

[c] Defined as studies that established a positive association between SES and health in simple bivariate or cross-tabulation analyses, without controlling for other factors or confounders.

[d] Defined as studies that accounted for at least some other confounding (usually demographic) variables in establishing a positive association between SES and health.

[e] Study estimates are generally based on data from government administrative sources and are representative of relevant populations in the State of South Australia.

[f] Life expectancy estimates are based on mortality records for all ages; data for smoking during pregnancy is generally limited to women aged 15 years and older.

3.5.5 Evaluation

My review of the empirical evidence on the relationship between SES and health in Australian Aboriginal populations leads to three primary conclusions. First, there is a dearth of research to date that has specifically focused on this topic and, on the basis of the limited research and varied findings across available studies, I am unable to make strong assertions about the nature and strength of the SES–health relationship. The mixed findings partly reflect the wide array of health and SES measures and a diversity of Aboriginal population groups and analytic techniques within a small number of eligible studies. Second, there is, however, consistent evidence supporting a positive social gradient in mortality, kidney disease, diabetes, and smoking status. This effect was also shown in single studies on arthritis, eye and sight problems, oral health, and heart and circulatory problems. Although general health status tended to exhibit a positive social gradient, the effects were not always statistically significant. Third, there are number of methodological issues that make it difficult to interpret the study results and assess differences between them. There is also the potential that weak gradient effects merely reflect low variability in the distributions of SES and health measures in Aboriginal populations. Overall, the review findings call for continued efforts to improve the quantity and quality of research to provide more insights into the gradient effect (or absence of it) among Aboriginal population groups. The discussion that follows provides more detail on the limitations of review studies, the implications of the findings for policy, and directions for future research.

A dearth of data and research

Our understanding of whether, and to what extent, the social gradient in health exists in Aboriginal Australia is primarily hampered by a scarcity of research. Although there is a need to improve the quantity of data that can be used by researchers to adequately examine this topic, existing data sets have been underused and should be investigated in more detail.

Study limitations and measurement challenges

I have noted that low variability in the distribution of SES and health is a pertinent limitation. Aboriginal peoples are vastly over-represented in the lower levels of all constructs of SES used in review studies. For example, Oddy et al. reported that almost two thirds of Aboriginal children in Western Australia lived in the lowest quartile of disadvantaged areas.[128] Notwithstanding this, some measures of household income and poverty may have underestimated the extent of Aboriginal marginalisation, by not properly accounting for the size and structure of Aboriginal families and households or the nature of sharing of economic resources between extended family members.[140] The skew in the distribution of SES measures in Aboriginal populations can reduce statistical power for comparing outcomes across SES levels, particularly if conventional groupings are used (e.g. quintiles), and potentially obscure the nature of the SES–health relationship. Although this is generally applicable here, a number of review studies are based on population-level data with sufficient power to potentially detect an effect across the full spectrum of SES categories, despite an uneven distribution.

A deeper understanding of the SES–health relationship can be attained by the simultaneous use of SES variables at individual, household, family, and community levels.[66, 110, 141] The importance that Aboriginal peoples place on social connections with family and community, relative to the needs of individuals, suggests that a multilevel analysis that includes SES indicators at a contextual or community level may shed some light on the nature of social gradients in Aboriginal health.

The findings have highlighted that there was often no definitive evidence of an association with self-reported, or subjective, measures of health. Self-reported measures of morbidity have been criticised in the past as being misleading, particularly among socially disadvantaged people who may underreport or understate poor health outcomes.[142] This can give rise to a flatter health gradient compared with results that rely on objective assessments of health.[143] Future studies in this field will benefit from collecting information on both objective and self-reported health measures and comparing the patterns of their association with SES.

There are potentially many pathways through which SES influences health. Most of the studies examined in this review (and research more generally into Aboriginal–non-Aboriginal health inequalities) have not examined the range of psychosocial and environmental factors that define these pathways, or the factors that characterise

Aboriginal cultures.[137] The results of the two review studies that incorporated cultural factors in their analytic framework suggest that they can influence, though not invariably, the relationship between SES and health. Strategies for testing social gradient effects need to consider the conceptual basis on which mediating variables are included in multivariate analyses. Researchers should report the effect of SES on health, with and without mediating factors, so that the total, direct, and indirect effects of SES on a health outcome can be estimated.[143]

Health and social determinants in Aboriginal contexts

In addition to the range of methodological limitations in review studies, there are substantive social, cultural, and historical factors that may contribute to the mixed findings. Aboriginal Australia is not a homogenous group; as Bell states, "Aboriginal Australia is a network of interconnected Aboriginal nations, with their own languages and ways of life."[24(p4)] Health determinants may therefore differ by region or along cultural lines,[11] and these differences may predict variation in health outcomes within each group. Health determinants also differ between Aboriginal and non-Aboriginal populations of Australia,[63, 144] which in part reflects two very different concepts of health. As outlined in Chapter 2, Aboriginal peoples have a holistic view of health, which includes aspects of spirituality, connection to land, and the social, emotional, and cultural wellbeing of the community.[42, 45] Australian Aboriginal peoples tend to ascribe their relatively poor health to broader, "macrosocial" factors.[145] Issues of dispossession and exclusion are key among these, and they extend to traditional land, kinship, language, and culture.[90, 146] Racism is a common thread to Aboriginal people's history of being excluded from many aspects of social, political, and economic life in Australian society, and is being cited more commonly in the literature as having adverse consequences for health.[147] Human rights contraventions are enmeshed in the postcolonial experiences of Australian Aboriginal peoples. Evidence suggests that there is a vicious cycle between human rights and health, particularly for marginalised and minority populations.[148, 149] The health of Australian Aboriginals therefore may have been affected over time—directly by human rights abuses or indirectly by the systematic inequalities that they give rise to. Many of the issues discussed here—dispossession, exclusion, discrimination, marginalisation, and inequality—are implicated in the unique stress profile of Aboriginal populations in Australia. It has been shown that chronic stress is a feature of the lives of Aboriginal people from all social classes,[35] and this may dampen the benefits that higher SES normally generates for health.

The validity of using standard SES measures in Aboriginal contexts has been questioned and is also central to the analysis of social inequalities in Aboriginal health.[64, 150] Income, education, and employment can be decidedly different constructs among Aboriginal peoples (as are notions of health), and this reflects the different social contexts of Aboriginal and non-Aboriginal populations.[71] Social status in more traditional communities may be more a function of knowledge than of material resources, or it may reflect control over resources more than ownership of them.[64] This underscores the need to reconceptualise existing notions of SES to gain a better understanding of the complexities of their relationship with Aboriginal health.[144] Critically, this rethink needs to be fully informed by Aboriginal peoples' views on the concept of health and its determinants. These views may be varied but will most likely represent a complete paradigm shift to existing SES constructs.[150]

The health determinants of Australian Aboriginal peoples need to be considered in light of their unique population distribution. Although most Aboriginal people live in urban settings, they are also far more likely than non-Aboriginal Australians to live in remote and isolated areas. Many of the factors that affect population health are unevenly distributed across areas of geographic remoteness. For example, there tend to be fewer health care services in more remote areas, and a more limited range of job choices. Location is therefore likely to be an important factor that accounts for variations in health within the Aboriginal population.

Limitations to this review

There are a number of limitations to this review. A focus on the published literature may have introduced publication bias, which could potentially overstate the evidence supporting an association between SES and health. The results point to a higher proportion of statistically significant associations in the academic literature (68%) than in the gray literature (47%). I did not compare social gradients between

Aboriginal and non-Aboriginal populations, and this restricts the policy recommendations that can be drawn from specific review study findings.

In addition, this review focused only on studies of Aboriginal Australian health, and the results may not be generalisable to Indigenous populations in other countries. There is certainly evidence of positive health gradients among a number of other Indigenous cultures, including Native Americans and Alaska Natives,[151-155] New Zealand Maori,[156-162] Canadian First Nations and Metis,[163-168] Inuit,[169-173] South American Indigenous groups (Andean culture and Amazon Basin tribes,[174] Mapuche[175] and Tsimane'[176]), Taiwanese Aboriginals[177] and Indian Adivasis.[178] There is also, as I have found in Australia, variation in the available evidence among these Indigenous populations; the US literature, for example, also features inconclusive evidence for measures of birthweight,[179] mental health,[180] general health status,[154, 180] health risk behaviours[153, 181] and health care actions.[182] For further details on the studies cited here (including study design, sample, measurement of SES and health, and results) see Table 3.2. This table also includes the wider range of studies of non-Australian Indigenous populations that match the search parameters outlined in Section 3.5.2.

3.6 Conclusion

This chapter proposes that the health and early development of Aboriginal children can be understood within the parameters of a human development framework. The underlying theory suggests that there is a small set of mechanisms that prompt, facilitate or constrain the health and development of children, and these mechanisms are likely to operate similarly among Aboriginal and non-Aboriginal children. While this theoretical framework, and a robust body of empirical literature, confirms that socioeconomic factors are pivotal determinants of the health of populations, less is known about the relationship between SES and health in Aboriginal contexts. The limited empirical evidence-base suggests that there is a less universal and less consistent socioeconomic status patterning in health among Aboriginal Australians.

There are important implications of improving our understanding of socioeconomic disparities in health within Aboriginal populations. The magnitude and shape of disparities can provide insights into the relative importance of social conditions to health outcomes and may facilitate a better grasp of the complex underlying mechanisms that determine Aboriginal health. This has clear ramifications for policies that aim to improve the health outcomes of Aboriginal populations and reduce the pervasive health disparities between Aboriginal and other populations. Given the dearth of research to date on, and the policy relevance of, this topic, there is a need to improve the quality and quantity of research to provide better insights into the socioeconomic patterning of health outcomes in Aboriginal populations.

Table 3.2: Summary of results from (selected) studies examining the relationship between health and socioeconomic status (SES) in non-Australian Indigenous populations.

Authors and Year of Publication	Study Type	Year of Study	Indigenous Sample Size[a]	Scope (Age)	Outcome Variables	SES Variables	Pattern of Association Between SES and Health[b]
New Zealand Maori							
Pearce et al., 1985[156]	Retrospective cohort	1974-78	2,119	15-64 males	Mortality	Occupation	Positive gradient[c]
Pearce et al., 1993[157]	Retrospective cohort	1975-7 & 1985-7	2,000 (approx.)	15-64	Mortality	Occupation	Positive gradient[c]
Sporle et al., 2002[158]	Retrospective cohort	1975-7, 1985-7 & 1996-97	1,600 (approx.)	15-64	Mortality	Occupation; area-based measure (occupation)	Positive gradient[c]
Tobias & Cheung, 2003[159]	Ecological	1995-7 to 1998-00	15,000 (approx.) deaths[d]	All ages	Life expectancy	Area-based measure (relative disadvantage)	Positive gradient[c]
Tobias & Li-Chia, 2006[160]	Ecological	1999-2003	13,174 deaths[d]	All ages	Life expectancy	Area-based measure (relative disadvantage)	Positive gradient[c]
Ministry of health and University of Otago, 2006[161]	Retrospective cohort	1981-84 & 1996-99	All deaths[e]	25-77	Mortality	Income	Positive gradient[c]
Baxter et al., 2006[162]	Cross-sectional (secondary analysis)	2003-04	2,595	16+	Mental disorders	Education; household income; area-based measure (relative disadvantage)	Positive gradient[c]
Native Americans and Alaska Natives							
Jernigan et al., 2010[151]	Cross-sectional (successive)	1995-96 & 2005-06	2,548 & 11,104	18+	Diabetes; obesity; hypertension; smoking; nutrition	Education	Positive gradient (obesity, hypertension, smoking, nutrition); reverse gradient

							(diabetes)[c]
Pandhi et al., 2010[182]	Cross-sectional	2004-06	975	21+	Cancer screening	Education	Inconclusive
Nepomnyaschy, 2009[179]	Cross-sectional (secondary analysis)	2001	550	All births	Birthweight	Parental education, household income, wealth	Reverse gradient; inconclusive with some SES measures[f]
Gold et al., 2006[152]	Cross-sectional (secondary analysis)	1993-98	631	50-79 females	Morbidity burden	Household income, education	Positive gradient[f]
Giuliano et al., 1998[181]	Cross-sectional	1993	559	18-89 females	Smoking; alcohol consumption; obesity	Education, employment	Reverse gradient (smoking, alcohol consumption); inconclusive (obesity); no association with one SES measure[c]
Cheadle et al., 1994[180]	Cross-sectional	1988	435	18-49	Self-rated health; mental health; alcohol consumption; smoking	Education, employment, income	Inconclusive
Spangler et al., 1997[153]	Cross-sectional	1990-91	614	18+ females	Smoking	Education, income	Positive gradient (smokeless tobacco); no association (smoking)[f]
Zhang et al., 2010[154]	Cross-sectional (secondary analysis)	2007	841	18+	Self-rated health	Household income, employment, education, area-based measures (education, poverty)	Positive gradient; no association with some SES measures[c]
Braveman et al., 2010[155]	Cross-sectional (secondary analysis)	2005-07	914,669[g]	25-74	Self-rated health	Education	Positive gradient[c]
Canadian First Nations & Metis							

Wilson & Rosenburg, 2002[163]	Cross-sectional (secondary analysis)	1991	16,249	15+	Health status	Education; income; labor force status	Positive gradient[f]
Martens et al., 2007[164]	Ecological	1995-99	9 areas	20-79	Diabetes	Area-based measure (income)	Positive gradient[c,h]
Anand et al., 2001[165]	Cross-sectional	1998-2000	301	35-75	Cardiovascular disease	Income	Positive gradient[f]
Anand et al., 2006[166]	Cross-sectional	1998-2000	301	35-75	Cardiovascular disease	Relative disadvantage (individual-level)	Positive gradient[f]
Lemstra et al., 2009[167]	Cross-sectional (successive)	2000, 2003, 2005 & 2007	618	12+	Suicidal ideation	Household income	Positive gradient[c]
Tjepkema et al., 2009[168]	Retrospective cohort	1991-2001	68,500	25+	Mortality	Education, income, occupation	Positive gradient[f]
Inuit							
Young & Mollins, 1996[169]	Ecological	1988-91	49 regions	All ages	Health centre visits	Area-based measures (relative disadvantage)	Positive gradient[c]
Young, 1996[170]	Cross-sectional	1990-91	434	18+	Obesity	Education; income	Positive and reverse gradient[f]
Bjerregaard & Young, 1998[171]	Review	Various	Various	Various	Self-rated health	Income; education	Positive gradient[f]
Bjerregaard, 1990[172]	Retrospective cohort; ecological	1968-85	6,463	All ages	Mortality	Area-based measure (income)	Positive gradient[c]
Bjerregaard, 1991[173]	Prospective cohort	1979-80	737	All ages	Hospital admissions	Housing conditions; social group	Positive gradient[c]
Mapuche							
Amigo et al., 2000[175]	Cross-sectional	1997-99	351	5-6	Height	Area-based measure (poverty)	Positive gradient[c]
Andean culture & Amazon Basin tribes							
Larrea et al., 2002[174]	Cross-sectional	1995-98	Various[i]	0-4	Stunting; malnutrition	Relative disadvantage	Positive gradient[c]

	(secondary analysis)					(household-level)	
Tsimane'							
Reyes-Garcia et al., 2008[176]	Cross-sectional	2005	289	18+ males	Body-mass index	Perceived social rank	Positive gradient[f]
Taiwanese Aborigines							
Chen & Wen, 2010[177]	Cross-sectional (secondary analysis)	2001	27,593[j]	15+	Obesity	Employment, income, education	Positive and reverse gradient[f]
Indian Adivasis							
Subramanian et al., 2006[178]	Cross-sectional (secondary analysis)	1998-99	529,206	All ages	Mortality, smoking, alcohol consumption	Asset-based standard of living index (household-level)	Positive gradient[f]

[a] Numbers refer to persons unless otherwise stated.

[b] A 'positive gradient' is defined as better health outcomes for those with better SES outcomes, i.e. a positive association; a 'reverse gradient' is defined as better health outcomes for those with worse SES outcomes (negative association); 'inconclusive' is defined as a trend or effect that was not statistically significant or a study with too many methodological limitations to support definitive conclusions.

[c] Defined as studies that established a positive association between SES and health in simple bivariate or cross-tabulation analyses, without controlling for other factors or confounders.

[d] Numbers represent all Maori deaths in New Zealand in relevant years, which form the basis of life expectancy estimates used in social gradient analysis.

[e] Study uses all Maori deaths in New Zealand in the three years subsequent to the 1981, 1986, 1991 and 1996 national censuses (where links can be made between census and mortality records). These records form the basis of mortality rate comparisons across socioeconomic groups.

[f] Defined as studies that accounted for at least some other confounding (usually demographic) variables in establishing a positive association between SES and health.

[g] Indigenous sample not provided; the total in-scope sample was 914669. The survey was nationally representative, hence only a small proportion of the sample will be American Indian/Alaskan Native or Native Hawaiian/Pacific Islander peoples.

[h] Study found a correlation between diabetes and an area-based measure of income using an ecological design. While the findings do not represent a gradient per se, they suggest a positive association.

[i] Study utilises large, nationally representative sample surveys. While the size of the Indigenous sample was not stated, the total samples range from 5800–28100 households.

[j] Aboriginal sample not provided; the total in-scope sample was 27593. While only a small proportion of the sample is likely to be Aboriginal people, the survey was conducted among 23 of the 55 Aboriginal townships in Taiwan.

CHAPTER 4

RESEARCH DESIGN

4.1 Introduction

This chapter outlines the design of the study, including the fundamental methodological decisions and approaches. It outlines the core objectives that were developed to support the achievement of the overall study aim, describes the study methodology, provides an overview of the main methods and analytic techniques, and concludes with a summary of ethical issues and approvals.

The methodology section highlights that a quantitative research design was chosen and considered appropriate for the study aim and objectives. This section will also describe the researcher's experience, motives for the study, and viewpoint.

The methods section will describe the data sources and the justification for choosing them. Some of the methods and statistical analysis are common to all chapters, while others are chapter-specific. A broad description is provided in these sections, with the finer detail outlined in each results chapter (Chapters 5–9). All ethical approvals are provided here; these details have been removed from results chapters to avoid unnecessary duplication.

4.2 Objectives

The study has three key objectives. These are designed to support the achievement of the project aim (stated in Chapter 1):

1. Describe the developmental status of Aboriginal children and the mechanisms that influence this status.
2. Use the best available contemporary population-representative datasets of Australian Aboriginal children to determine the pattern of association between socioeconomic factors and physical and mental health outcomes:
    a. Describe the direction, shape and magnitude of socioeconomic disparities in Aboriginal child health

    b. Assess the relative contribution of conventional and alternative measures of socioeconomic status (SES) on Aboriginal child health
    c. Assess the relative influence of compositional and contextual socioeconomic indicators on Aboriginal child health
    d. Assess the magnitude of direct and indirect effects of socioeconomic status on Aboriginal child health. In doing so, determine whether psychosocial and environmental factors, and those that characterise Aboriginal culture, mediate the impact of socioeconomic status on health.
3. Use the best available contemporary population-representative datasets of Australian children to reveal the significant differences (and similarities) in the socioeconomic pattern of child health between Aboriginal and non-Aboriginal populations, and articulate these in terms of their direction, shape and magnitude.

4.3 Methodology

The study used a quantitative analytic methodology. This has been a popular approach to examining disparities in health, both within and across population groups, for decades.[108] It has been used for this purpose in many countries and contexts and is well-suited to testing and describing the socioeconomic patterns of health in Aboriginal Australia.

There are, however, some limitations to focusing on a purely quantitative approach in Aboriginal settings. In the context of this study, the health and social disadvantage faced by Aboriginal populations is the result of complex and dynamic social processes over the course of generations. While quantitative statistical techniques can provide some insights to these processes, they are likely to be enhanced by alternative approaches, including qualitative and ethnographic research methods.[8]

4.3.1 Researcher's position

The selection of a quantitative analytic approach for this study reflects not only its successful application in this field over time but is consistent with the strengths and experiences of the researcher. In addition to undergraduate training in statistics I have 20 years of experience in quantitative methods and analysis. Furthermore, I have applied these skills to the analysis of issues affecting Aboriginal health and development since 1994—in government, policy and academic settings—with a full-time professional commitment to this field of research since 2005. I have strived to conduct research that has meaning to a range of Aboriginal peoples, that engages the community, and that can contribute to sustainable improvements in Aboriginal health.

I am a non-Aboriginal person but firmly believe that research into Aboriginal issues requires guidance by experienced Aboriginal people—at all stages of the study—and findings need an interpretation incorporating an Aboriginal worldview.[183] To this end, I have sought approval and advice for this study from three important groups:

- The (then) Western Australian Aboriginal Health Information and Ethics Committee (WAAHIEC): a properly constituted Aboriginal ethics committee
- The Aboriginal Collaborative Council Advising on Research and Evaluation (ACCARE): the Aboriginal reference group for research at the Telethon Institute for Child Health Research, comprising members from a variety of regions and organisations
- The Kulunga Research Network: a small but experienced group of researchers that conduct and facilitate research that Aboriginal communities have identified as a priority.

4.3.2 Motives for the study

Most Australians are acutely aware of the poor state of the Aboriginal circumstance, and that it persists despite the efforts of many sectors of Australian society. For many, including myself, this is a difficult reality to accept, particularly as there are examples of recent improvements in the health and wellbeing of other colonised Indigenous cultures.[184] The bulk of the epidemiologic and empirical sociologic research has, overwhelmingly, focused on disparities between Aboriginal and non-Aboriginal populations, and there has been little focus on within-population difference. This applies to key determinants of health (such as SES) which is surprising given the insights that social gradients research has provided to elucidating social pathways to poor health in other populations of the World. Accordingly, I saw this study as an opportunity to examine Aboriginal health disparities from a different perspective, with a view to providing insights into the most salient drivers of ill health. I was also hopeful that the study might broaden the scope of the field of social disparities in health with the recognition of social factors that may play a critical role in Indigenous health but fall outside the traditional domains of social determinant of health. Ultimately the goal with this and any study of Aboriginal health is to make a meaningful contribution that can lead to an increase in the pace of change toward health equity in Australia.

4.3.3 Refining the objectives and approach

In the early stages of the study I briefly (and informally) reviewed the literature on: (1) the state of Aboriginal child health and development; (2) the determinants of Aboriginal health; and (3) the mechanism linking social factors to health. I focused my reading on government statistical reports, academic empirical literature, and prominent texts in the fields of social determinants of health and human development. This was a process of re-familiarising myself with the foundational aspects of the study topic. The statistics provided an objective view of the extent of social and health disadvantage facing contemporary Aboriginal communities and, in conjunction with the theoretical texts, provided a viewpoint on the determinants of this disadvantage and a broader framework for understanding health inequalities.

Following this initial skirmish with the literature, I conducted a formal and comprehensive literature review. The review had a specific focus on the relationship between SES and health in Indigenous populations, and its scope included Australian Aboriginal and other Indigenous cultures. The learnings gained from this review and the earlier readings helped to refine the overall objectives of the study and provided a frame for the core, quantitative components. As such, I undertook the quantitative analytic stage of the study with an appreciation of the knowledge gaps in this field, the most prominent health and socioeconomic problems among Aboriginal children and their plausible determinants, and issues in measuring inequalities in health and their applicability in Aboriginal contexts.

4.4 Methods

The objectives of the study were primarily assessed using a quantitative analytic framework applied to four existing data sources: the 2008 *National Aboriginal and Torres Strait Islander Social Survey* (NATSISS), the 2000–2002 *Western Australian Aboriginal Child Health Survey* (WAACHS), the 2004–05 *National Aboriginal and Torres Strait Islander Health Survey* (NATSIHS) and 2004–05 *National Health Survey* (NHS).

4.4.1 Rationale for chosen datasets

All four principal datasets in this study have been established from broad-based household surveys of the population. They comprise large sample sizes, collected using area-based multi-stage sample designs that ensure a random selection of participants and the production of robust representative estimates of the population of interest: this includes estimates of Aboriginal populations at the national level and for each State and Territory using the NATSISS and NATSIHS (and comparisons with non-Aboriginal populations using the NHS); and for Western Australia and its regions using the WAACHS. All datasets have information on a range of health outcomes and health care actions and myriad potential risk and protective factors for health, including SES constructs. The combination of sample size and breadth of indicators in these datasets enables a thorough examination of the relationships between SES and health within and across population groups.

The NATSISS and NATSIHS support an examination of the entire Aboriginal child population of Australia. The WAACHS, while restricted in scope to the State of Western Australia, has a wider range of socioeconomic variables (for children) and therefore it is better placed to capture the complex set of factors that contribute to socioeconomic disadvantage in Aboriginal populations. The NHS shares a common design and questionnaire with the NATSIHS, enabling a comparison of Aboriginal and non-Aboriginal children.

Aside from the three Aboriginal-specific datasets mentioned above, and to the best of my knowledge, no other data sources satisfy the three compulsory criterion for analysing health disparities within Aboriginal populations: (1) a sample size with sufficient power to support robust, representative estimates of the current circumstances of Aboriginal children; (2) information at a unit record level on the socioeconomic status of Aboriginal persons, families, households and/or communities (preferably indicators with at least three categories); (3) information at a unit record level on the health characteristics of Aboriginal children (health status, outcomes, risk factors and/or health care actions). There are other information sources that satisfy some of these criteria but all have deficiencies that limit their utility for this study. Noteworthy examples include the *Footprints in Time Study* (*Longitudinal Study of Indigenous Children*) and the linked total population datasets that are available from the administrative systems of some jurisdictions. Both sources support longitudinal analysis and could theoretically provide insights into the effect of SES mobility on health, however the *Footprints in Time Study* has a non-representative sample drawn from 11 study sites across five of the seven States and Territories of Australia[185] and administrative sources typically have a paucity of (or incomplete) information on SES at individual and familial levels and incomplete and inconsistent information from which to identify Aboriginal people.[186]

4.4.2 Description of datasets

The Western Australian Aboriginal Child Health Survey

The WAACHS is the largest and most comprehensive survey ever conducted in Australia of the health and development of Aboriginal children and was conducted by the Telethon Institute for Child Health Research in 2000–2002. It collected information on 5289 Aboriginal children aged 0 to 17 years living in 1999 families across Western Australia. Of eligible families, 84% consented to participate in the survey and useable information was obtained on 96% of participating children, predominantly from household interview.

Information pertaining to children was obtained from their primary and secondary carers. In addition to a rich suite of data on the physical (including chronic and acute conditions) and mental health of children, carers were asked questions in relation to risk behaviours, health care access and use, and the demographic, social and economic circumstances of the families, households and the communities in which they lived. SES characteristics were measured at multiple levels: parents/carers (e.g.

educational attainment of carers), families/households (e.g. family financial strain) and neighbourhoods/communities (e.g. area-level relative disadvantage).

All aspects of the survey were conducted under the direction of a steering committee of senior Aboriginal people from a cross-section of settings and organisations, to ensure the cultural integrity of survey methods and processes. The full details of the design and conduct of the WAACHS have been described elsewhere.[35]

National Aboriginal and Torres Strait Islander Social Survey

The NATSISS is a large-scale, multi-faceted social survey of Aboriginal persons and is conducted periodically by the Australian Bureau of Statistics (ABS) in remote and non-remote areas of Australia, including discrete communities. The 2008 enumeration used an area-based multi-stage sample design, with separate random designs for discrete Aboriginal communities and non-community areas. Information was obtained from 13300 Aboriginal persons across all age groups (including almost 5500 children), living in private dwellings. The survey is one of the few reliable quantitative sources of detailed information on both developmental outcomes and their risk factors for Aboriginal persons aged 0–14 years. Of all eligible households, 78% consented to participate in the NATSISS and were fully responding. All responses for children (0–14 year-olds) were provided by parents/guardians in most instances, or a member of the household with responsibility for the child. Children aged 15–17 were directly interviewed, with parental consent. The full details of the design and conduct of the NATSISS have been described elsewhere.[187]

In terms of child developmental outcomes, the 2008 NATSISS asked about birthweight and gestational age (for 0–3 year olds only), a global question on health status, and questions regarding specific problems with ears/hearing, eyes/sight and teeth/gums. Also, some information can be gleaned on educational attendance. In addition, the NATSISS included a rich set of variables that can be described as either prompts, facilitators or constraints of child development. These include aspects of diet and nutrition, connection with culture, carer education, informal learning, stress and supports.

The NATSISS collected an array of SES indicators, however, only three were available for analysis with the child sample (0–14 year-olds): carer education; area-level disadvantage; and household income. All three were included in this study.

National Aboriginal and Torres Strait Islander Health Survey

The NATSIHS is a large-scale health survey of Aboriginal persons conducted periodically by the ABS in remote and non-remote areas of Australia. The 2004–05 enumeration collected information on 10439 Aboriginal persons (4114 children aged 0–14 years) across all age groups (about one in 45 of the total Aboriginal population) in relation to their health status, health service use, health care actions and lifestyle and health risk factors. Over 80% of all eligible households consented to participate in the NATSIHS (after sample loss). Information on selected children was, in most cases, provided by a parent or guardian. Children aged 15–17 were directly interviewed, with parental consent.

The NATSIHS collected an array of SES indicators, however, only three were available for analysis with the child sample (0–14 year-olds): household income; overcrowding and area-level disadvantage. All three were included in this study.

The design of the survey was guided by the ABS in conjunction with an advisory group of Aboriginal health experts from a range of settings—including government agencies, Aboriginal health organisations, peak Aboriginal bodies and academic institutions. The full details of the design and conduct of the NATSIHS have been described elsewhere.[188]

National Health Survey

The NHS was conducted in parallel with the NATSIHS in 2004–05; collectively, they constitute the largest population survey of Australia's health. The two surveys shared a common design and questionnaire, enabling a comparison of the health circumstances and outcomes of Aboriginal and non-Aboriginal children and adults. However, the NHS, unlike the NATSIHS, did not collect information from persons in remote areas of Australia. Almost 90% of all eligible households consented to participate in the NHS (after sample loss), netting a final sample of 25511 persons

(4895 children aged 0–14 years in non-remote areas). The full details of the design and conduct of the NHS have been described elsewhere.[189]

Common features of ABS surveys

There are a number of common quality-control features that pertain to ABS household surveys of Aboriginal people, such as the NATSISS and NATSIHS—and a few are worth mentioning here. First, household surveys are conducted by highly trained interviewers that have undertaken cultural awareness training for surveys involving Aboriginal peoples. Second, questionnaires and other survey design features are developed in consultation with experts in Aboriginal issues and undergo a rigorous, multi-stage regime of testing. Third, like all ABS survey, data is captured, coded, edited and validated using gold-standard statistical processing techniques.

4.5 Statistical analysis

This study used a range of statistical techniques to address the research objectives, which have produced a combination of descriptive (univariate and cross-tabulation) and inferential (regression modelling) statistics for presentation in this thesis. Simple univariate and cross-tabulation data are used to describe population characteristics in most chapters. Various regression techniques are used to highlight the association between socioeconomic indicators and health outcomes, in both tabular and graphical formats. All data in all chapters are weighted to reflect population benchmarks.

The multivariate logistic regression models applied in Chapters 7 and 8 used a multilevel framework, which accounts for the complex WAACHS survey design and enables a more accurate estimation of the effects of individual and area-level measures of SES on health. In addition, Chapter 8 used a stepwise approach to the regression analysis to explore the mechanisms that may explain the relationship between SES and mental health. A multilevel approach was unable to be applied to the logistic regression models of Chapters 6 and 9, due to limitations in the analytic environment—these chapters present unadjusted and adjusted odds ratios from conventional models, and include standard errors that have been adjusted with a design effect. Generalised Additive Models have been applied in Chapter 7 to account for the possible non-linear nature of associations between continuous SES variables and physical health outcomes, and the results have been presented as non-parametric spline curves.

Data have been presented in graphs and charts, where relevant and appropriate, in this thesis to support an assessment of the shape of SES patterns in health (as per objectives 1a and 2), clarify results and enhance the general readability of the thesis. Figures 5.1–5.3 include a 'best fit' line, constructed using the coefficients of a polynomial regression. All bar charts include 95% confidence intervals.

Analyses were, primarily, performed using SAS: version 9.2 for Chapters 7 and 8, while for Chapters 5, 6 and 9 version 9.1 was used and the analyses conducted within the ABS' Remote Access Data Laboratory (RADL) (SAS Institute Inc., Cary, NC, USA, 2000–08). The RADL is a secure online data query service that enabled confidentialised versions of the NATSISS, NATSIHS and NHS to be interrogated remotely. While the RADL processes protect the confidentiality of the data, they restrict some of the analytic capacities of SAS.

4.6 Ethics

4.6.1 Ethical considerations

No new data were collected as part of the study, i.e. analyses were conducted solely on existing datasets. As such, the principal ethical issues for this project concern privacy, confidentiality and data security.

The WAACHS dataset stores participant data that are identifiable and linked data that are potentially re-identifiable. This dataset is securely stored at the Telethon Institute for Child Health Research, with access protected by administrative and electronic permissions, and subject to explicit approvals from the Chief Investigator and the Kulunga Research Network and the completion of a confidentiality declaration.

All other datasets (NATSISS, NATSIHS and NHS) were accessed indirectly via the ABS' RADL system. The ABS store these data in-house—researchers are unable to view or store unit record data at any time. Restrictions to the outputs and analytic techniques further protect the security and confidentiality of the data.

4.6.2 Ethics approvals

This study was conducted under ethical approvals from Curtin University's Human Research Ethics Committee and the WAAHIEC, and was endorsed by the ACCARE.

The WAACHS was conducted under ethical approvals from the WAAHIEC and the (then) King Edward Memorial and Princess Margaret Hospital Ethics Committee. Approval to access this dataset was provided by the Chief Investigator and the Kulunga Research Network at the Telethon Institute for Child Health Research.

The NATSISS, NATSIHS and NHS were conducted under the authority of the *Census and Statistics Act 1905* and conform to the provisions of the *Privacy Act 1988*. Approval to access confidentialised versions of the datasets for these three surveys, via RADL, was provided by the ABS.

4.7 Conclusion

This chapter has provided a detailed account of the design of this research study. The study has three core objectives, which were assessed using a quantitative analytic methodology. A range of statistical analytic techniques were applied to the four primary data sources in order to provide insights into the relationship between SES and health in Aboriginal populations of Australia. The advice of Aboriginal peoples has been drawn upon at all stages of the research in order to ensure that the methodology, methods, analysis and reporting is culturally relevant and competent.

CHAPTER 5

THE HEALTH AND DEVELOPMENTAL CIRCUMSTANCES OF ABORIGINAL CHILDREN

5.1 Introduction

Chapter 3 provided some of the broad theoretical underpinnings of healthy child development and proposed that these constructs were equally applicable to the Aboriginal circumstance. While this appears to be a plausible proposition, it is difficult to validate its legitimacy given the Australian empirical landscape. Despite improvements in the quantity and quality of data on Aboriginal populations in recent decades, descriptions of the health and early developmental circumstances of Aboriginal children remain sparse and have typically been documented in a fragmented manner.

This chapter explores the developmental status of Aboriginal children in Australia using the human development constructs outlined in Chapter 3 as an organising framework. It examines how Aboriginal children are faring in terms of some traditional markers of child development and the mechanisms that prompt, facilitate and constrain Aboriginal child development.

5.2 Background[2]

Descriptions of the Australian Aboriginal circumstance have been dramatically enriched through improvements in, and delivery of, high quality quantitative survey findings over the past 20 years. Since 1901—when Aboriginal Australians were effectively excluded from even being counted in the populations of the States of the Commonwealth[20]—Australia has made significant improvements in its capacity to

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[2] Material in Sections 5.2–5.5 has been reproduced from the following article: Shepherd CCJ, Zubrick SR. What shapes the development of Indigenous children? In: Hunter B, Biddle N, editors. Survey Analysis for Indigenous Policy in Australia: Social Science Perspectives, CAEPR Research Monograph No. 32. Canberra: ANU E-Press; 2012.

detail the demographic and developmental status of its Indigenous peoples. Amid this progress though, it still remains the case that good quality descriptions of the developmental circumstances of Aboriginal children, as distinct from Aboriginal adults, are surprisingly few and far between. The 2008 *National Aboriginal and Torres Strait Islander Social Survey* (NATSISS) provides an opportunity to specifically describe the health and development of Aboriginal children using an important and high quality data source.

To make sense of the findings about the health and development of Australian Aboriginal children, it is important to place their development in the context of the healthy development of *all* children. This is not to discount the vital and obvious importance of Aboriginal culture. Rather, by starting with some principles of healthy development that apply universally to all children, some of the underpinnings of the current Australian Aboriginal circumstance and its apparent intractability are brought into perspective. This opening perspective offers opportunities for better policies, services and practices to improve the life prospects of Australian Aboriginal people.

5.2.1 Developmental outcomes for Aboriginal children

Before we begin to describe the developmental status of Aboriginal children we must ask the question, 'what constitutes an outcome?' In this chapter, the overarching outcome is the capability to participate—economically, socially and civically. These outcomes are largely at the core of what public policy and its funding effort seeks to achieve. Public policy and expenditure on human services is deliberately organised to influence human capability with the express aim of enabling more people to choose lives that they value. There has been a heavy emphasis historically on economic participation and only in recent times have developed countries begun to listen to citizen demands that there is more to life than participating in the labour market—social participation and civic participation form part of the mix of what human development is all about.[190]

Focusing on a human capability framework enables an examination of specific types of outcomes, i.e. diseases, good health, literacy, as well as those that may be considered as developmental 'means'. For example, the achievement of good health or the occurrence of specific diseases, are typically studied as ‘outcomes’ in their own right. These outcomes may also be thought of as the means through which the capability to participate economically, socially and civically is achieved or diminished. Using this as a guiding framework, I have selected a range of outcomes for children for examination in this chapter (see Methods section, below).

5.3 Methods

The NATSISS is a vital source of data for addressing the human capability story in an Australian Aboriginal context. The 2008 enumeration of the NATSISS is significant in that it enables, for the first time, an examination of the development of children. As such, it is one of the few reliable quantitative resources that have detailed information on both developmental outcomes and their risk factors for Aboriginal persons aged 0–14 years in remote and non-remote areas of Australia.

Of all eligible households, 78% consented to participate in the NATSISS and were fully responding. All responses for children (0–14 year-olds) were provided by parents/guardians in most instances, or a member of the household with responsibility for the child. Children aged 15–17 were directly interviewed, with parental consent. The full details of the design and conduct of the NATSISS has been described elsewhere.[187]

5.3.1 Developmental outcomes

In terms of child developmental outcomes, the 2008 NATSISS asked about:

1. Birthweight (for 0–3 year olds only)
2. Gestational age (for 0–3 year olds only)
3. Overall (global) health status
4. Eye/sight problems
5. Ear/hearing problems, and
6. Teeth and gum problems.

In addition, some information can be gleaned on:

7. Educational attendance.

Indicators of all seven of these outcomes have been examined in this chapter.

In addition, the NATSISS included a rich set of variables that can be described as either prompts, facilitators or constraints of child development. The indicators pertaining to diet and nutrition, connection with culture, carer education, area-level disadvantage, informal learning, stress and supports have all been examined in this chapter.

5.3.2 Geographic remoteness

Geographic remoteness is defined using the Australian Standard Geographic Classification (ASGC) Remoteness Structure, which is based on the plus version of the Accessibility/Remoteness Index of Australia (a widely used classification of remoteness in Australia).[188] The five categories of remoteness reflect differences in access to services and opportunities for social interaction, and include Major cities, Inner Regional Australia, Outer Regional Australia, Remote Australia and Very Remote Australia (see Figure 2.2 for a map of remoteness areas).[191] For the purposes of this chapter, 'non-remote' refers to an aggregation of the 'Major cities', 'Inner Regional Australia' and 'Outer Regional Australia' categories, while the other two categories constitute 'remote' areas.

5.3.3 Analysis

The large scale of the 2008 NATSISS (almost 5500 children were sampled) enables a robust analysis of child developmental outcomes and their antecedents, with potential for regional comparisons (by State/Territory or geographic remoteness). All analyses in this chapter were conducted on the *State/Territory by ASGC Remoteness Structure Confidentialised Unit Record File* (CURF) using SAS version 9.1 (SAS Institute Inc., Cary, NC, USA, 2000–08) within the Australian Bureau of Statistics' Remote Access Data Laboratory (RADL). The RADL is a secure online data query service that enables a confidentialised version of the NATSISS to be interrogated remotely by researchers.

All output has been generated using person-level weights to produce representative estimates of the population of interest. The statistical significance of differences in proportions in remote and non-remote areas was assessed on the basis of a 95% level of confidence. While the ABS supplies replicate weights for the derivation of standard errors, the version of SAS provided in the RADL does not support the use of replicate weights. As a consequence, standard errors that allow for the complex design of the survey have been approximated with the application of a design effect. A design effect is an estimate of the change between the variance of estimates for a complex sample design and the variance that would have been achieved from a simple random sample with the same sample size, and has been calculated by comparing the simple variance with the variance estimates published by the ABS for a range of point prevalence data. The confidence intervals reported here are based on estimates of standard error and variance (calculated on the assumption of a simple random sample) adjusted by the estimated design effect.

In addition to the dichotomous remoteness indicator (remote/non-remote) mentioned above, this chapter makes occasional use of a 13-part derived item on the CURF that cross-classifies State/Territory by remoteness.

5.4 Results

5.4.1 Developmental outcomes for Aboriginal children

Birthweight

High rates of low birthweight in developing countries are primarily due to intrauterine growth restriction, which is associated with a range of poor outcomes that commence at birth (death, disability and poor health) and can lead to complications in childhood and the development of chronic illnesses in adult life.[192-194] Low birthweight babies are generally more prevalent in Aboriginal populations, where population rates correspond more closely with those observed in developing nations.[195]

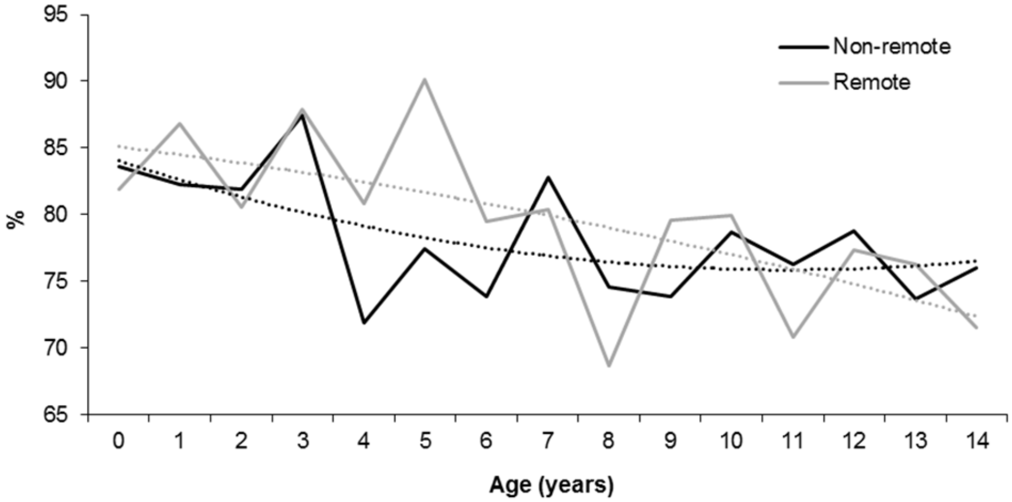
Low birthweight is typically defined as less than 2500 grams, while those born less than 1500 grams are of very low birthweight. The NATSISS found that 11% of Aboriginal children aged 0–3 years in Australia were of low birthweight and 1.9% were born at very low birthweight (Table 5.1).

Gestational age

Babies born prior to 37 weeks gestation are considered to be 'preterm' or to have 'low' gestational age. This cut-off point aligns with the development of several organ systems, and evidence suggests that low gestation is associated with a greater risk of neonatal mortality and a range of morbidities into childhood and beyond.[196] Close to one-quarter (24%) of Aboriginal children aged 0–3 years were considered preterm at birth. A higher proportion of females than males were preterm (27% compared with 21%).

Global health

Global health status was assessed on a five-point ordinal scale: excellent; very good; good; fair; or poor. Less than 4% of children aged 0–14 years had fair or poor health. The majority were in either excellent (46%) or very good health (32%). There was some variation by age, with older children generally less likely to be in excellent or very good health than younger age groups. This pattern can be observed in both non-remote and remote areas (see Figure 5.1).



Note: The broken lines represent a 'best fit' line, based on the coefficients of a second order polynomial regression.

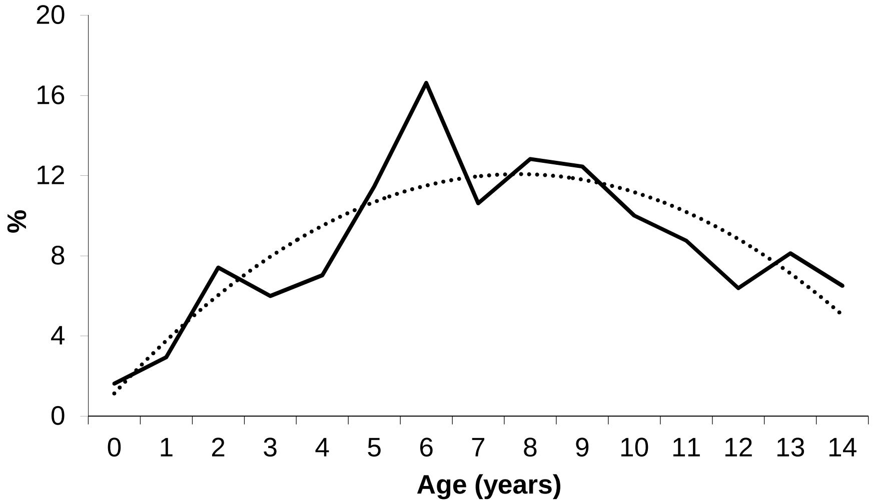
Figure 5.1: Proportion of Aboriginal children in excellent or very good health, by age, Australia, 2008.

When aggregated together, global health levels were broadly similar in remote and non-remote areas of Australia—however, this masks differences that were evident at finer geographic levels. For example, only 72% of Aboriginal children in 'outer regional' areas of New South Wales were in excellent/very good health, whereas the same was true of 90% of children in Queensland 'inner regional' areas.

Hearing and vision

Hearing impediments can delay speech and language development in children, with undesirable consequences for both social development and a child's ability to engage in educational opportunities. Previous studies have highlighted that hearing loss and impediments are more prevalent among Aboriginal children,[133] particularly in more remote communities with poor environmental health conditions.[197, 198] Middle ear infection, or otitis media, is a persistent problem in many Aboriginal communities and is regarded as the most common cause of hearing impediments among Aboriginal children.[199]

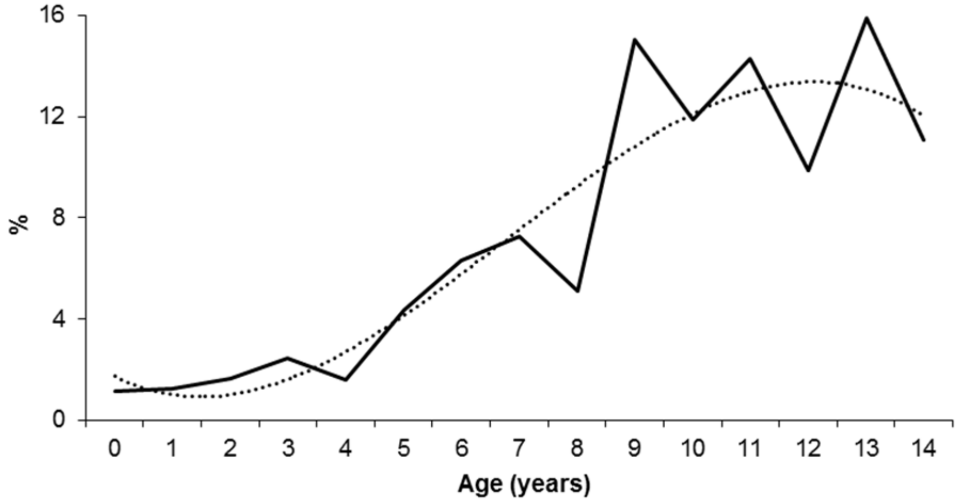
From the NATSISS, 8.5% of children aged 0–14 years had an ear or a hearing problem, which includes partial or full hearing loss and conditions such as tinnitus, runny/glue ear and tropical ear. The trend by age is roughly a reverse U-shape, peaking at age six (see Figure 5.2). While it is reasonable to expect ear/hearing problems to be more prevalent in remote areas, I found similar proportions in remote (10%) and non-remote areas (8.0%).



Note: The broken lines represent a 'best fit' line, based on the coefficients of a second order polynomial regression.

Figure 5.2: Proportion of Aboriginal children with ear or hearing problems, by age, Australia, 2008.

The proportion of children that had an eye or sight problem (7.2%) was not trivial, although these problems were mainly of a less severe nature (long or short sightedness). There were relatively few cases of blindness, trachoma, glaucoma, and cataracts. Similar to the findings of the *Western Australian Aboriginal Child Health Survey*, there were fewer cases of eye or sight problems in remote (3.9%) than non-remote (8.2%) areas.[198] This is likely to reflect differences between remote and non-remote areas in the factors that are associated with short sightedness (for example, type of school work undertaken and lifestyle factors).



Note: The broken lines represent a 'best fit' line, based on the coefficients of a third order polynomial regression.

Figure 5.3: Proportion of Aboriginal children with eye or sight problems, by age, Australia, 2008.

Oral health

About 36 per cent of children aged 2–14 years had at least one problem with their teeth or gums—this included cavities, decay, fillings, breakage, having no teeth, and bleeding or sore gums. Dental problems were less prevalent among children in remote settings (26%) than non-remote areas (37%), which may reflect a greater reliance on bush tucker in the most remote regions of Australia and a correspondingly smaller reliance on diets high in energy derived from refined carbohydrates and saturated fats.[200] This is consistent with the findings for Aboriginal children in Western Australia[198] but contrasts the evidence of Jamieson et al. in a study of Aboriginal children in New South Wales, South Australia and the Northern Territory.[124] The discrepancy between studies is likely to be attributable to differences in sample characteristics, collection methods, or the measurement of oral health between studies. The binary, carer-reported measure of dental problems used here may be a greater reflection of dental services use than dental problems per se. If so, then my findings would suggest that dental services are more accessible (and affordable) to Aboriginal children living in less remote areas.

Educational attendance

The NATSISS design did not allow the collection of a robust range of variables on child education, and this naturally limits what can be examined in this important domain of child development. The survey questions mainly focus on issues of attendance, although the included items could only be considered proxy indicators of attendance patterns. Encouragingly, the vast majority of 'eligible' Aboriginal children were going to school (98%) and only a relatively small proportion of school children (7.0%) were seen to have a problem with attendance (not attending without permission).

The carers of 27% of school children stated that they had missed at least one day of school in the previous week, with the modal response for this group being five days (all days) missed. About 30% of absence was due to sickness/injury, although many reported that the absence was due to the fact that the school was not available or not open. These results are difficult to interpret but almost certainly support the observation that Aboriginal students have poorer rates of attendance than their non-Aboriginal counterparts.[195]

Despite no data in the NATSISS on child academic performance, this outcome merits a short comment here. Other studies demonstrate clearly that there are considerable gaps in the performance of Aboriginal and other children at school.[104, 195] Importantly, disparities are evident at Year One and widen further in subsequent school years. These gaps are arguably the most important in terms of predicting onward disparities in human capabilities between Aboriginal and other Australians.

Table 5.1: Proportion of Aboriginal children with selected health and development problems, Australia, 2008.

Health/development factor	Non-remote (%)	Remote (%)	Total (%)
Birthweight[a]			
Less than 2500 grams	11.9	8.8	11.2
Less than 1500 grams	2.1*	1.4**	1.9*
Low gestation (less than 37 weeks)[a]	23.8	25.2	24.1
Global health			
Excellent	48.0□	41.4□	46.4
Very good	30.4□	38.3□	32.2
Good	17.8	17.0	17.6
Fair	3.0	2.6	2.9
Poor	0.8*	0.8*	0.8
Eye or sight problem	8.2□	3.9□	7.2
Ear or hearing problem	8.0	10.2	8.5
Teeth or gum problems[b]	37.1□	25.8□	34.4
Educational attendance			
‘Eligible’ children not going to school[c]	4.3	5.0	4.5
Problem with attendance[d]	5.4□	12.8□	7.0

[a] 0–3 year olds only.

[b] 2–14 year olds only.

[c] Excludes those who are too young, too old or ineligible for school.

[d] Of those attending school.

□ Denotes a statistically significant difference (at 95% level of confidence) in the proportions in remote and non-remote areas.

* Relative standard error between 25% and 50%.

** Relative standard error greater than or equal to 50%.

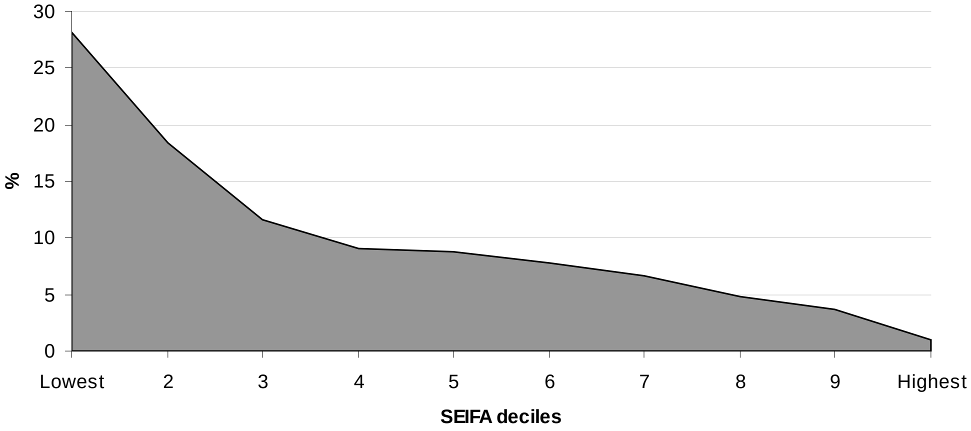
5.4.2 Prompts, facilitators and constraints of child development

As I outlined in Chapter 3, developmental strengths are influenced by a small set of mechanisms that either prompt, facilitate or constrain their development. Many of the factors that prompt or facilitate child development are either missing in the lives of Aboriginal children or are too limited to produce sustainable benefits and opportunities in life. When skills and abilities are sufficiently acquired their benefits are, too often, constrained or overwhelmed by the influences of the living environment. Some of these constraints are characteristics of individuals or families, and have a direct influence on Aboriginal children. Others are population-wide characteristics that impact on children in indirect ways, and reflect the fact that Aboriginal populations have a diminished capability base relative to other Australians.

From a policy perspective, these prompts, facilitators and constraints offer avenues for deliberate investment at a variety of levels, from those that focus on individuals to those that affect national and global policy. There is plenty of flexibility to address them through one or more settings (e.g. family, school, care environments, work) using different instruments (legislation, remuneration, transfers and benefits, goods and services) to effect change.

Population-wide constraints

Population-wide constraints include lower life expectancy and higher fertility rates. These two factors conspire to produce a very young population (median age is 20 years) with a relatively low adult-to-child ratio. The NATSISS data highlight that there was 1.3 Aboriginal adults (18+) for every Aboriginal person aged 0–17 years, which compares with an approximate 3:1 ratio in the total population.[201] This indicates that Aboriginal children have less access to older, experienced people available for care, protection, cultural guidance and general life-skills education.[35] This is compounded by high rates of imprisonment, father absence and family breakdown and consequent sole parent status. Over one-third (37%) of Aboriginal children less than one year of age were in one parent families; this proportion rose to 46 per cent among those aged 14 years.



Note: SEIFA deciles were determined based on the distribution of values for all Australian Collection Districts.

Figure 5.4: Distribution of Aboriginal children aged 0–14 years by SEIFA deciles, Australia, 2008.

Furthermore, the socioeconomic disadvantage experienced by Aboriginal peoples in the form of low levels of education, employment and income, can generate stress. These circumstances change the capacity of populations to participate in, and benefit from, mainstream services.[194] Aboriginal children are vastly overrepresented in the lower levels of all socioeconomic constructs included in the NATSISS, including the area-based Socio-Economic Indexes for Areas (SEIFA) measure (see Figure 5.4).

A profile of prompts, facilitators and constraints

Here I attempt to categorise 2008 NATSISS items as either prompts, facilitators or constraints of child development (see Table 5.2). The NATSISS cannot fully inform the breadth of these constructs nor are they necessarily the most salient measures. In some instances the selected items are proxy indicators of the constructs discussed earlier—for example, I use: carer involvement in informal activities as an indicator of early language development; and carer reports of the child being bullied or treated unfairly at school (in conjunction with other variables) as an indicator of both stress and social exclusion. Further, the prevalence estimates obtained from carer responses for many of the variables used here is likely to differ to estimates that would be obtained from self-reports or other respondents. The measurement of unfair treatment, for example, can yield different results depending on the respondent and their characteristics and the approach to questioning.[202] Despite these shortcomings, the NATSISS items, collectively, provide insight into the capability profile of Aboriginal children in Australia.

The most prominent feature of the data presented in Table 5.2 is the high prevalence of development constraints. They document a profile of stress and discrimination that are experienced at levels unique to Aboriginal children. For example, 44% of 0–3 year olds and 65% of 4–14 year olds experienced at least one of the stressors that were asked about in the NATSISS. These stressors commonly included serious events such as the death of a close family member/friend, having a really bad illness/accident, and being physically hurt by someone. When these types of stressors occur frequently in early life they can have serious longer-term effects on the development of the brain, endocrine and immune systems, and are a key mechanism in the biological embedding of disadvantage.[203] Carers also reported that 15% of school children aged 6–14 years were bullied or treated unfairly at school because they were Aboriginal, 9.2% needed to stayed overnight somewhere else due to a family crisis in the six months prior to the survey, and 62% of 5–14 year olds had moved house in the last five years.

Table 5.2: Summary of selected developmental prompts, facilitators and constraints of Aboriginal child development, by remoteness, Australia, 2008.

	Non-remote (%)	Remote (%)	Total (%)
Developmental prompts			
Birthweight[a]			
Less than 2500 grams	11.9	8.8	11.2
Less than 1500 grams	2.1*	1.4**	1.9*
Breastfeeding[a]			
Never been breastfed	24.6☐	13.7☐	22.2
Breastfed but less than 3 months	23.2☐	10.0☐	20.3
Does not usually eat fruit[b]	4.8☐	2.3☐	4.2
Does not usually eat vegetables[b]	3.5	2.4	3.3
Identified with a clan, tribe or language group[c]	40.6☐	69.2☐	47.4
Some involvement in cultural events, ceremonies or organisations in last 12 months[c]	66.5☐	80.9☐	70.0
Participation in cultural activities[c]	60.4☐	79.4☐	64.9
Developmental facilitators			
Education of main carer			
Completed Year 12	22.8	19.4	22.0
Non-school qualification	38.2☐	23.6☐	34.8
Time spent by main carer doing informal learning activities with child in last week[d]			
None	3.3	4.1*	3.5
1–6 days	26.3	26.5	26.3
7 days	70.2	69.1	69.9
Type of informal learning activities main carer did with child in last week			
Read a book (0–6 year olds)	74.7☐	54.6☐	69.8
Told a story (0–6 year olds)	60.1	60.7	60.3
Listened to child read (7–10 year olds)	71.6☐	53.3☐	67.2
Developmental constraints			
Experienced a stressor in last 12 months			
0–3 year olds	46.6☐	35.1☐	44.0
4–14 year olds	66.3	59.8	64.8
Bullied or treated unfairly at school[e]	16.1☐	10.8☐	14.9
Stayed overnight somewhere else due to family crisis in the last 6 months	9.1	9.6	9.2
Affected by friends/family members with alcohol problem	11.6	13.2	12.0
Affected by friends/family members with drug problem	9.1	8.2	8.9
Moved house in the last 5 years[f]	63.3	57.6	62.0
Needed more formal child care[g]	12.8	17.3	13.8

[a] 0–3 year olds.

[b] 1–14 year olds.

[c] 3–14 year olds.

[d] 1–6 year olds.

[e] 2–14 year olds that were attending school.
[f] 5–14 year olds.
[g] 0–12 year olds.
□Denotes a statistically significant difference (at 95% level of confidence) in the proportions in remote and non-remote areas.
* Relative standard error between 25% and 50%.
** Relative standard error greater than or equal to 50%.

5.5 Discussion

I have been able to utilise the 2008 NATSISS to explore the developmental status of Aboriginal children in Australia. I have demonstrated three significant results from the 2008 NATSISS data. First, the majority of Aboriginal children are in excellent or very good overall health, although there are some developmental danger signs—that are evident from birth—for a significant number of children. Second, the profile of developmental constraints in Aboriginal Australia is likely to overwhelm the critical acquisition of skills and abilities for many children. Third, the analysis confirms that stress and discrimination are part of many Aboriginal children’s lives, and from an early age.

The findings here confront policy and practice settings with competing demands: the urgency to be seen to be ‘doing something’ to address the acute needs and demands of families overwhelmed by crises while at the same time diverting government resources and energies to the longer and slower process of enabling demographic restitution of capability. As noted above, this process is commencing from a very low base and it is unlikely that there is any generational short-cut in the time that it will take to effect true change. I have highlighted that Aboriginal children have less access to older, experienced people available for their care, protection, cultural guidance and general life-skills education. The ‘treatment’ for this is primarily a demographic treatment: delay the onset of age of first pregnancy while concurrently increasing the proportion of Aboriginal children that receive high quality early childhood educational daycare and support into primary school. The goal here is to prolong enrolment, attendance and retention into the upper secondary school to increase the proportion of the Aboriginal population that has vocational and tertiary experiences—this will build greater human capital. It will have the ultimate effect of expanding choices for

Aboriginal adults and, concomitantly, improve the wellbeing and life opportunities of Aboriginal populations.

While this is slowly transforming the capability profile of the Aboriginal population, there is a need to specifically enrol Aboriginal people in understanding how to reduce the developmental chaos which is the major constraint affecting Aboriginal children. This will take different forms depending on where the child and family are living—the major areas here are demarked by the metropolitan setting (urban), transition zone (rural and remote regional centres) and extremely remote areas. The short-term strategies require establishing effective buffering around the child and stabilising the level of chaos the child is exposed to: reducing the effects of direct and indirect violence, improving the quality of the material environment particularly for children aged 2–4 years, establishing emotional support for the adult carer, and providing regularity in routine and setting realistic expectations for the child. The treatment for the population is a focus on slow, progressive, upstream and distal changes in human capital formation; the treatment for children living today is a proximal approach with an explicit engagement of Aboriginal adults in enhancing life prospects.

5.5.1 Strengths and limitations

The large sample size and breadth (in terms of data items) of the 2008 NATSISS offer considerable strength for the purposes of examining aspects of Aboriginal child development. However, there are, as with any survey, a range of limitations to the NATSISS data which restrict what can be achieved in this chapter and what can be inferred from the results. First, there is a lack of information on academic performance and social and emotional wellbeing, and a narrow range of educational attendance variables in the survey. This limits my ability to examine some of the key domains of child development. Second, all of the questions relating to 0–14 year olds rely on the perceptions and recall of parents and caregivers, which are inherently open to bias (e.g. problems with interpretation, willingness to answer openly) and inaccuracy.[142] In relation to the 2008 NATSISS, the difficulties with interpreting a child's health are two-fold—a carer's views may not accord with that of a medical expert or with the view of the child themselves. Third, the available CURF does not allow a full examination of the effects of geographic location. This is particularly limiting in Aboriginal contexts because of the heterogeneity of Australian Aboriginal population groups[24] and the important role that a sense of place and connection to land plays in determining the health status of Aboriginal peoples.[42, 145]

5.6 Conclusion

This chapter has described the developmental status of Aboriginal children in Australia using a robust nationally representative survey. Perhaps contrary to popular belief, most Aboriginal children appear to be in excellent or very good overall health. However, the profile of constraints that I have documented indicates that a substantial proportion of Aboriginal children will not develop the critical capacities needed to optimise their opportunities through life.

The findings in this chapter reinforce the difficulties that confront policy makers and practitioners in striking a balance between addressing short-term crisis needs and longer-term solutions that aim to redress health and developmental inequalities. It seems clear that governments and other stakeholders in Australia are now resolved to diminishing these inequalities across all age groups. What is less clear is whether these stakeholders are focussing their efforts on the most salient drivers of key inequalities. As posited in Chapter 3, the mechanisms that shape the health and developmental outcomes of children may be pertinent in both Aboriginal and non-Aboriginal contexts but do the recognised key drivers of child health affect these population groups differently?

CHAPTER 6

DO SOCIOECONOMIC FACTORS IMPACT ON ABORIGINAL CHILD POPULATION HEALTH AND DEVELOPMENT?

6.1 Introduction

To this point the thesis has assessed the developmental status of Aboriginal children by summarising the population prevalence of key markers of child health and development and their risk factors. The relationship between risk factors and Aboriginal child outcomes is still largely undescribed—and this observation extends to the widely acknowledged critical determinants of health, such as socioeconomic status. As a consequence, there are still gaps in our understanding of the relative importance of factors that influence Aboriginal child health, and therefore limitations in the ability of the community and governments to address the needs of Aboriginal children in the critical early stages of the life course.

In this chapter I begin to assess whether socioeconomic status has an influence on Aboriginal child population health and development, using a large, nationally representative population survey. I test a small set of socioeconomic factors and evaluate their relative importance to the general health status of Aboriginal children in Australia.

6.2 Background[3]

There is a relatively circumscribed literature on the nature of the associations between Aboriginal child developmental outcomes and their antecedents. The empirical evidence that was reviewed in Chapter 3 suggests that there is a fairly weak

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[3] Material in Sections 6.2–6.5 has been reproduced from the following article: Shepherd CCJ, Zubrick SR. What shapes the development of Indigenous children? In: Hunter B, Biddle N, editors. Survey Analysis for Indigenous Policy in Australia: Social Science Perspectives, CAEPR Research Monograph No. 32. Canberra: ANU E-Press; 2012.

relationship between the income, education and employment of Aboriginal adults and the developmental outcomes of their children.

6.3 Methods

Data are sourced from the *National Aboriginal and Torres Strait Islander Social Survey* (NATSISS), a large-scale, multi-faceted social survey of Aboriginal persons conducted periodically by the Australian Bureau of Statistics (ABS). The 2008 survey used an area-based multi-stage sample design, with separate random designs for discrete Aboriginal communities and non-community areas. These features ensure that the sample can be used to produce population representative estimates at a national level and for each State and Territory.

Of all eligible households, 78% consented to participate in the NATSISS and were fully responding. All responses for children (0–14 year-olds) were provided by parents/guardians in most instances, or a member of the household with responsibility for the child. Children aged 15–17 were directly interviewed, with parental consent. The full details of the design and conduct of the NATSISS have been described elsewhere.[187]

6.3.1 Outcome variable

The NATSISS asked a global question on health status that was assessed by survey participants on a five-point ordinal scale: excellent, very good, good, fair and poor. Responses are based on the participant's general overall physical and mental health.

6.3.2 SES measures

The NATSISS collected an array of SES indicators, with a limited number available for analysis with the child sample (0–14 year-olds). Three indicators were chosen for this analysis—carer education, area-level disadvantage and household income—as they represent three different dimensions of socioeconomic status at multiple levels (parent, family and neighbourhood).

Carer education was measured by the highest year of school completed by the main carer of the child. Responses were grouped into three categories: Year 9 or less (including never attended); Year 10; and Years 11–12.

The Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product was used to measure area-level socioeconomic disadvantage.[204] The SEIFA index ranks the relative level of disadvantage of areas using the attributes of all persons (Aboriginal and non-Aboriginal) in each Collection District (CD), and includes measures of income, educational attainment, employment status and occupational skill. Quintiles were determined based on the distribution of values for the total Australian population (for Aboriginal and non-Aboriginal children).

While household income is a popular conventional indicator of material wellbeing, it has some limitations in this context: first, income data were not collected from each household member personally; second, it is a sensitive item that is prone to inaccurate and incomplete reporting; and third, income does not capture the nature of sharing of economic resources that can occur between members of extended Aboriginal families.[140] Information on household income was provided by a household spokesperson. The individual incomes of the usual residents of a household (aged 15 years and over) were summed, and standardised using equivalence scales to account for differences in household size and composition. The resultant measure of gross weekly household equivalised income is designed to be a more accurate reflection of a household's relative wellbeing. Quintiles were determined based on the distribution of values for the total Australian population (for Aboriginal and non-Aboriginal children). Information on household income quintile was not available for approximately 18% of the sample aged 0–14 years—these records were removed from the analysis that included this variable.

6.3.3 Geographic remoteness

Geographic remoteness is defined using the Australian Standard Geographic Classification (ASGC) Remoteness Structure, which is based on the plus version of the Accessibility/Remoteness Index of Australia (a widely used classification of remoteness in Australia).[188] The five categories of remoteness reflect differences in access to services and opportunities for social interaction, and include Major cities, Inner Regional Australia, Outer Regional Australia, Remote Australia and Very Remote Australia (see Figure 2.2 for a map of remoteness areas).[191]

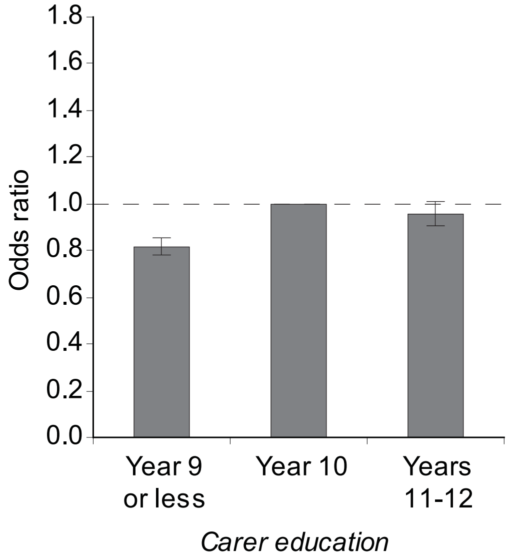
6.3.4 Analysis

The analysis in this chapter was restricted to data from the 5484 Aboriginal children in the sample aged 0–14 years. All analyses in this chapter were conducted on the *State/Territory by ASGC Remoteness Structure Confidentialised Unit Record File* (CURF) using SAS version 9.1 (SAS Institute Inc., Cary, NC, USA, 2000–08) within the Australian Bureau of Statistics' Remote Access Data Laboratory (RADL). The RADL is a secure online data query service that enables a confidentialised version of the NATSISS to be interrogated remotely by researchers. While the RADL processes protect the confidentiality of the data, they restrict some of the analytic capacities of SAS.

All logistic regression models report odds ratios with 95% confidence intervals. All output has been generated using person-level weights to produce representative estimates of the population of interest. While the ABS supplies replicate weights for the derivation of standard errors, the version of SAS provided in the RADL does not support the use of replicate weights. As a consequence, standard errors that allow for the complex design of the survey have been approximated with the application of a design effect. A design effect is an estimate of the change between the variance of estimates for a complex sample design and the variance that would have been achieved from a simple random sample with the same sample size, and has been calculated by comparing the simple variance with the variance estimates published by the ABS for a range of point prevalence data. The confidence intervals reported here are based on estimates of standard error and variance (calculated on the assumption of a simple random sample) adjusted by the estimated design effect.

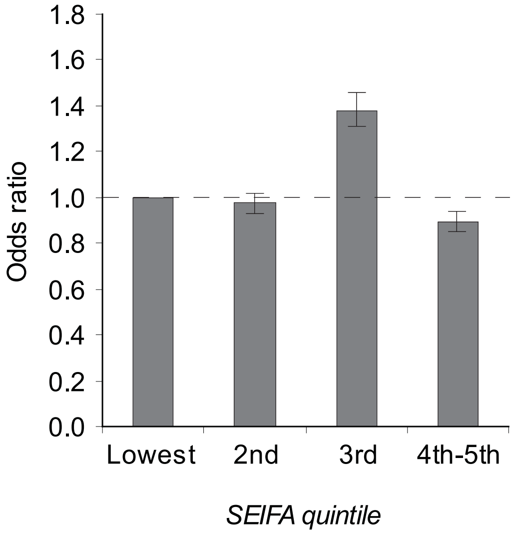
6.4 Results

The shape and magnitude of the associations between socioeconomic status and child health is highlighted in Figures 6.1–6.3, which show the odds ratios from logistic regression analyses. There appears to be no association between the parent-rated measure of child health status and carer education (Figure 6.1) and no statistically significant trend by the SEIFA measure, although those children in the third quintile of SEIFA were 1.4 times more likely (95% CI: 1.3–1.5) to be in excellent or very good health than those in the lowest quintile (Figure 6.2). Household income is positively associated with child health, although the relationship is non-linear in nature and only features an elevated odds of having excellent or very good health for children in the top two quintiles (OR = 1.8; 95% CI: 1.6–2.0) and second quintile (OR = 1.5; 95% CI: 1.4–1.5), relative to those in the lowest quintile (Figure 6.3). Household income continues to have a statistically significant independent effect on child health when analysed collectively with carer education and SEIFA (p=0.0024).



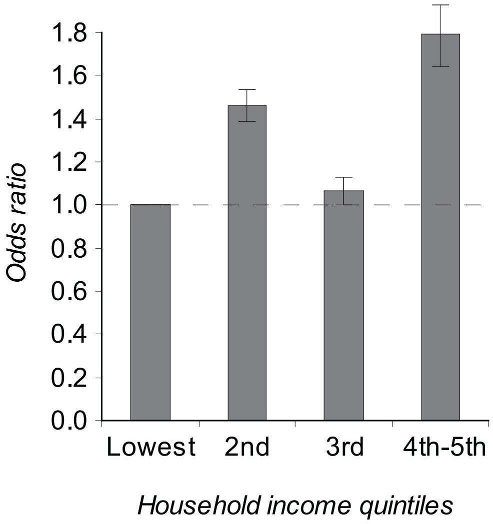
Note: Logistic regression model includes age and sex as covariates.

Figure 6.1: Relative odds of excellent or very good health in Aboriginal children, by carer education, Australia, 2008.



Note: Logistic regression model includes age and sex as covariates. SEIFA quintiles were determined based on the distribution of values for the total Australian population.

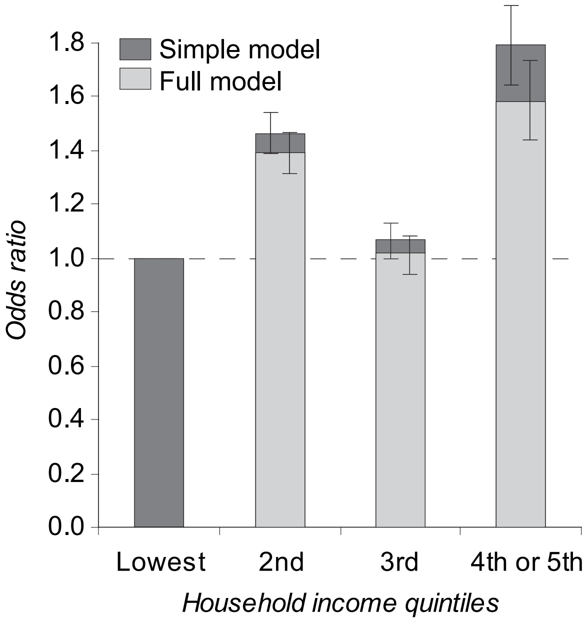
Figure 6.2: Relative odds of excellent or very good health in Aboriginal children, by area-level relative disadvantage (SEIFA), Australia, 2008.



Note: Logistic regression model includes age and sex as covariates. Household income is derived using equivalence scales; quintiles have been derived based on the distribution of total household income for Aboriginal and non-Aboriginal households.

Figure 6.3: Relative odds of excellent or very good health in Aboriginal children, by household income, Australia, 2008.

The association between household income and child health status is only slightly attenuated by the inclusion of other factors in the model that are known to influence health in early life (see Figure 6.4). I found that stress, carer engagement in informal activities with the child, and bullying and discrimination were all factors significantly associated with a child being in excellent or very good health, and that household income has an effect on child health over and above the influence of these factors.



Note: ‘Simple’ logistic regression model includes age and sex as covariates. The ‘full’ model also includes the following covariates: remoteness, SEIFA quintiles, carer education, experience of stressors, carer engagement in informal activities with the child, whether bullied or treated unfairly, whether child stayed overnight somewhere else because of family crises, whether child was involved in cultural events, ceremonies or organisations or participated in cultural activities in last 12 months, and whether child eats fruit and vegetables. Household income is derived using equivalence scales; quintiles have been derived based on the distribution of total household income for Aboriginal and non-Aboriginal households.

Figure 6.4: Relative odds of excellent or very good health in Aboriginal children, by household income, Australia, 2008—simple and full models.

6.5 Discussion

Our findings suggest that the strong associations characteristically seen in mainstream populations between child health and development outcomes and socioeconomic status do not necessarily hold in Aboriginal populations. This does not imply that these factors are unrelated to the development of Aboriginal children or that improving education, for example, is unwarranted. Instead it is likely to reflect that there are other circumstances in the social and physical environment that disrupt these associations for large segments of the Aboriginal population.[194]

Weak health gradients are particularly problematic for populations with low levels of health because they imply that there are greater barriers to improving health. If traditional levers do not produce improvements in health, then these populations are in danger of being ‘trapped’ in poor health.[118] It is difficult to underestimate the implications of this for Aboriginal Australia. The current policy imperative is one that aims to ‘close the (developmental) gap’ between the mainstream and Aboriginal population within a generation.[47] These gaps are now well documented and include sentinel indicators of health and development at the earliest stages of life, such as low birthweight and infant mortality.[52] For example, mortality rates among Indigenous infants were 2-3 times as high as those for non-Indigenous infants in 2007-09.[53] Given the scale of difference in the health status of Aboriginal and non-Aboriginal populations, the findings here of weak associations between determinants of human development and human capital formation would suggest that either the policy expectation is overly ambitious or that greater effort will be needed to compensate for the reduced effect size.

6.5.1 Strengths and limitations

The large sample size and availability of SES variables at multiple levels are particular strengths of the 2008 NATSISS for the purposes of examining associations between SES and Aboriginal child health. There are, however, some limitations to the NATSISS data which have restricted the scope of the analyses in this chapter and the strength of the statements that can be made from the results. The main limitations include: the cross-sectional design of the NATSISS which reduces any discussion of causal inference to a discussion about associations; the reliance on self-reported data for the outcome and predictors. The recall and perceptions of parents and caregivers may be subject to bias (e.g. problems with interpretation, willingness to answer openly) and inaccuracy.[142] If health status has been overstated by those in the lower levels of the social hierarchy, for example, then this would produce smaller SES disparities in health when compared with results that rely on objective assessments of health;[143] an abbreviated set of geographic identifiers which constrains my ability to examine the effects of geographic location; and, lastly, the CURF does not include stratum or CD information which precludes a multi-level analysis of the data, and therefore I am not able to fully examine the relationships between factors at the individual, family and neighbourhood level and child health status.

SES has been measured here using three available variables from the NATSISS (carer education, area-level disadvantage and household income). While these provide an insight into the characteristics of households, neighbourhoods and parents, they offer only a partial view of the broad constructs of SES. Further, this set of variables comprise only traditional measures of SES, which can be less relevant to Aboriginal populations and have limited applicability in some Aboriginal contexts (see Section 2.4).[9, 70, 71] Income and education are two prime examples: research highlights that the participation and attachment of Aboriginal people to the formal labour market is distinct to other Australians. As a result, Aboriginal people tend to earn less, be more reliant on government transfer payments, and are more likely to receive in-kind remuneration for informal productive activities,[31, 64] than other Australians. Income that is earned is more often shared among extended family members when compared with other Australian families;[72, 140] with respect to educational attainment, standard indicators typically ignore knowledge that is valued in Indigenous society (that may have an impact on wellbeing) but acquired outside of Western education systems and do not capture the quality of the educational experiences of carers. The relatively poor performance of Aboriginal people in education is well-documented,[53, 104] and suggests that, at every level of education, Aboriginal people may acquire less health-benefitting knowledge and skills than non-Aboriginal people. These two examples highlight the significant challenges in assessing the pattern of SES-health relationships in Aboriginal populations and comparing them with non-Aboriginal populations.

6.6 Conclusion

The findings of this chapter are suggestive of a relative weak association between child health and development outcomes and socioeconomic determinants in Aboriginal populations. This provides incremental evidence that some of the prime policy levers of government—that is, investments that can modify socioeconomic conditions—may not have an appreciable impact on the population health outcomes of Aboriginal children.

While the findings here provide some potentially fresh insights into the role of social factors in determining health outcomes, I am unable to make strong assertions about the nature of the SES-health relationship given the limited scope of the analyses. A wider array of both health outcomes and socioeconomic factors needs to be assessed. In addition, a more rigorous analytic approach is required, that takes account of differences that might exist in the social pathways to health by age, sex, geographic location and, concomitantly, considers a range of plausible mediating factors.

CHAPTER 7

THE SOCIOECONOMIC PATTERN OF PHYSICAL HEALTH OUTCOMES

7.1 Introduction

The results of the previous chapter suggested that the social gradients in health observed in general populations may not hold true for populations of Aboriginal children. This chapter extends on the analyses conducted in Chapter 6, by providing a more rigorous examination of the SES-health relationship in this population group. It aims to assess the socioeconomic pattern of physical health outcomes among Aboriginal children. The analysis draws upon the most comprehensive and relevant population-representative survey for the purposes of examining this topic in an Aboriginal context. While the survey dataset is limited to children in Western Australia, it enables advanced analytic techniques to be applied to the assessment of the relationships between a diverse set of physical health outcomes and SES indicators.

7.2 Background[4]

Socioeconomic factors have consistently been shown to influence population health.[1, 2] These factors reflect the way in which society is ordered according to wealth, prestige, power, social standing or one's control over economic resources.[3] The pattern of association between socioeconomic status (SES) and health has almost always depicted better health for those who are better off, regardless of how SES is defined or measured—that is, the health of population groups normally follows a gradient pattern,[109] at all stages of the life course.[5-7] Despite the ubiquity of this

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[4] Material in Sections 7.2–7.5 has been reproduced from the following published paper, with permission (see Appendix D): Shepherd CCJ, Li J, Zubrick SR. Socioeconomic disparities in physical health among Aboriginal and Torres Strait Islander children in Western Australia. Ethn. Health. 2012; 17(5):439-461.

observation in the empirical literature, there is uncertainty as to whether it applies to Aboriginal populations in Australia.[8, 9]

There are important implications of improving our understanding of socioeconomic disparities in health within Aboriginal populations. The magnitude and shape of disparities can provide insights into the relative importance of social conditions to health outcomes and may facilitate a better grasp of the complex underlying mechanisms that determine Aboriginal health.[14, 15] Moreover, there are critical policy implications of improving our knowledge in this area. If the relationships between SES and health are relatively weak in Aboriginal populations then investments aimed at stimulating employment, income and education, for example, are unlikely to improve the health outcomes of Aboriginal populations or significantly reduce health disparities between Aboriginal and other populations. This implies that policy responses that are suitable for the general population would need to be modified in order to benefit the health of Aboriginal peoples.

The quality and quantity of data that describe the circumstances of Australian Aboriginal peoples has improved markedly in recent decades.[205] These data reveal striking disparities between Aboriginal and non-Aboriginal populations in most domains of health and constructs of SES,[195] which reflect a post-colonial history of marginalisation and exclusion from mainstream society, dispossession of traditional lands, forced separation from family and kinship networks, and racism.[90, 206-209]

The comparatively poorer health status of Australian Aboriginals is evident across the life course, including the earliest stages of life. Aboriginal children are more likely than non-Aboriginal children to be born at sub-optimal weight, die in infancy, suffer from a range of long-term health conditions, and be hospitalised.[52, 57-60] Some conditions affecting Aboriginal children are scarcely encountered outside of Third World countries (such as rheumatic fever) and, too often, child illnesses, hospitalisations, disabilities and deaths are caused by potentially preventable events (such as injury, poisoning, abuse and neglect).[52] While Aboriginal/non-Aboriginal health disparities are now well documented, less is known about the health disparities that exist *within* Aboriginal populations in Australia.

The empirical evidence on socioeconomic disparities in health in Aboriginal Australia covers only a narrow range of health and SES indicators, with little consistency in scope or analytical approach. There are examples of socioeconomic gradients in mortality, cardiovascular disease, renal disease, diabetes, disability, oral health, infections and self-rated overall health,[91, 126, 128, 132, 134, 137, 138, 210, 211] although the slope and direction of these gradients typically varies across studies. Mental health, asthma and long-term health conditions appear to be equally prevalent across SES categories,[74, 93, 136, 212] and a single study on birthweight was inconclusive as to whether outcomes varied significantly by an area-based measure of relative disadvantage.[131] In some cases, the SES-health pattern has been shown to vary depending on the SES construct used. For example, Cunningham et al. highlighted that better self-rated health was associated with better education and labour force outcomes and home ownership, but not with household income, in a 1994 survey of Aboriginal adults.[91]

This chapter aims to provide insights into the nature of the relationship between SES and health among Aboriginal peoples, with a focus on the socioeconomic disparities in physical health outcomes of Aboriginal children in Western Australia. I use a diverse set of health outcome indicators and investigate the pattern of their associations with conventional and alternative measures of SES, including the characteristics of individuals, families, households and communities.

7.3 Methods

Data are from the 2000–2002 *Western Australian Aboriginal Child Health Survey*, a population-representative study of the health, development and education of 5289 (or one in six) Aboriginal children aged 0–17 years in the State of Western Australia, and their families and communities. The survey used an area-based clustered multi-stage sample design. Dwellings in selected census collection districts were approached, with in-scope families defined by whether there was an Aboriginal or Torres Strait Islander child aged 0–17 years living in the dwelling. All Aboriginal children aged 0–17 years in in-scope families were selected to participate. Of eligible families, 84% consented to participate in the survey and useable information was obtained on 96% of participating children, predominantly from household interviews. In addition to data on the health of children, interviews were conducted among primary carers and, where possible, secondary carers of children to gather information on the demographic and social circumstances of families, households and the communities in which they lived. Primary and secondary carers were the people who spent the most time with survey children and knew them best. The primary carer was usually the mother of the child (80%). In the majority of cases, the secondary carer was the father of the child (77%) or another related person (19%). Most primary (83%) and secondary (79%) carers identified themselves as Aboriginal. All aspects of the survey were conducted under the direction of a steering committee of senior Aboriginal people from a cross-section of settings and organisations. The full details of the design and conduct of the study have been described elsewhere.[35]

7.3.1 Health outcomes

Six physical health indicators were analysed, including chronic conditions (asthma, sensory function problems, recurring chest infections and oral health problems) and acute conditions (ear infections and accidents and injuries). These conditions represent some of the most prevalent long-term conditions (e.g. asthma) and those with significant contributions to hospitalisation (e.g. ear infections), mortality (e.g. injury) and the overall disease burden in childhood and young adulthood.[52, 94, 213] Information on all health outcomes was gathered from primary carers of participating children. Questions on sensory function and oral health problems and accidents and injuries were restricted to 4–17 year-olds. To determine asthma prevalence, carers were simply asked whether the child had "ever had asthma". Four questions were used to assess whether a child had a sensory function problem: Does the child have normal hearing in both ears? Does the child have normal vision in both eyes? Do other people need help to understand what the child is saying? Does the child have difficulty saying certain sounds? A limitation in one or more of these areas was considered a sensory function problem for the purposes of this study. Children who had ever had holes in their teeth, teeth removed, fillings, or sore/bleeding gums were deemed to have had an oral health problem. A child was classified as having an ear infection if they experienced recurring ear infections or a single episode of discharging ear(s) (runny, tropical or glue ear). Accidents and injuries were assessed by asking whether the child had ever: broken a bone(s); been knocked out; or had a stay in hospital because of an accidental burn or poisoning.

7.3.2 SES measures

SES was measured using eight separate variables, including characteristics of parents/carers (educational attainment of both primary and secondary carers and highest occupational class of carers), families/households (family financial strain, housing tenure, housing quality) and neighbourhoods/communities (two composite indexes of socioeconomic disadvantage). This array of measures was chosen for four main reasons. First, reliance on a single measure is unlikely to capture how socioeconomic position shapes health disparities in any population. This is particularly true among Aboriginal populations because they are more likely to be distributed at the lower levels of any SES construct. Second, it is necessary to measure different dimensions of SES at multiple levels in order to capture the complex set of factors that contribute to socioeconomic disadvantage among Aboriginal populations. Third, use of multiple SES measures enables a comparison of compositional and contextual effects on health disparities. Fourth, it is important to test the saliency of conventional versus alternative SES indicators in shaping health disparities, particularly as there are doubts about the relevance of conventional SES measures for Indigenous and other disadvantaged populations.[64, 150, 214] I have included conventional indicators of social class (education and occupation) and used a subjective rating of financial strain as a proxy measure of material wellbeing. Financial strain is used in preference to a conventional measure of household income, for two main reasons: first, income data was not collected from all household members that contributed to its financial base; and second, income does not capture the nature of sharing of economic resources that can occur between extended members of Aboriginal families.[140] It should be borne in mind that while this variable is an indicator of the stress faced by families in meeting the basic needs of day-to-day living, it may not strictly reflect the financial resources available to a family unit. Housing characteristics are afforded prominence in these analyses, given the importance of housing to Aboriginal health.[215] Housing tenure and quality are proxy indicators of income and wealth[216] and have been included to complement the measure of financial strain (income) in describing the material wealth of Aboriginal families and households.

Information about the characteristics of primary carers, families and households was provided by the primary carers of participating children. Secondary carers provided separate responses on their educational attainment and occupational class. Housing quality was measured using a set of indicators based on a nationally agreed framework for the design, construction and maintenance of Aboriginal housing.[35] This includes whether the house had facilities for washing people and clothes, removing waste safely, storing and cooking food, and controlling the temperature. Households were classified into one of four categories: having none, one, two, or three or more indicators of poor housing quality.

The Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product and Biddle's Index of Relative Indigenous Socioeconomic Outcomes (IRISEO) were used to measure area-level socioeconomic disadvantage.[77, 217] The SEIFA index ranks the relative level of disadvantage of areas using the attributes of all persons (Aboriginal and non-Aboriginal) in each census collection district (CD). The SEIFA index used in this study includes measures of income, educational attainment, employment status and occupational skill but excludes the proportion of Aboriginal people in the CD.[35] Quintiles were determined based on the distribution of values for all Australian CDs. Biddle's IRISEO is a rank order variable that measures the socioeconomic outcomes of all 531 Indigenous Areas in Australia in 2001, based on the employment, income, education and housing characteristics of Aboriginal persons only.[77] Quintiles were determined based on the distribution of IRISEO values for all Australian Indigenous Areas.

7.3.3 Geographic isolation

Geographic isolation is defined using the Level of Relative Isolation (LORI) classification, which is based on the ARIA++ index (a widely used classification of remoteness in Australia). The five categories of isolation reflect differences in access to services, cultures and health outcomes for Aboriginal children in Western Australia, and range from none (Perth metropolitan area), to low, moderate, high and extreme.[198]

7.3.4 Non-response and imputation

Analysis of non-response characteristics showed that the survey sample was broadly representative of the population of Aboriginal children living in Western Australia, although comparisons with population benchmarks showed that age, socioeconomic status, household size and region were significantly associated with non-response. Post-stratification weighting was employed to adjust for differential non-response and produce unbiased estimates. There was only a small amount of item-level non-response. While an imputation procedure was employed to assign values to non-responding items, the percentage of imputed values was less than 1% for each variable and, based on this, imputation had no effect on the results of this study. Information was unable to be obtained on the characteristics of 15% of secondary carers, and I have treated all variables from these records as missing in the following analysis. More details about non-response characteristics, weighting and imputation are available elsewhere.[198]

7.3.5 Analysis

Analysis was conducted using logistic regression techniques within a multilevel framework. Models were fitted with the method described by Pfeffermann et al., which takes into account the survey weights and the hierarchical structure of the data, i.e. selection of children within families and communities.[218] All models report odds ratios, adjusted for age and sex, with 95% confidence intervals. Standard errors for survey estimates of totals were produced using the Ultimate Cluster Variance estimation technique.[219] Standard errors for estimates of odds ratios and proportions were calculated using a modified form of the Jack knife variance estimation technique.[220] Standard chi-square tests and chi-square tests for trend adjusted for the complex sample design were used to assess the difference between categorical SES indicators and dichotomised health outcome variables. Spline curves were used to further describe the shape of the association between SEIFA and health, and to assess the impact of geographic isolation (LORI) on the SES-health relationship. I used the Generalized Additive Models framework to account for the possible non-linear nature of these relationships and fit a non-parametric spline curve[221] SAS version 9.2 was used for all analyses (SAS Institute Inc., Cary, NC, USA, 2000–08).

7.4 Results

7.4.1 Population characteristics

The six indicators of physical health ranged in prevalence, from 12% (for recurring chest infections) to 47% (for oral health problems) (Table 7.1). Aboriginal children were largely distributed in the more disadvantaged categories of most measures of SES, with few represented in the top category: only 5.4% of Aboriginal children had a primary carer with a post-secondary education, 4.8% lived in a family that could 'save a lot', 6.4% lived in houses that were owned by its occupants, and 4.9% lived in areas coded to the top two SEIFA quintiles. When area-level relative disadvantage was constructed using the characteristics of Aboriginal people only (IRISEO), 17% of the study population was in the top two quintiles (Table 7.1). This signals that, on average, Aboriginal children in Western Australia live in areas with less favourable socioeconomic characteristics than other Aboriginal people across Australia.

Table 7.1: Health, SES and demographic characteristics of Aboriginal children aged 0–17 years in Western Australia, 2000–02[a].

	Number	% (95% CI)
	Health characteristics	
Asthma	6910	23.2 (21.6–24.9)
Ear infections	8160	27.4 (25.8–29.0)
Recurring chest infections	3660	12.3 (11.1–13.5)
Sensory function problem[b]	5560	24.3 (22.4–26.3)
Injury or accident[b]	5220	22.8 (21.2–24.4)
Oral health problem[b]	10700	46.6 (44.3–48.9)
	SES characteristics	
Education: primary carer		
Did not attend	740	2.5 (1.8–3.4)
Year 9 or less	6630	22.2 (20.3–24.3)
Year 10	12800	42.9 (40.6–45.3)

Years 11–12	7240	24.3 (22.3–26.4)
13 or more years	1600	5.4 (4.0–6.9)
Education: secondary carer		
Did not attend	700	2.4 (1.6–3.4)
Year 9 or less	4880	16.4 (14.6–18.2)
Year 10	5910	19.8 (17.8–22.1)
Years 11–12	3050	10.2 (8.8–11.8)
13 or more years	710	2.4 (1.6–3.3)
No secondary carer	11900	39.9 (37.5–42.4)
Occupation[c]		
Managers and professionals	3490	11.7 (10.1–13.4)
Tradespersons, clerical workers and labourers	10800	36.3 (33.9–38.8)
Not employed	14800	49.6 (47.0–52.2)
Family financial strain		
Spending more than we get	2630	8.8 (7.5–10.3)
Just enough to get by	13300	44.5 (42.1–46.9)
Some left over but spend it	4010	13.5 (11.7–15.3)
Can save a bit	7680	25.8 (23.7–27.9)
Can save a lot	1420	4.8 (3.7–6.1)
Housing tenure		
Owned	1910	6.4 (4.9–8.1)
Being paid off	4120	13.8 (12.1–15.7)
Renting	21800	73.0 (70.5–75.4)
Other	1230	4.1 (3.0–5.5)
Number of indicators of poor housing quality		
None	8930	29.9 (27.5–32.4)
One	7980	26.8 (24.7–28.9)
Two	6480	21.9 (19.8–24.2)
Three or more	6340	21.4 (19.2–23.7)
SEIFA[d] (quintiles)		
Bottom quintile (less advantaged)	17500	58.6 (54.4–62.7)
Second	7310	24.5 (21.1–28.0)
Third	3600	12.1 (9.3–15.2)
Fourth	1270	4.3 (2.4–7.0)
Top quintile (more advantaged)	170	0.6 (0.1–1.6)
IRISEO[e] (quintiles)		
Bottom quintile (less advantaged)	6350	21.3 (17.8–25.0)
Second	8760	29.4 (26.1–33.0)
Third	9490	31.8 (28.8–35.0)
Fourth	4830	16.2 (13.7–18.9)
Top quintile (more advantaged)	300	1.0 (0.4–2.4)
Demographics		
Age (years)		
0–3	6910	23.2 (21.7–24.7)
4–11	13800	46.5 (44.8–48.2)
12–17	9100	30.3 (28.5–32.1)
Sex		
Male	15370	51.6 (49.9–53.1)
Female	14430	48.4 (46.9–50.1)
Level of relative isolation		
None	10200	34.1 (31.5–36.8)
Low	7270	24.4 (21.8–27.0)

Moderate	6390	21.4 (18.1–25.1)
High	3170	10.6 (7.9–14.0)
Extreme	2830	9.5 (6.8–12.7)

[a] Numbers are weighted estimates of the population of Aboriginal children in each category, and have been rounded. Proportions for sensory function problems, injuries/accidents and oral health problems are based on all Aboriginal children aged 4–17 years (n=22900); all other proportions are based on all Aboriginal children aged 0–17 years (n=29800). The frequencies of missing responses have not been reported.

[b] For 4–17 year-olds only.

[c] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. 'Managers and professionals' include occupational skill levels 1 & 2. 'Tradespersons, clerical workers and labourers' include occupational skill levels 3–5.

[d] Customised version of the index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs.

[e] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Aboriginal persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

7.4.2 SES–health disparities

Tables 7.2 and 7.3 show the odds ratios from logistic regression analyses, and highlight that the direction and magnitude of the association between SES and health varied greatly by both SES indicator and health outcome. Overall, of the 48 associations examined, 17 were statistically significant on the basis of a chi-square test for trend, and another seven had at least one significant difference (at a 95% level of confidence) in health status between categories of SES. For ear infections, recurring chest infections and sensory function problems, the patterns were generally consistent with a positive socioeconomic gradient—where better health was associated with higher SES. Conversely, asthma, accidents and injuries, and oral health problems tended to exhibit a reverse gradient—where better health was associated with lower socioeconomic status, although this was primarily observed for area-level SES indicators.

The largest differences in health outcomes were observed for area-level SES indicators, with other SES measures generally showing a weak to moderate association with the health outcomes. For example, Aboriginal children aged 0–17 years in the top quintile of the IRISEO were 9.2 times more likely (95% CI: 3.1–27.2) to have ever had asthma than those in the bottom quintile; whereas there was generally less than a two-fold disparity in the health outcomes within parental, family and household-level SES indicators.

Most health outcomes had a curvilinear pattern of association with SEIFA (Figure 7.1), although not all of these were statistically significant. There was evidence of a reverse threshold effect for oral health problems and asthma, whereby those in the lowest quintile of SEIFA generally had *better* health outcomes than all others. The relationship with the IRISEO was characterised by a reverse gradient for four of the six health variables. These gradients tended to be linear, reflecting monotonic changes in health status along the continuum of this index.

Table 7.2: Socioeconomic disparities in selected physical health outcomes among Aboriginal children aged 0–17 years, Western Australia, 2000–2002[a].

	Asthma			Ear infections			Recurring chest infections		
Socioeconomic measure	OR	95% CI	*p*-value[b]	OR	95% CI	*p*-value[b]	OR	95% CI	*p*-value[b]
Carer characteristics									
Education: primary carer									
Did not attend	0.60	0.33–1.36		1.90	1.21–2.98		2.35	0.98–5.67	
Year 9 or less	0.75	0.64–1.04		1.34	1.05–1.71		0.94	0.71–1.25	
Year 10	1.00	..	0.089	1.00	..	0.007	1.00	..	0.362
Years 11–12	1.08	0.84–1.36		1.26	0.98–1.63		1.05	0.80–1.38	
13 or more years	1.33	0.89–1.86		1.63	1.09–2.45		1.19	0.76–1.85	
Education: secondary carer									
Did not attend	0.89	0.48–1.57		2.10	1.04–4.24		0.97	0.45–2.08	
Year 9 or less	0.90	0.67–1.19		1.36	1.00–1.85		1.03	0.70–1.51	
Year 10	1.00	..	0.343	1.00	..	0.002	1.00	..	0.305
Years 11–12	1.31	0.88–1.69		0.98	0.68–1.42		0.78	0.50–1.21	
13 or more years	0.85	0.44–1.88		0.42	0.20–0.88		0.76	0.39–1.45	
No secondary carer	1.22	0.90–1.45		1.42	1.09–1.85		1.13	0.81–1.57	
Occupation[c]									
Managers/professionals	1.08	0.70–1.67	0.736	1.28	0.93–1.77	0.125	1.07	0.73–1.58	0.718
Tradespersons, clerical workers and labourers	1.00	..	..	1.00	..	..	1.00	..	..
Not employed	1.01	0.79–1.30	0.907	1.04	0.84–1.29	0.702	1.35	1.05–1.75	0.021
Family/household characteristics									
Family financial strain									
Spending more than we get	0.95	0.49–1.84		1.11	0.56–2.19		2.65	1.33–5.27	
Just enough to get by	0.88	0.47–1.62		1.05	0.58–1.90		1.72	0.91–3.24	
Some left over but spend it	0.78	0.41–1.50	0.857	1.12	0.60–2.09	0.366	1.37	0.69–2.69	0.015
Can save a bit	0.96	0.53–1.76		0.86	0.47–1.60		1.52	0.81–2.84	
Can save a lot	1.00	..		1.00	..		1.00	..	
Housing tenure									
Owned	1.00	..	..	1.00	..	..	1.00	..	..
Being paid off	1.97	1.00–3.88	0.049	0.91	0.54–1.55	0.729	0.57	0.34–0.97	0.037

Renting	1.90	1.02–3.53	0.042	1.14	0.71–1.82	0.594	0.83	0.53–1.30	0.423
Other	0.66	0.23–1.91	0.440	1.42	0.71–2.83	0.324	0.53	0.21–1.33	0.176
Number of indicators of poor housing quality									
None	1.00	..	0.018	1.00	..	<0.001	1.00	..	0.237
One	0.99	0.76–1.30		0.97	0.73–1.29		1.20	0.89–1.62	
Two	0.94	0.68–1.29		1.28	0.96–1.69		1.31	0.97–1.77	
Three or more	0.60	0.43–0.85		1.55	1.21–2.00		1.32	0.97–1.81	
Neighbourhood characteristics									
SEIFA quintiles[d]									
Bottom quintile	1.00	..	0.001	1.00	..	0.790	1.00	..	0.237
Second	1.48	1.10–2.00		1.18	0.90–1.55		0.90	0.69–1.17	
Third	1.80	1.29–2.51		1.10	0.80–1.50		0.85	0.58–1.22	
Fourth	1.41	0.83–2.37		1.14	0.69–1.88		0.84	0.53–1.34	
Top quintile	3.48	1.34–9.04		1.06	0.41–2.74		0.38	0.16–0.93	
IRISEO quintiles[e]									
Bottom quintile	1.00	..	<0.001	1.00	..	0.001	1.00	..	0.407
Second	3.37	2.07–5.49		0.68	0.50–0.90		1.06	0.78–1.46	
Third	3.91	2.42–6.31		0.54	0.40–0.73		0.92	0.66–1.28	
Fourth	4.66	2.80–7.74		0.56	0.38–0.84		1.24	0.86–1.79	
Top quintile	9.24	3.10–27.20		0.47	0.22–1.04		0.69	0.27–1.81	

[a] Results are derived from multivariate logistic regression models using a multi-level framework. All models are adjusted for age and sex. Each SES-health variable pair represents a separate model.

[b] Calculated using chi-square tests adjusted for the complex sample design. Chi-square tests for trend were used for ordinal SES variables; standard chi-square tests were used for nominal SES variables.

[c] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. 'Managers and professionals' include occupational skill levels 1 & 2. 'Tradespersons, clerical workers and labourers' include occupational skill levels 3–5.

[d] Customised version of the index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs.

[e] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Aboriginal persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

Table 7.3: Socioeconomic disparities in selected physical health outcomes among Aboriginal children aged 4–17 years, Western Australia, 2000–2002[a].

	Injury/accident			Sensory function problem			Oral health problem		
Socioeconomic measure	OR	95% CI	*p*-value[b]	OR	95% CI	*p*-value[b]	OR	95% CI	*p*-value[b]
Carer characteristics									
Education: primary carer									
Did not attend	0.83	0.39–1.77	0.192	2.43	1.17–5.01	0.037	1.75	0.93–3.28	0.001
Year 9 or less	1.05	0.84–1.31		1.05	0.80–1.39		0.71	0.54–0.92	
Year 10	1.00	..		1.00	..		1.00	..	
Years 11–12	1.09	0.87–1.36		1.25	0.94–1.67		1.04	0.79–1.36	
13 or more years	1.57	1.07–2.30		0.77	0.44–1.37		1.51	1.00–2.30	
Education: secondary carer									
Did not attend	1.47	0.86–2.52	0.175	1.20	0.47–3.03	0.308	0.41	0.19–0.90	0.066
Year 9 or less	0.99	0.75–1.32		0.83	0.57–1.21		0.73	0.53–1.00	
Year 10	1.00	..		1.00	..		1.00	..	
Years 11–12	0.79	0.55–1.13		1.50	0.94–2.39		0.57	0.36–0.89	
13 or more years	1.57	0.83–3.00		0.73	0.35–1.53		0.49	0.22–1.12	
No secondary carer	1.05	0.84–1.32		1.05	0.79–1.41		0.85	0.65–1.13	
Occupation[c]									
Managers/professionals	1.26	0.92–1.73	0.152	0.99	0.69–1.42	0.948	0.93	0.66–1.30	0.664
Tradespersons, clerical workers and labourers	1.00	..	..	..	..	..	..	..	..
Not employed	1.25	1.02–1.52	0.028	0.95	0.76–1.19	0.673	0.93	0.75–1.16	0.523
Family/household characteristics									
Family financial strain									
Spending more than we get	1.59	0.91–2.79	0.211	1.31	0.67–2.56	0.692	1.37	0.78–2.42	0.412
Just enough to get by	1.30	0.80–2.11		0.96	0.54–1.72		1.41	0.81–2.47	
Some left over but spend it	1.16	0.69–1.93		1.01	0.54–1.91		1.07	0.62–1.84	
Can save a bit	1.50	0.91–2.49		1.00	0.54–1.83		1.24	0.72–2.15	
Can save a lot	1.00	..		1.00	..		1.00	..	
Housing tenure									
Owned	1.00	..	..	1.00	..	..	1.00	..	..
Being paid off	0.99	0.61–1.60	0.972	1.41	0.77–2.56	0.264	0.91	0.57–1.46	0.700

Renting	0.92	0.61–1.40	0.710	1.32	0.76–2.29	0.333	0.66	0.44–0.99	0.043
Other	0.85	0.54–1.34	0.483	0.91	0.38–2.19	0.840	0.49	0.24–1.03	0.060
Number of indicators of poor housing quality									
None	1.00	..	0.093	1.00	..	0.982	1.00	..	<0.001
One	1.19	0.90–1.56		1.05	0.78–1.42		0.89	0.68–1.16	
Two	1.23	0.92–1.64		1.03	0.72–1.46		0.72	0.54–0.96	
Three or more	0.90	0.69–1.16		1.06	0.77–1.46		0.52	0.38–0.70	
Neighbourhood characteristics									
SEIFA quintiles[d]									
Bottom quintile	1.00	..	0.225	1.00	..	0.105	1.00	..	0.001
Second	1.16	0.93–1.45		1.07	0.81–1.41		1.10	0.83–1.47	
Third	1.28	0.97–1.67		1.37	0.86–2.19		1.43	1.05–1.96	
Fourth	1.08	0.69–1.68		0.48	0.25–0.91		0.55	0.37–0.82	
Top quintile	2.72	0.70–10.20		0.82	0.17–3.92		2.53	0.50–13.60	
IRISEO quintiles[e]									
Bottom quintile	1.00	..	<0.001	1.00	..	0.041	1.00	..	<0.0001
Second	1.50	1.14–1.99		1.81	1.17–2.79		2.72	1.85–4.01	
Third	1.79	1.36–2.36		1.61	1.08–2.39		2.98	2.03–4.36	
Fourth	1.70	1.26–2.31		1.61	1.05–2.49		2.98	1.93–4.60	
Top quintile	2.98	1.15–7.73		2.43	1.16–5.10		5.37	1.90–15.30	

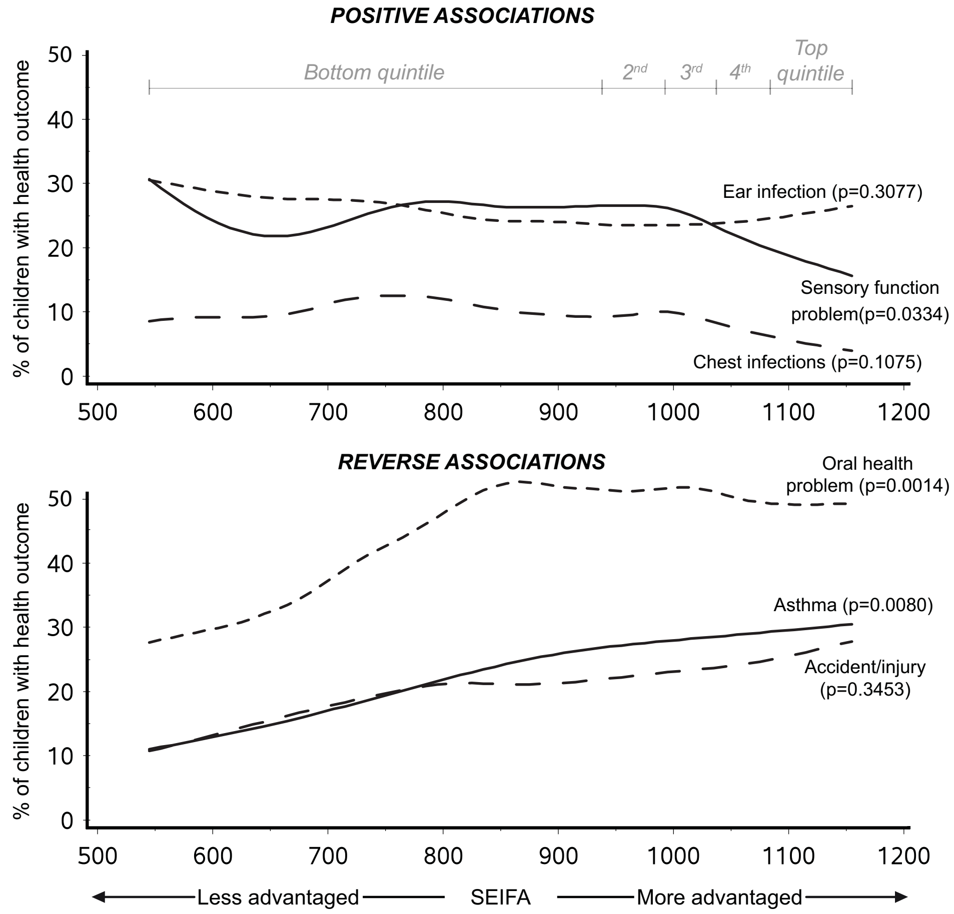
[a] Results are derived from multivariate logistic regression models using a multi-level framework. All models are adjusted for age and sex. Each SES-health variable pair represents a separate model.

[b] Calculated using chi-square tests adjusted for the complex sample design. Chi-square tests for trend were used for ordinal SES variables; standard chi-square tests were used for nominal SES variables.

[c] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. 'Managers and professionals' include occupational skill levels 1 & 2. 'Tradespersons, clerical workers and labourers' include occupational skill levels 3–5.

[d] Customised version of the index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs.

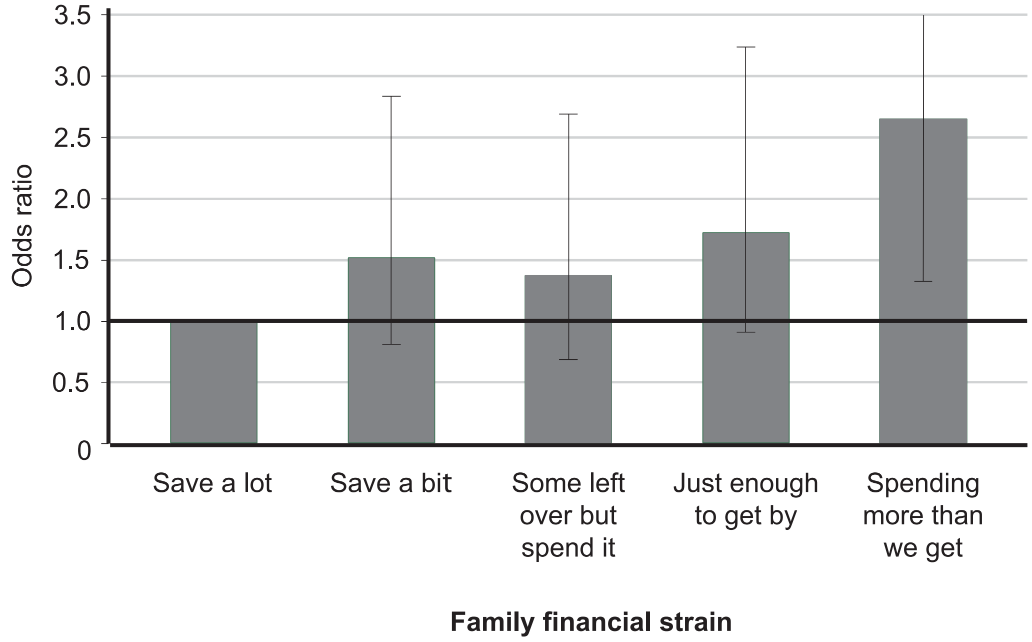
[e] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Aboriginal persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.



Note: Data for asthma, and ear and chest infections refer to 0–17 year-olds; all other data refer to 4–17 year-olds. Results are derived using Generalized Additive Models, adjusting for age and sex, and accounting for survey weights.

Figure 7.1: Pattern of association between SEIFA and various physical health outcomes for Western Australian Aboriginal children, 2000–2002.

The pattern of health disparities by family financial strain was generally consistent with a positive socioeconomic gradient (Figure 7.2). This pattern was strongest for recurring chest infections: children in families that described their financial situation as ‘spending more than we get’ were 2.6 times more likely (95% CI: 1.3–5.3) to experience recurring chest infections than children in families that could ‘save a lot’ (Figure 7.2).



Note: Odds ratios are derived from logistic regression models, adjusted for age and sex, and accounting for survey weights.

Figure 7.2: Relative odds of recurring chest infections by categories of family financial strain, Western Australian Aboriginal children aged 0–17 years, 2000–2002.

There was no clear pattern in health disparities for housing characteristics, such as tenure and housing quality. This reflects a lack of consistency in the direction of the associations and generally modest effect sizes.

The strength and shape of the associations with primary carer education varied: there was a U-shaped relationship with both ear infections and oral health – with the worst health outcomes found when primary carers had not attended school or had 13 or more years of education; and a pronounced positive gradient with sensory function problems. Few of the results by secondary carer educational attainment reached statistical significance. Most of the odds ratios for carer occupation were close to the null value, with the exceptions reflecting differences in employment status rather than occupational skill. For example, children without an employed carer had a slightly elevated likelihood of experiencing recurring chest infections (OR: 1.4; 95% CI: 1.1–1.8) and an accident/injury (OR: 1.3; 95% CI: 1.0–1.5) than other children.

Table 7.4: Correlation between SES variables[a].

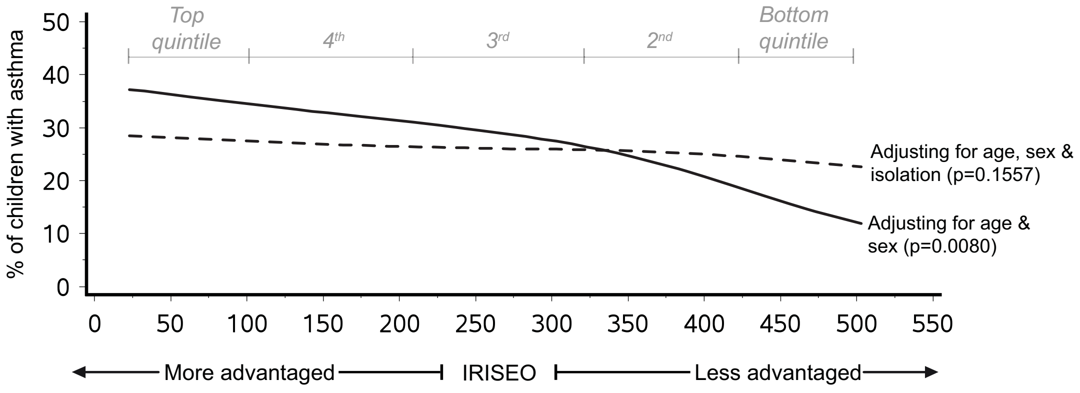
	Education (secondary carer)	Family financial strain	Housing quality	SEIFA[b]	IRISEO[c]
Education (primary carer)	0.47 (p<0.001)	0.30 (p<0.001)	0.38 (p<0.001)	0.17 (p<0.001)	0.17 (p<0.001)
Education (secondary carer)		0.24 (p=0.017)	0.21 (p=0.041)	0.19 (p<0.001)	0.21 (p<0.001)
Family financial strain			0.18 (p=0.005)	0.02 (p=0.779)	0.08 (p=0.010)
Housing quality				0.29 (p<0.001)	0.26 (p<0.001)
SEIFA[b]					0.37 (p<0.001)

[a] Correlation coefficients have been computed for all discrete ordinal and continuous SES variables (nominal variables, such as occupation and housing tenure, have been omitted). Observations with missing values are excluded from all calculations. Coefficients are estimated using linear and logistic regression models, and adjusted to account for the complex survey design and survey weights.

[b] Customised version of the index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product.

[c] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Aboriginal persons only.

The pattern of disparities presented here does not differ appreciably when all SES variables are considered simultaneously in the models (data not shown). This is not surprising given only weak to moderation associations among these SES indicators, as shown in Table 7.4. Further, the majority of the SES-health associations are not significantly attenuated by the inclusion of geographic isolation in the models, with the exception of associations between IRISEO and asthma, ear infections and oral health problems (data not shown). In these instances, the effect sizes were diminished, although the association with oral health remained statistically significant (Figure 7.3 provides an example, using asthma).



Note: Results are derived using a Generalized Additive Model, adjusting for age and sex, and accounting for survey weights.

Figure 7.3: The impact of relative geographic isolation on the pattern of association between area-level socioeconomic disadvantage (IRISEO) and asthma for Aboriginal children aged 0–17 years, 2000–2002.

7.5 Discussion

I examined six health outcomes across eight SES variables and found that half of the associations exhibited a statistically significant socioeconomic disparity in health, although the direction, shape and magnitude of associations differed. While these findings suggest that socioeconomic factors shape the physical health of Aboriginal children to some degree, the diversity of results implies that other factors are likely to play a significant role in the pattern of these health outcomes.

It is not surprising to observe inconsistent patterns across health outcomes, as each outcome has a unique and complex causal pathway and is likely to interact with socioeconomic factors in different ways and at different points along the pathway.[2]

For example, education is known to influence the etiology of many health outcomes, partly through pathways involving greater access to material resources and health care.[222] However, in an Aboriginal context, the pathway from education to wealth creation and health could conceivably be weakened by the direct and indirect effects of discrimination and racism. For example, the persistent marginalisation of Aboriginal peoples can limit developmental opportunities for children. This, in turn, can inhibit the attainment of skills and abilities that can be drawn upon for the benefit of health at each level of SES, and this may alter the SES-health relationship in Aboriginal contexts.

7.5.1 Positive gradients

Despite the diversity across outcomes, the results for ear infections, recurring chest infections and sensory function problems were generally consistent with a positive socioeconomic gradient. This is the prevailing pattern in the wider literature, where lower parental SES is generally linked to poorer child health outcomes,[69] including conditions related to the physical health outcomes discussed here.[223, 224] There are few studies that examine SES-health relationships among Indigenous children, and none are directly comparable with this study. Chi et al. reported a positive but statistically insignificant association between helicobacter pylori infection and both parental education and income among Aboriginal children in Taiwan.[225] Studies of adult Aboriginal populations in Australia confirm that there are positive gradients with aspects of physical health, including end-stage renal disease, diabetes and cardiovascular disease.[123, 126, 210, 211] The results of these studies may not be generalisable to Aboriginal child populations, given the conflicting evidence on the strength of gradients by age.[226] While childhood has been characterised as a period of relatively shallow gradients, life course patterns are likely to vary depending on the choice of health and SES indicators and population context.[69]

7.5.2 Reverse gradients

However, better health was not always associated with higher SES, particularly for asthma, accidents/injuries and oral health. The reverse associations found here, while curious, are not necessarily surprising results. This pattern has been observed in mainstream populations for each of these three outcomes.[227-229] Reverse associations between SES and health in mainstream populations have been variously attributed to measurement anomalies (e.g. labelling and reporting bias) or methodological concerns (e.g. no consideration of pertinent mediators such as access to health services, quality of health care and environmental conditions, or the impact of SES mobility), and these issues may have relevance to my findings. While the findings for asthma contrast those found for Aboriginal adults,[212] they are plausibly explained by the hygiene hypothesis, on the assumption that lower SES is linked to greater infectious challenge in early life.[230] The associations with accidents and injuries may reflect greater availability of recreational activities and facilities for children living in more affluent areas or in families with greater material resources.[229] Further, the measure of childhood accidents/injuries includes hospitalisation events which are influenced by better access to hospitals and more responsive care-seeking behaviours, all of which are typically associated with higher SES.[231] While the significance of these issues cannot be adequately empirically tested using these data, they remain pertinent theories for further exploration.

Our findings for oral health in Western Australian Aboriginal children are counter to the marked positive socioeconomic gradients found among Aboriginal and Torres Strait Islander children in the Northern Territory.[138] This discrepancy may be attributable to differences in sample characteristics, data collection methods, or the measurement of oral health between the two studies. In this study a composite binary indicator was created from carer responses to four questions (ever had holes in teeth, teeth removed, fillings, or sore/bleeding gums), whereas Jamieson et al. analysed the number of decayed, missing and filled teeth in the deciduous dentition (dmft) and in the permanent dentition (DMFT) of children based on dental examinations by a government-funded school dental service. The carer-reported measure of dental problems may be a greater reflection of dental services access and utilisation than dental problems per se. If so, then my findings would suggest that dental services are more accessible (and possibly affordable) to Aboriginal children living in areas of higher relative advantage.

7.5.3 Conventional and alternative measures of SES

The findings highlighted that a number of SES constructs are associated with child physical health, including those that measure the SES characteristics of carers, families, households and neighbourhoods. The largest disparities in health were observed for area-level SES indicators, which may relate to the greater importance that Aboriginal peoples place on social connections with family and community than to individuals.

The results of this chapter confirm that the physical health of Aboriginal children can differ by conventional measures of SES, although outcomes were more sensitive to primary than secondary carer education and to employment status than occupation. This is in accordance with a substantial body of literature that demonstrates that the education of the mother is a more proximate determinant of child health and development than that of the father.[232] More broadly, the diversity of my results could imply that conventional SES measures alone are inadequate for explaining variations in health outcomes in Aboriginal contexts. Standard indicators of educational attainment typically ignore knowledge that is valued in Aboriginal society (that has an impact on status) but acquired outside of Western education systems, while most income measures do not properly account for the nature of sharing of economic resources that can occur between extended members of Aboriginal families.[140]

7.5.4 Effects of geographic isolation

I demonstrated that geographic isolation does not explain the relationship between SES and Aboriginal child physical health outcomes (with the partial exception of the relationship with an area-based index of relative Indigenous socioeconomic outcomes (IRISEO)). This is somewhat surprising because many of the factors that impact on population health are unevenly distributed across areas of geographic isolation. For example, there tends to be fewer health care services in more isolated areas. This is particularly pertinent for Aboriginal peoples who, despite predominantly living in urban settings, are far more likely than non-Aboriginal Australians to live in remote and isolated areas. The finding that geographical isolation partially explains away the association between IRISEO and child health outcomes confirms a common belief that Aboriginal peoples living in isolated areas are more disadvantaged. Notwithstanding, they also suggest that the area-level SES characteristics of both the Aboriginal and total population have an independent effect on the physical outcomes of Aboriginal children.

7.5.5 Strengths and limitations

The main strength of the study in this chapter is that it draws upon a representative dataset that was collected using robust and culturally appropriate methods, and that it employs rigorous analytical methods. The limitations primarily relate to difficulties in measuring SES and health and a reliance on cross-sectional data which limits an assessment of the causal relationships between SES and health. My findings are based on self-reported, or subjective, measures of health, which are inherently open to issues of bias, particularly among socially disadvantaged people who may underreport or understate poor health outcomes.[142] This can give rise to a flatter health gradient when compared with results that rely on objective assessments of health.[143] This may be exacerbated by the reliance on carer perceptions of child health status—as a carer's views may not accord with that of a medical expert or the child. However, I believe that the use of Aboriginal interviewers, including Aboriginal health workers where possible, has minimised misclassification error. Future research will benefit from collecting information on both objective and self-reported health measures and comparing the patterns of their association with SES.

The measurement of accidents and injuries was restricted to the narrow set of available variables from the survey. The exclusion of a wider range of adverse events, including those resulting in hospitalisation, may have influenced the observed relationships. Sensory function problems were assessed using three different, albeit partly overlapping, limitations (vision, hearing and speech problems). While the prevalence of these limitations was too low to enable separate analysis, their aggregation may have obscured a different SES patterning of health for each limitation.

Access and use of health services is likely to affect a number of the study outcomes. Robust objective measures of health service access were not available; carers were asked about satisfaction with access to services but this is not a substitute for access. I have adjusted the regression model results for geographic isolation (using the Level of Relative Isolation measure) and this partly, but not adequately, accounts for the fact that services are less accessible in more remote areas.

SES, like health outcomes, may have been incorrectly reported by some survey participants. Some participants may have considered expenditure on wealth creation initiatives (e.g. home loan repayments) as a family financial strain. If this interpretation was consistently applied by participants then financial strain estimates will be overstated and potentially lessen the strength of health gradients for this SES measure. Further, the overrepresentation of Aboriginal children in the lower levels of all SES constructs used in this analyses has reduced the statistical power for comparing child health outcomes across SES levels, and this may have obscured the nature of the SES-health relationship in some instances.

7.6 Conclusion

After controlling for age and sex, I found statistically significant socioeconomic disparities in health in almost half of the associations that were investigated, although the direction, shape and magnitude of associations differed. For ear infections, recurring chest infections and sensory function problems, the patterns were generally consistent with a positive socio-economic gradient—where better health was associated with higher SES. The reverse pattern was found for asthma, accidents and injuries, and oral health problems, although this was primarily observed for area-level SES indicators.

The results of this chapter confirm that conventional notions of social position and class have some influence on the physical health of Aboriginal children, although the diversity in the pattern of socioeconomic disparities implies that there are other ways of conceptualising and measuring SES that are important for Aboriginal populations.

In addition to an examination of a broader range of health outcomes, including mental health, future research needs to consider factors that relate specifically to Aboriginal circumstances and culture in the past and present day, and give more thought to how we measure social position in the Aboriginal community, to gain a better understanding of the pathways from SES to Aboriginal child health outcomes.

CHAPTER 8

THE SOCIOECONOMIC PATTERN OF MENTAL HEALTH PROBLEMS

8.1 Introduction

The results of Chapter 7 suggest that social position and class have some influence on the physical health of Aboriginal children. While this is an important observation, it may not extend to other key domains of Aboriginal health. In addition, the findings convey the total effect of SES on health but do not separate out the potential myriad pathways through which SES influences health. This chapter aims to extend both the breadth and depth of the existing analyses. Here I focus on mental health outcomes and consider how a range of psychosocial and environmental factors, including those that characterise Aboriginal families, may define the pathways from SES to Aboriginal child health.

The data source and broad analytic techniques used in Chapter 7 are retained here. The chapter focuses on the relationships between a diverse set of SES indicators and a single measure of the mental health of Aboriginal children in Western Australia.

8.2 Background[5]

Mental health conditions and disorders are among the leading causes of disability in many countries, and are estimated to account for 13% of the total burden of disease worldwide.[233] The existing epidemiological evidence-base, while limited, confirms that mental health problems are a universal dilemma among children and adolescents, with a global prevalence of about 10–20%, and up to 40% in some low income countries.[234]

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[5] Material in Sections 8.2–8.5 has been reproduced from the following published paper, with permission (see Appendix D): Shepherd CCJ, Li J, Mitrou F, Zubrick SR. Socioeconomic disparities in the mental health of Indigenous children in Western Australia. BMC Public Health. 2012; 12:756.

Mental health disorders have complex aetiologies, with a broad range of factors shown to variably influence them[235] across time and by place and lifecourse stage.[4] Among these factors socioeconomic status (SES) is consistently implicated as an important determinant in both adult[143, 236-239] and child populations.[240, 241] Overwhelmingly, quantitative studies show that better SES outcomes are associated with better mental health.[242-245] While this pattern has been observed from early childhood (0-5 years), the association is less consistent among young children, potentially owing to the difficulty in identifying mental illness in children of this age.[240]

The theories regarding the mechanisms underpinning the association between SES and mental health are disputed.[115, 246] Explanations of SES disparities in mental health tend to support one of two broad hypotheses: that SES factors cause the onset of a mental health condition (social causation), or that poor mental health causes a downward shift in social class or status (health selection). The relative merits of these hypotheses may depend on the outcome of interest,[247, 248] although both theories support a distal connection between socioeconomic conditions and mental health.[249, 250]

There are few reliable population-based studies that have specifically aimed to assess the mental health of Aboriginal Australians.[251, 252] This partly reflects the difficulties in measuring mental health in culturally distinct populations. The complexities of accurate assessment in these contexts extend to issues of diagnostic validity (e.g. the reliability and validity of mainstream assessment tools, and appropriateness of Western classification systems),[253] misdiagnosis (e.g. as a result of language problems) and under-reporting (e.g. not willing to identify as belonging to a minority group).[116] These issues are complicated by differences in the definition of mental health concepts and associated terminology between Western and other (including Aboriginal) cultures.[252] The scant quantitative literature, in conjunction with a wider body of qualitative and ethnographic studies, suggests that the mental health outcomes of Aboriginal Australians are particularly poor,[116, 254] and worse than those of non-Aboriginal Australians.[46] Recent evidence reveals that these disparities are evident in childhood and adolescence.[93, 213]

The distribution of mental health outcomes across socioeconomic strata within Aboriginal populations of Australia is largely uncharted. The review of existing literature contained in this thesis (Section 3.5) highlighted that the social patterning of physical health in Aboriginal Australia is diverse, and found limited and inconclusive evidence on mental health. While the mental health outcomes of mainstream populations of Australian children typically reflect a social gradient,[244, 255, 256] it is unclear whether this pattern characterises Aboriginal children.

It is plausible that the association between SES and mental health is relatively muted in Aboriginal population groups. It is now well-accepted that the unique post-colonial history of Aboriginal Australia, characterised by widespread dispossession, exclusion, discrimination and marginalisation, has had profoundly negative effects on the wellbeing of Aboriginal peoples. Evidence suggests that these effects include high levels of stress in the lives of a disproportionate number of Aboriginal people in all levels of the social hierarchy[35] and, correspondingly, this may limit the mental health benefits that normally accrue from improved SES. In addition, extended family networks, cultural continuity, and connection to traditional lands may exert a greater influence on Aboriginal health than SES.

Gaining an appreciation of the relationship between SES and the mental health of Aboriginal children is important for a number of reasons. Evidence that details the magnitude and shape of mental health disparities within Aboriginal child populations, and the mechanisms that mediate the impact of SES on mental health, can provide insights into the relative importance of social conditions to child mental health outcomes. This would facilitate a better grasp of the complex underlying mechanisms that lead to poor mental health among Aboriginal children specifically and Aboriginal peoples more generally. It is also likely to broaden the scope of this field of research with the recognition of social factors that may play a critical role in the mental health of Aboriginal children but are not implicated as traditional determinants of mental wellbeing.

Further, there are important policy implications of improving our knowledge in this area. If there are relatively weak socioeconomic gradients in the mental health of

Aboriginal child populations then investments aimed at improving socioeconomic conditions (e.g. the employment, income and education of carers) may not translate into the same level of improvement in the mental health of Aboriginal populations as in mainstream populations. Such investments may fail to substantially reduce the disparities in mental health status between Aboriginal and other populations of children. This implies that policy intent, expectations and interventions would need to be modified in order to substantially benefit the mental health of Aboriginal children. Importantly, if interventions can improve the mental health status of Aboriginal children they are likely to have positive consequences for subsequent generations of adults, given that physical and mental wellbeing in childhood builds the foundation for health and development throughout the lifecourse.[4, 257]

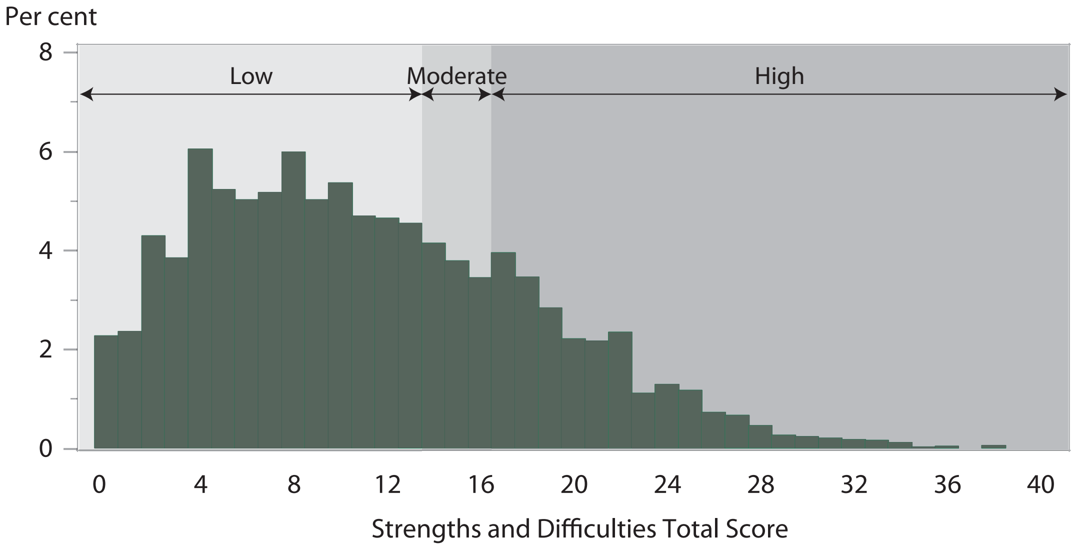
This chapter aims to examine the nature of the relationship between SES and mental health among Aboriginal children in Western Australia, and the underlying mechanisms, using a rare and large, representative sample that is well-characterised and comprehensively measured. We use a reliable, validated measure of emotional and behavioural difficulties applicable to Aboriginal children and youth in Western Australia[258] to investigate the pattern of associations with conventional and alternative measures of SES at individual, family, household and community levels.

8.3 Methods

Data are from the 2000–2002 *Western Australian Aboriginal Child Health Survey* (WAACHS), a population representative study of the health, development and education of Aboriginal children aged 0–17 years in the State of Western Australia, and their families and communities. While the data source is now over ten years old, they still provide a reliable assessment of the social, economic and health circumstances of Aboriginal children and families as there have been few significant changes in these circumstances across Australia since the WAACHS data were collected.[53] The survey used an area-based clustered multi-stage sample design. Dwellings in selected census collection districts (CDs) were approached and in-scope families were surveyed, where there was an Aboriginal child aged 0–17 years living in the dwelling. All Aboriginal children aged 0–17 years in in-scope families were selected to participate in the survey. Of all eligible families, 84% consented to participate in the survey and useable information was obtained on 96% of participating children (from interviews with their carers, supplemented with self-reported information from 12–17 year old participants). This netted a final sample of 5289 Aboriginal children living in 1999 responding families, equating to almost 18% of all Aboriginal children living in Western Australia. In addition to data on the health of children, interviews were conducted among primary carers and, where possible, secondary carers of children to gather information on the demographic, social and economic circumstances of families, households and the communities in which they lived. Primary and secondary carers were the people who spent the most time with survey children and knew them best. The primary carer was usually the mother of the child (80%). In the majority of cases, the secondary carer was the father of the child (77%) or another related person (19%). Most primary (83%) and secondary (79%) carers identified themselves as Aboriginal. All aspects of the survey were conducted under the direction of a steering committee of senior Aboriginal people from a cross-section of settings and organisations, to ensure the cultural integrity of survey methods and processes. The full details of the design and conduct of the WAACHS have been described elsewhere.[35]

8.3.1 Measuring mental health

Information on mental health outcomes was gathered from primary carers of participating children aged 4–17 years. The Strengths and Difficulties Questionnaire (SDQ) was used to assess risk status for clinically significant emotional or behavioural difficulties (CSEBD),[259, 260] and was modified, with permission from the author, to be more suitable for use in Australian Aboriginal populations. Consistent with its design parameters, the SDQ was collected only for participants aged 4–17 years. No reliable indicator of infant and toddler mental health was available to the survey—as such, no mental health data were collected for 0–3 year olds. The 20 questions that examined emotional symptoms, conduct problems, hyperactivity and peer problems were combined to produce a SDQ Total Score (range 0–40). Primary carers' responses to the SDQ form the basis of the analysis of Aboriginal children's emotional and behavioural difficulties in this chapter, with scores of 17–40 indicating that a child was at high risk of CSEBD (Figure 8.1). The SDQ Total Score demonstrated excellent psychometric properties across a range of geographic areas, from urban to very remote settings (Raykov's Rho=0.93).[261]



Note: SDQ=Strengths and Difficulties Questionnaire; 'Low, 'Moderate' and 'High' indicate risk of clinically significant emotional or behavioural difficulties. Figure from Zubrick et al.; used with permission of author.[93]

Figure 8.1: Distribution of SDQ Total Scores among Aboriginal children aged 4–17 years, Western Australia, 2000–02.

The term 'mental health' is used here to describe the WAACHS measure of risk of CSEBD, in preference to 'social and emotional wellbeing' (SEWB). Mental health is one aspect of the broader concept of SEWB and its scope does not include the aspects of SEWB that pertain to issues of suicide, self-harm, spiritual wellbeing, and the broader issues that impact on the wellbeing of Aboriginal communities.

8.3.2 SES measures

SES was measured using seven variables, including characteristics of parents/carers (educational attainment of primary carer and highest occupational class of carers), families/households (family financial strain, housing tenure, housing quality) and neighbourhoods/communities (two composite indexes of socioeconomic disadvantage; one based on the total population and the other on the Aboriginal population only). This array of measures was chosen for four main reasons. First, reliance on a single measure is unlikely to capture how socioeconomic position shapes health disparities in any population. This is particularly true among Aboriginal populations because they are more likely to be distributed at the lower levels of any SES construct (see Section 2.4.1). Second, it is necessary to measure different dimensions of SES at multiple levels in order to capture the complex influences of socioeconomic disadvantage on mental health in Aboriginal populations. Third, use of two different area-level SES measures enables us to distinguish compositional from contextual effects on health disparities. Fourth, it is important to test the saliency of conventional versus alternative SES indicators in shaping health disparities, particularly in Aboriginal and other disadvantaged populations.[64, 150, 214] I have included conventional indicators of social class (education and occupation) and used a subjective rating of family financial strain as a proxy measure of material wellbeing. Financial strain is used in preference to a conventional measure of household income, for two main reasons: first, income data were not collected from all household members that contributed to its financial base; and second, income does not capture the nature of sharing of economic resources that can occur between members of extended Aboriginal families.[140] Housing characteristics are afforded prominence in these analyses, given that Aboriginal children often experience sub-standard housing that fails to meet the basic requirements for maintaining physical and mental health and social wellbeing.[215, 262] Housing tenure and quality can also be considered as proxy indicators of income and wealth[216] and have been included to complement the measure of financial strain (income) in describing the material wellbeing of Aboriginal families and households.

Information about the characteristics of primary carers, families and households was provided by the primary carers of participating children. Secondary carers provided separate responses on their occupational class. Housing quality was measured using a set of indicators based on a nationally agreed framework for the design, construction and maintenance of Indigenous housing.[263] This includes whether the house had facilities for washing people and clothes, removing waste safely, storing and cooking food, and controlling the temperature. Households were classified into one of four categories: having none, one, two, or three or more indicators of poor housing quality.

The Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product and Biddle's Index of Relative Indigenous Socioeconomic Outcomes (IRISEO) were used to measure area-level socioeconomic disadvantage.[77, 217] The SEIFA index ranks the relative level of disadvantage of areas using the attributes of all persons (Aboriginal and non-Aboriginal) in each CD, and includes measures of income, educational attainment, employment status and occupational skill. Quintiles were determined based on the distribution of values for all Australian CDs. Biddle's IRISEO is a rank order variable that measures the socioeconomic outcomes of all 531 Indigenous Areas in Australia in 2001, based on the employment, income, education and housing characteristics of Aboriginal persons only.[77] Quintiles were determined based on the distribution of IRISEO values for all Australian Indigenous Areas.

8.3.3 Geographic isolation

Geographic isolation is defined using the Level of Relative Isolation (LORI) classification, which is based on the Accessibility/Remoteness Index of Australia (a widely used classification of remoteness in Australia). The five categories of isolation reflect differences in access to services, cultures and health outcomes for Aboriginal children in Western Australia, and range from none (Perth metropolitan area), to low, moderate, high and extreme.[198]

8.3.4 Non-response and imputation

The survey sample was broadly representative of the population of Aboriginal children living in Western Australia, although comparisons with population benchmarks revealed that age, household size and region were significantly associated with non-response. The sample had a lower proportional representation of older children and children living in small households and the south-west region of Western Australia (including the Perth metropolitan area). Post-stratification weighting was employed to adjust for differences in response rates by age, household size and region and produce unbiased estimates. There was only a small amount of non-response to individual questions. While an imputation procedure was employed to assign values to non-responding items, the percentage of imputed values was less than 1% for each variable. Thus, imputation had no effect on the results of this study. Information was unable to be obtained on the characteristics of 15% of secondary carers, and I have treated all variables from these records as missing in the following analysis. More details about non-response characteristics, weighting and imputation are available elsewhere.[198]

8.3.5 Analysis

The analysis in this study was restricted to data from the 3993 children aged 4–17 years for whom the SDQ was collected. Analysis was conducted using logistic regression techniques within a multilevel framework. Models were fitted with the method described by Pfeffermann et al.,[218] which takes into account the survey weights and the hierarchical structure of the data, i.e. selection of children within families and communities. A dichotomised total SDQ score was the outcome of interest and modelled separately with each of the following SES variables: carer education, carer occupation, family financial strain, housing tenure, housing quality, SEIFA and IRISEO. Age, sex and LORI are included in the first step (Model 1). Known covariates were entered in blocks at separate steps. The results of successive steps were only reported here if the SES variable achieved marginal statistical significance ($p < 0.10$). Child physical health factors (whether child had runny ears, whether child had normal vision in both eyes, whether child had difficulty saying certain sounds) were added in the second step (Model 2). Factors related to the physical and mental health of the carer (whether primary carer had a medical condition for six months or longer, whether the primary carer had used Mental Health Services) were added in the third step (Model 3). Factors related to the circumstances of the family and household (quality of parenting, life stress events, family composition, overcrowding, number of homes the child had lived in, whether bothered by racism in the neighbourhood/community, and family functioning) were added in the fourth step (Model 4). All models report odds ratios, with the highest status category used as the reference category for ordinal SES variables. Standard errors for survey estimates of total numbers of children were produced using the Ultimate Cluster Variance estimation technique.[219] Standard errors for estimates of odds ratios and proportions were calculated using a modified form of the Jack knife variance estimation technique.[220] Standard chi-square tests adjusted for the complex sample design were used to assess the difference between categorical SES indicators and a dichotomised

SDQ Total Score. SAS version 9.2 was used for all analyses (SAS Institute Inc., Cary, NC, USA, 2000–08).

8.4 Results

Almost a quarter (24%) of Aboriginal children was at high risk of clinically significant emotional or behavioural difficulties (CSEBD). Aboriginal children were largely distributed in the more disadvantaged categories of most measures of SES, with few represented in the top category: only 6.0% of Aboriginal children had a primary carer with a post-secondary education, 4.7% lived in a family that could 'save a lot', and less than 1% lived in areas that fall into the top SEIFA quintile (more advantaged areas). When area-level relative disadvantage based on the characteristics of Aboriginal people only (IRISEO) was analysed, 17% of the study population was in the top two quintiles (Table 8.1). This signals that, on average, Aboriginal children in Western Australia live in areas with less favourable socioeconomic characteristics than other Aboriginal people across Australia.

Table 8.2 presents odds ratios from logistic regression analyses, and highlights a generally positive—and significant—association between SES and risk of CSEBD in Aboriginal children, suggesting that those with higher SES have better mental health. The strength and shape of the associations with mental health vary by SES measure, although the most consistent gradients were found for housing quality and tenure. For example, children living in poorer quality housing (three or more indicators of poor quality) were 3.1 times more likely ($p < 0.01$) to be at high risk of CSEBD than those in the top category (no indicators of poor quality), after adjusting for age, sex and geographic isolation. Children living in rented housing were 1.9 times more likely ($p < 0.01$) to be at high risk of CSEBD than those in houses that were owned or being paid off by its occupants. The relationship between CSEBD and SEIFA represents a threshold effect, whereby those in the top (most advantaged) SEIFA quintile were at least four times less likely to be at high risk of CSEBD than other children, although only 0.5% of children were in the top quintile (Table 8.1). While the carer occupation variable was significantly associated with CSEBD, the disparities in odds ratios reflect differences in CSEBD by employment status rather than occupational skill.

Table 8.1: Mental health, SES and demographic characteristics of Aboriginal children aged 4–17 years in Western Australia, 2000–02[a].

	Number	% (95% CI)
Mental health status		
Risk of clinically significant emotional or behavioural difficulties		
Low risk	14800	64.6 (62.2–66.9)
Moderate risk	2610	11.4 (10.3–12.6)
High risk	5490	24.0 (21.9–26.1)
SES characteristics		
Education: primary carer		
13 or more years	1370	6.0 (4.6–7.6)
Years 11–12	5080	22.2 (20.0–24.4)
Year 10	9920	43.3 (40.7–46.0)
Year 9 or less[b]	5960	26.0 (23.7–28.4)
Occupation[c]		
Managers and professionals	2910	13.0 (11.2–15.0)
Tradespersons, clerical workers and labourers	8480	38.0 (35.4–40.7)
Not employed	10900	49.0 (46.2–51.8)
Family financial strain		
Can save a lot	1080	4.7 (3.5–6.2)
Can save a bit	5780	25.3 (23.0–27.6)
Some left over but spend it	3040	13.3 (11.5–15.3)
Just enough to get by	10400	45.2 (42.6–47.9)
Spending more than we get	2050	9.0 (7.5–10.6)
Housing tenure		
Owned or being paid off	4800	21.0 (18.6–23.6)
Renting	16600	72.3 (69.6–75.0)
Other	960	4.2 (3.0–5.6)
Number of indicators of poor housing quality		
None	6930	30.3 (27.7–32.9)
One	6180	27.0 (24.7–29.3)
Two	4950	21.6 (19.4–24.0)
Three or more	4840	21.1 (18.9–23.6)
SEIFA[d] (quintiles)		
Top (more advantaged)	120	0.5 (0.1–1.9)
Third and fourth	3750	16.4 (13.1–20.0)
First and second (less advantaged)	19000	83.1 (79.4–86.5)
IRISEO[e] (quintiles)		
Top (more advantaged)	260	1.1 (0.4–2.3)
Fourth	3660	16.0 (13.5–18.8)
Third	7310	32.0 (28.9–35.2)
Second	6580	28.8 (25.4–32.4)
First (less advantaged)	5020	22.0 (18.5–25.7)
Demographics		
Age (years)		
4–11	13900	60.6 (58.6–62.5)
12–17	9040	39.4 (37.5–41.4)
Sex		

Male	11700	51.2 (49.3–53.1)
Female	11200	48.8 (46.9–50.7)
Level of relative isolation		
None	7830	34.2 (31.6–36.9)
Low	5590	24.4 (21.8–27.1)
Moderate	4680	20.4 (17.1–24.0)
High	2550	11.2 (8.4–14.4)
Extreme	2260	9.8 (7.1–13.0)

[a] Numbers are weighted estimates of the population of Aboriginal children in each category, and have been rounded. Proportions are based on all Aboriginal children aged 4–17 years (N=22900). The frequencies of missing responses have not been reported.

[b] Includes those who had not attended an educational institution.

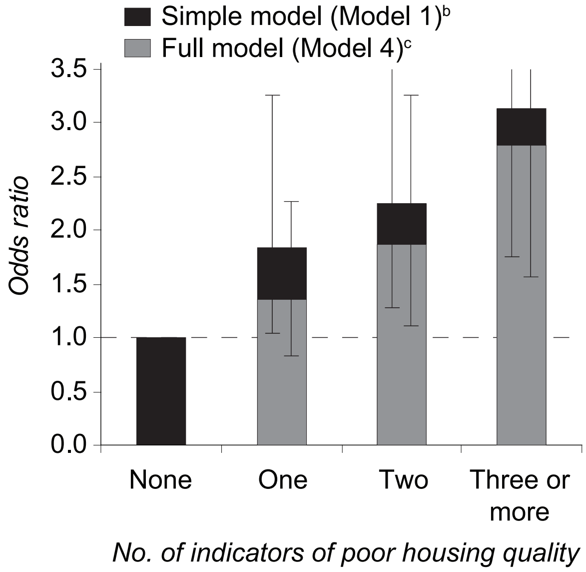
[c] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. 'Managers and professionals' include occupational skill levels 1 & 2. 'Tradespersons, clerical workers and labourers' include occupational skill levels 3–5.

[d] Customised version of the index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs.

[e] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Aboriginal persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

There was a positive, but not continuous, gradient between the primary carer's educational level and the child's mental health, although the effects were not statistically significant. There was no clear pattern in CSEBD outcomes when using IRISEO as the SES indicator.

The relationships between SES and CSEBD are partly attenuated by other known covariates—especially by factors that describe the circumstances of Aboriginal families and households, such as parenting quality, life stress events, family composition, overcrowding, residential mobility, perceptions of racism in the neighbourhood, and family functioning. This is most evident for occupation and family financial strain, where adjusted effect sizes are reduced to close to null (Table 8.2). In contrast, the inclusion of covariates describing aspects of the physical health of the child had little impact on the strength of the social gradients in mental health, whereas the physical and mental health of the carer had a modest influence on the relationships between mental health and occupation, family financial strain and housing quality (Table 8.2). Housing quality, housing tenure and SEIFA continue to be strongly associated with Aboriginal child mental health after adjusting for the full range of relevant covariates available from the dataset, although there is some attenuation of the odds ratios in the case of the latter two variables (Table 8.2 and Figure 8.2).



[a] High risk of clinically significant emotional or behavioural difficulties. [b] Simple model (Model 1) adjusts for age, sex and geographic isolation. [c] Full model (Model 4) also adjusts for a range of factors related to the physical health of the child, the physical and mental health of the carer, and the circumstances of the family and household.

Figure 8.2: Relative odds of a mental health problem[a], by number of indicators of poor housing quality.

Tables A.1, A.2 and A.3 (in Appendix A) provide separate odds ratios for all variables (SES and other known covariates) in logistic regression models where carer occupation, family financial strain and housing tenure are the primary independent variable of interest, respectively. They highlight independent significant associations between CSEBD and all of the included covariates. The results affirm that children have an elevated odds of CSEBD if they had experienced runny ears, vision problems or difficulty saying certain sounds, had a primary carer that had used Mental Health Services or had a chronic medical problem, lived in a sole parent family or without a biological parent, experienced poor parenting quality, poor family functioning, significant life stress or racism, or had moved homes a lot. In contrast, being female, an older child, or living in overcrowded conditions or in the most isolated areas, appeared to be protective of mental health. Among these variables, the strongest associations with CSEBD were found with quality of parenting, life stress events, geographic isolation and whether the child had difficulty saying certain sounds—with odds ratios typically exceeding 3.

Table 8.2: Relative odds of a mental health problem[a], by socioeconomic measure[b].

Socioeconomic measure	Odds ratio: Model 1[c]	Adjusted odds ratio: Model 2[c]	Adjusted odds ratio: Model 3[c]	Adjusted odds ratio: Model 4[c]
Education: primary carer				
13 or more years	1.00			
Years 11–12	1.37			
Year 10	1.16	—	—	—
Year 9 or less[d]	1.81			
Occupation[e]				
Managers/professionals	1.10	1.08	1.07	0.96
Tradespersons, clerical workers and labourers	1.00	1.00	1.00	1.00
Not employed	1.94***	1.91***	1.64**	1.17
Family financial strain				
Can save a lot	1.00	1.00	1.00	1.00
Can save a bit	1.75*	1.86**	1.95**	1.56
Some left over but spend it	1.61	1.72*	1.80*	1.25
Just enough to get by	1.79**	1.89**	1.90**	1.23
Spending more than we get	2.70***	2.72***	2.54***	1.34
Housing tenure				
Owned or being paid off	1.00	1.00	1.00	1.00
Renting	1.93***	1.90***	1.83***	1.54***
Other	2.60***	2.55***	2.48***	1.78*
Number of indicators of poor housing quality				
None	1.00	1.00	1.00	1.00
One	1.82**	1.78**	1.52	1.36
Two	2.24***	2.18***	2.02**	1.88**
Three or more	3.13***	2.93***	2.66***	2.80***
SEIFA (quintiles)[f]				
Top (more advantaged)	1.00	1.00	1.00	1.00
Third and fourth	4.81**	4.89**	5.83**	4.43*
First and second (less advantaged)	5.69**	5.91**	6.71**	4.68**
IRISEO (quintiles)[g]				
Top (more advantaged)	1.00			

Fourth	1.82	—	—	—
Third	1.04			
Second	1.58			
First (less advantaged)	0.91			

Notes: *p < 0.1; **p < 0.05; ***p < 0.01; *p*-values are calculated using chi-square tests adjusted for the complex sample design.

[a] High risk of clinically significant emotional or behavioural difficulties (CSEBD).

[b] Results are derived from multivariate logistic regression models using a multilevel framework. Results for each SES variable represents a separate model.

[c] All models include age, sex, Level of Relative Isolation (LORI) and the socioeconomic variable of interest. Model 2 also includes child physical health factors (whether child had runny ears, whether child had normal vision in both eyes, whether child had difficulty saying certain sounds). Model 3 further adds factors related to the physical and mental health of the carer (whether primary carer had a medical condition for 6 months or longer, whether the primary carer had used Mental Health Services). Model 4 further adds factors related to the circumstances of the family and household (quality of parenting, life stress events, family composition, overcrowding, number of homes the child had lived in, whether bothered by racism in the neighbourhood/community, and family functioning). Successive steps were conducted if the socioeconomic variable achieved marginal statistical significance (p < 0.1).

[d] Includes those who had not attended an educational institution.

[e] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. ‘Managers and professionals’ include occupational skill levels 1 & 2. ‘Tradespersons, clerical workers and labourers’ include occupational skill levels 3–5.

[f] Customised version of the index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics’ Socioeconomic Index for Areas (SEIFA) product. Percentiles were determined based on the distribution of values for all Australian CDs.

[g] Biddle’s Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Aboriginal persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

8.5 Discussion

The pervasive inequalities in health between Aboriginal and non-Aboriginal people in Australia has demanded a better understanding of the aetiology of poor health outcomes in Aboriginal populations—including mental health. While the current scientific literature implicates social factors and processes in the complex pathways to mental health problems, there has been little scrutiny of the saliency of these factors in Aboriginal population groups.

Our findings generally indicate that higher SES is associated with a reduced risk of clinically significant emotional or behavioural difficulties (mental health problems) in Aboriginal children. Housing and neighbourhood SES characteristics feature prominently in this study, with housing tenure, housing quality and neighbourhood-level disadvantage all having a strong direct effect on mental health. These results are consistent with the extant literature that acknowledges the multiple benefits of housing and neighbourhoods to mental wellbeing.[262, 264, 265] Previous research has shown that housing has indirect effects on mental health via material and psychosocial pathways. For example, inadequate housing can lead to social disruption and stress and can limit access to services, while home ownership generally provides greater control over the living environment and choice of neighbourhood.[216] The relatively high prevalence of inadequate housing among Aboriginal peoples, the unique geographic dispersion of Aboriginal populations, and the added difficulties in providing and maintaining quality housing in remote communities, may add to the significance of housing as a critical determinant of the mental health of Aboriginal children.

The circumstances of Aboriginal families and households emerged as an important explanatory mechanism, particularly in the relationship between child mental health and both carer employment status and family financial circumstances. This suggests that factors such as parenting quality, stress, family composition, overcrowding, residential mobility, racism and family functioning have a substantial mediating role in the pathway from material wellbeing to poor mental health. Stress is of particular importance here as it has been shown to be a feature of the lives of many Aboriginal families,[266-268] and to have deleterious effects on the developing brain, including emotional functioning.[99] Racism and overcrowded living conditions are two of the key sources of stress faced by Aboriginal people and families and have been shown to exacerbate mental health problems.[96, 269] Overcrowding has been cited as a common problem in households with Aboriginal people[270]—particularly in remote communities[271]—and can magnify stress in a number of ways. More household residents can lead to less privacy, increased noise, lack of sleep, and a general loss of control. It can also increase contact between residents, which has been shown to promote the spread of infection and disease[268, 272, 273] and, accordingly, increase the strain and anxiety in a person's life. Racism occurs at both interpersonal and systemic levels in Australian society and it impacts a disturbingly high proportion of Aboriginal people.[209] While the effects of racism on Aboriginal wellbeing is an emerging area of research in Australia, the international literature suggests that discrimination and racism may be a direct cause of psychological distress and/or have an indirect effect on wellbeing via pathways involving smoking and alcohol and substance misuse.[147]

While stress is consistently implicated as a primary link between SES and mental health,[143, 238, 240, 241] most of the hypothesised pathways have not been fully or adequately investigated in child populations.[240] It is also plausible that stress, racism and overcrowding (and the other potential mediators discussed above) lead to lower SES which, in turn, has a detrimental impact on mental wellbeing. For example, interpersonal and systemic racism can limit the labour market opportunities of parents, leading to a range of stresses that stem from financial insecurity.

The lack of clear evidence of a relationship between primary carer education and child mental health is notable, considering the substantial body of literature that highlights the positive impact of parental education—particularly that of the mother—on child development and wellbeing.[4, 232, 274] This finding however is consistent with results on aspects of the physical health (scabies, respiratory and ear infections, and diarrhoea and vomiting) of Aboriginal children in remote settings in the Northern Territory of Australia,[268] and may reflect Aboriginal peoples' often adverse interactions with mainstream Australia since colonisation and the associated legacies. For instance, Western education systems have been heavily implicated in the policies and practices of forced separation from family and kinship networks that were a widespread phenomenon in Australia until the 1970s.[275] The removal of children into missions and other institutions may have provided more formal education for some but had profound detrimental effects on the psychosocial functioning of these “stolen generation” children and their onward ability to adequately undertake the tasks of parenthood.[90, 276] Discrimination and racism is a common thread to past practices of dispossession and removal and the persistent marginalisation of Aboriginal peoples’ in present day Australian society. Racism has been shown to limit the ability of parents to promote optimal child development, by increasing psychological distress and disrupting community cohesion and the supports for raising children.[100] These stresses are likely to impair the ability of all parents to cope and could plausibly overwhelm the protective effects of parental education on child mental wellbeing.

8.5.1 Strengths and limitations

The main strengths of the study in this chapter are that it: (1) draws upon a large and representative dataset that was collected using robust and culturally appropriate methods and processes; (2) utilises a validated and reliable tool for assessing mental health problems; (3) employs rigorous analytical methods; and (4) uses a wide range of SES indicators that measure different aspects of socioeconomic disadvantage in the Western Australian Aboriginal population.

The main limitation is my reliance on cross-sectional data which limits my ability to assess the causal relationships between SES and mental health. Further, a range of generic and context-specific difficulties in measuring SES may have influenced my results. First, SES may have been incorrectly reported by some survey participants. Some participants may have considered expenditure on wealth creation initiatives (e.g. home loan repayments) as a family financial strain. If this interpretation was consistently applied by participants then financial strain will be overstated and potentially lessen the strength of mental health disparities for this SES measure. Second, there are difficulties in creating robust and meaningful SES measures in Aboriginal contexts. For instance, standard indicators of educational attainment typically ignore knowledge that is valued in Indigenous society (that may have an impact on wellbeing) but acquired outside of Western education systems. Third, the measure of education attainment does not capture the quality of the educational experiences of carers. The relatively poor performance of Aboriginal people in education is well-documented,[53, 104] and suggests that, at every level of education, Aboriginal people may acquire less health-benefitting knowledge and skills than non-Aboriginal people. If this is applicable to the study sample then I am likely to have understated the strength of the association between carer education and mental health. Fourth, the IRISEO measure is constructed using relatively broad geographic areas where the Aboriginal population often constitute a small minority; consequently, the index may mask the SES characteristics of the total population of an area, and variations in SES within areas. In addition, IRISEO does not capture all community-level SES variables or the full spectrum of factors that have been identified by Aboriginal Australians as important to community wellbeing, such as the resources gained from traditional subsistence activities, access to traditional lands and cultural maintenance.[77] Accordingly, the lack of a clear association between child mental health and the area-level SES characteristics of the Aboriginal population may be an artefact of the composition of the IRISEO measure.

8.6 Conclusion

The results presented in this chapter are consistent with the prevailing pattern in the mainstream literature—in Australia and elsewhere—where higher parental and household SES is generally associated with better child mental health outcomes. This study, in conjunction with a small set of studies of Aboriginal child, youth and adult populations in Australia, provides incremental evidence of a social gradient in the mental health of Aboriginal populations.

The findings have important policy implications, particularly in light of the considerably higher prevalence of mental health problems among Aboriginal children than non-Aboriginal children in Western Australia. The larger burden of mental health among Aboriginal children represents a major public health problem affecting Australian society as a whole. The results here suggest that improving the social, economic and psychological conditions of Aboriginal families has considerable potential to reduce the mental health inequalities within Aboriginal populations and, in turn, to close the substantial racial gap in mental health. Interventions that target housing quality, home ownership and neighbourhood-level disadvantage are likely to be particularly beneficial. Part of the goal should be to reduce the number of life stresses faced by Aboriginal families, which is likely to have significant payoffs for Aboriginal child wellbeing and development.

CHAPTER 9

DO ABORIGINAL CHILDREN HAVE A UNIQUE SOCIOECONOMIC PATTERN OF HEALTH?

9.1 Introduction

The previous three chapters have demonstrated that socioeconomic factors can influence, although not invariably, the health and development of Aboriginal children. Chapter 6 provided an initial test of the SES-health relationship, and a more rigorous examination of the socioeconomic pattern of physical and mental health outcomes was applied in Chapters 7 and 8. Each of these earlier chapters comment on the potential differences in these patterns between Aboriginal and non-Aboriginal populations, but they are yet to be empirically tested. While the work to this point adds to the discourse on the complex mechanisms that shape Aboriginal health, a comparison of the health of Aboriginal and non-Aboriginal populations at every level of SES is likely to provide more specific guidance to the application of policy interventions. This is because comparisons of this nature can highlight both the relative and absolute disparities in health in Aboriginal and non-Aboriginal populations, and both perspectives are needed to understand whether stimulating socioeconomic conditions will improve Aboriginal population health *and* reduce the health inequalities between Aboriginal and non-Aboriginal populations.

In this chapter I assess whether the socioeconomic pattern of health differs among Aboriginal and non-Aboriginal children of Australia. The analysis draws upon a vital national, population-representative dataset that has information on a range of health outcomes and health care actions and SES indicators for both population groups. The magnitude and shape of SES-health associations is examined by Aboriginal status across remote and non-remote settings.

9.2 Methods

Data are sourced from the 2004–2005 enumerations of the *National Aboriginal and Torres Strait Islander Health Survey* (NATSIHS) and *National Health Survey* (NHS), which, collectively, constitute the largest health survey in Australia. The surveys were run in parallel and shared a common design and questionnaire to enable a comparison of the health circumstances and outcomes of Aboriginal and non-Aboriginal children and adults. Both used an area-based multi-stage sample design, and selected in-scope persons from dwellings in selected census collection districts (CDs). While there were slight differences in the selection of the NATSIHS and NHS samples, both were designed to produce population representative estimates at a national level and for each State and Territory. Importantly, because of the small proportion of the non-Aboriginal population that live in remote areas, a comparison of remote and non-remote areas is only available for Aboriginal persons (from the NATSIHS). Of all eligible households (after sample loss), over 80% in the NATSIHS and 89% in the NHS consented to participate. Information on selected children was, in most cases, provided by a parent or guardian. Children aged 15–17 were directly interviewed, with parental consent. The full details of the design and conduct of the NATSIHS and NHS have been described elsewhere.[188, 189]

9.2.1 Health indicators

A range of health indicators were chosen, across multiple domains, in order to support a comprehensive examination of the topic. Seven indicators were selected on the basis of prevalence and contribution to disease burden in children[213]—these included health outcomes (asthma, ear disease, eye disease, hayfever and injuries), health care actions (hospital admissions) and a composite measure of long-term conditions.

A participant was coded as having asthma if they had ever been told by a doctor or nurse that they have the condition and they regarded their asthma as a current condition at the time of the survey. Ear disease, eye disease and hayfever were ascertained from a series of questions or prompts about specific problems, with conditions classified according to the International Classification of Diseases 10th

Revision (ICD-10). Respondents needed to indicate that the condition was current at the time of the survey and had been, or expected to be, experienced for six months or more.[188, 189] In this chapter I use the terms ‘ear disease’ and ‘eye disease’ to refer to the range of conditions labelled as ‘diseases of the ear and mastoid’ and ‘diseases of the eye and adnexa’, respectively, in ICD-10; ‘hayfever’ includes allergic rhinitis.

The detailed range of questions about events resulting in injury were based on the National Minimum Data Set for Injury Surveillance in the National Health Data Dictionary.[277] Data pertains to events in the four weeks prior to the survey that resulted in an injury for which some action was taken. Injuries include fractures, dislocations, sprains, strains, torn muscles/ligaments, open wound, bruising, burns and scalds, poisoning and others.

A participant was coded as having a hospital admission if they had been admitted as an inpatient (including same day patients) and formally discharged in the 12 months prior to the survey. Participants were considered to have ‘a long-term condition’ if they had any long-term condition (at the time of the survey) and reported taking any one of the following actions in the two weeks before the survey: discharged from hospital inpatient episode, visited casualty/emergency/outpatients, consulted a doctor (General Practitioner and specialist), consulted a dentist, consulted another health professional, taken days away from work or study, or had other days of reduced activity. Accordingly, there is some overlap in the scope of these two variables, although the composite measure described here is designed to be a proxy indicator of the prevalence of long-term conditions that require regular treatment as well as services use per se.

9.2.2 SES measures

The NATSIHS and NHS have an array of measures of SES, however, only three are available for analysis with the child sample: household income; overcrowding and area-level disadvantage. All three were included in this analysis in order to measure the different dimensions of SES and better capture the complex influences of socioeconomic disadvantage on health. While household income is a popular conventional indicator of material wellbeing, it has some limitations in this context.

First, income data were not collected from each household member personally; second, it is a sensitive item that is prone to inaccurate and incomplete reporting; and third, income does not capture the nature of sharing of economic resources that can occur between members of extended Aboriginal families.[140] Overcrowding provides a proxy measure of income, wealth and housing conditions. It is a critical indicator of SES in Aboriginal contexts, as it has been shown to have deleterious effects on health and contribute to psychological stress[270, 278] and is a feature of the lives of many Aboriginal families.[215]

Information on household income (and other aspects of the household and dwelling) was provided by a household spokesperson. Individual incomes within households were summed, and standardised using equivalence scales to account for differences in household size and composition. The resultant measure of gross weekly household equivalised income is designed to be a more accurate reflection of a household's relative wellbeing. Quintiles were determined based on the distribution of values for all Australian CDs (for Aboriginal and non-Aboriginal children). Information on household income quintile was not available for 9% of the sample aged 0–14 years—these records were removed from cross-tabulation and regression analyses that included this variable.

The Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product was used to measure area-level socioeconomic disadvantage.[204] The SEIFA index ranks the relative level of disadvantage of areas using the attributes of all persons (Aboriginal and non-Aboriginal) in each CD, and includes measures of income, educational attainment, employment status and occupational skill. Quintiles were determined based on the distribution of values for all Australian CDs (for Aboriginal and non-Aboriginal children).

9.2.3 Geographic remoteness

Geographic remoteness is defined using the Australian Standard Geographic Classification (ASGC) Remoteness Structure, which is based on the plus version of the Accessibility/Remoteness Index of Australia (a widely used classification of remoteness in Australia).[188] The five categories of remoteness reflect differences in access to services and opportunities for social interaction, and include Major cities, Inner Regional Australia, Outer Regional Australia, Remote Australia and Very Remote Australia (see Figure 2.2 for a map of remoteness areas).[191] For the purposes of this chapter, ‘remote’ refers to an aggregation of the ‘Remote Australia’ and ‘Very Remote Australia’ categories. Data for populations in ‘remote’ areas are only available for Aboriginal persons.

9.2.4 Analysis

The analysis in this chapter was restricted to data from the 4114 Aboriginal and 4895 non-Aboriginal children in the sample aged 0–14 years. Given that remote areas were outside of the scope of the NHS, and with the knowledge that remoteness may play a significant role in explaining health outcomes, Aboriginal/non-Aboriginal comparisons have been restricted to non-remote areas. As such, the sample was stratified into three groups: Aboriginal children in non-remote areas, Aboriginal children in remote areas, and non-Aboriginal children in non-remote areas. All analysis was conducted separately for these groups, which allowed for comparisons between Aboriginal and non-Aboriginal populations and by remoteness within the Aboriginal population.

SAS version 9.1 was used for all analyses (SAS Institute Inc., Cary, NC, USA, 2000–08), and conducted within the Australian Bureau of Statistics’ (ABS) Remote Access Data Laboratory (RADL). The RADL is a secure online data query service that enables confidentialised versions of the NATSIHS and NHS to be interrogated remotely by researchers. While the RADL processes protect the confidentiality of the data, they restrict some of the analytic capacities of SAS—as noted below.

All regression models report odds ratios, adjusted for age and sex, with the highest status category used as the reference category for all SES variables. Proportions and odds ratios are reported with 95% confidence intervals. All output has been generated using person-level weights to produce representative estimates of the population of interest. While the ABS supplies replicate weights for the derivation of standard errors, the version of SAS provided in the RADL does not support the use of replicate weights. As a consequence, standard errors that allow for the complex design of the survey have been approximated with the application of a design effect.

A design effect is an estimate of the change between the variance of estimates for a complex sample design and the variance that would have been achieved from a simple random sample with the same sample size, and has been calculated by comparing the simple variance with the variance estimates published by the ABS for a range of point prevalence data. The confidence intervals reported here are based on estimates of standard error and variance (calculated on the assumption of a simple random sample), adjusted by the estimated design effect. The magnitude of the design effect varied by Aboriginal status but not remoteness—as such, a separate design effect was applied to the samples of Aboriginal and non-Aboriginal children aged 0–14 years.

9.3 Results

9.3.1 Population characteristics

The selected health indicators ranged in prevalence, from 1.8% (for hayfever among Aboriginal children in remote areas) to almost a quarter (24%, for injury among non-Aboriginal children in non-remote areas). The profile of health indicators reveals that there are significant differences in the prevalence of a number of outcomes in Aboriginal and non-Aboriginal children, and variations across remote and non-remote settings. A higher proportion of Aboriginal children in non-remote areas had asthma and ear disease than non-Aboriginal children in these areas—however, the opposite was observed for eye disease, hayfever and injury. Within the Aboriginal population, children in remote areas had significantly lower rates of asthma and hayfever, and a higher rate of ear disease, when compared with those in non-remote areas (Table 9.1).

Table 9.1: Health, SES and demographic characteristics of Aboriginal and non-Aboriginal children aged 0–14 years, Australia, 2004–05[a].

	Aboriginal		
	Non-remote % (95% CI)	Remote % (95% CI)	Non-Aboriginal % (95% CI)
	Health outcomes		
Asthma	15.9 (13.4–18.4)	8.2 (5.8–10.6)	11.4 (10.3–12.6)
Ear disease	7.7 (5.9–9.5)	12.1 (9.3–14.9)	3.0 (2.4–3.6)
Eye disease	7.9 (6.1–9.8)	5.3 (3.4–7.3)	10.4 (9.3–11.5)
Hayfever[b]	5.0 (3.5–6.5)	1.8 (0.7–3.0)	7.8 (6.8–8.7)
Injury[c]	20.0 (17.2–22.7)	15.2 (12.1–18.3)	24.5 (23.0–26.0)

Long-term condition[d]	19.7 (17.0–22.4)	19.2 (15.7–22.6)	17.1 (15.8–18.4)
Health care actions			
Hospital admission[e]	10.2 (8.1–12.2)	15.9 (12.7–19.0)	9.1 (8.0–10.0)
Socioeconomic characteristics			
Household income (quintiles)[f]			
First (low)	45.8 (42.4–49.2)	46.4 (42.0–50.7)	17.0 (15.7–18.3)
Second	20.8 (18.0–23.5)	27.2 (23.4–31.1)	22.0 (20.5–23.4)
Third	14.0 (11.6–16.3)	6.2 (4.1–8.2)	22.0 (20.5–23.4)
Fourth/fifth (high)	7.6 (5.8–9.4)	4.3 (2.5–6.1)	27.4 (25.8–29.0)
Not stated/not known	11.9 (9.7–14.1)	16.0 (12.8–19.1)	11.7 (10.5–12.8)
Overcrowding (number of extra bedrooms needed)			
0	78.0 (75.2–80.9)	43.6 (39.3–47.9)	92.4 (91.5–93.4)
1	13.3 (11.0–15.6)	21.8 (18.2–25.4)	6.6 (5.7–7.5)
2 or more	5.6 (4.0–7.1)	34.0 (29.9–38.1)	0.9 (0.6–1.2)
SEIFA (quintiles)[g]			
First (low)	43.0 (39.7–46.4)	57.9 (53.6–62.2)	18.2 (16.8–19.5)
Second	22.4 (19.5–25.2)	11.0 (8.3–13.8)	19.6 (18.2–21.0)
Third	21.3 (18.6–24.1)	13.9 (10.9–16.9)	20.6 (19.1–22.0)
Fourth/fifth (high)	13.1 (10.8–15.4)	3.5 (1.9–5.1)	41.7 (39.9–43.4)

[a] Proportions are based on weighted estimates of the population of all children in Australia in each category (Aboriginal non-remote: n=134893; Aboriginal remote: n=45776; non-Aboriginal non-remote: n=3716724). The frequencies of missing responses have not been reported, with the exception of household income.

[b] Includes allergic rhinitis.

[c] Includes injuries sustained from an event in the four weeks prior to the survey, and for which action was taken.

[d] For those who had taken a health care action only. Actions include being discharged from hospital inpatient episode, visited casualty/emergency/outpatients, consulting a doctor (General Practitioner and specialist), consulting a dentist, consulting another health professional, days away from work or study, other days of reduced activity, and other actions.

[e] In last 12 months.

[f] Measure of gross weekly household equivalised income. Missing records (9% of the sample aged 0–14 years) were excluded. Quintiles were determined based on the distribution of values for all Australian CDs (for Aboriginal and non-Aboriginal children).

[g] Index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs (for Aboriginal and non-Aboriginal children).

Almost 16% (95% CI: 12.7%–19.0%) of Aboriginal children in remote areas had been admitted to hospital in the previous 12 months; higher than the proportion among both Aboriginal (10%; 95% CI: 8.1%–12.2%) and non-Aboriginal (9.1%; 95% CI: 8.0%–10.0%) children living in non-remote settings.

The socioeconomic disadvantage faced by Aboriginal populations is well established, is supported by the results of Chapters 7 and 8 and further confirmed here. Table 9.1 highlights that Aboriginal children are highly concentrated in the lower levels of household income and more disadvantaged areas, and that a higher proportion live in overcrowded conditions.

9.3.2 Socioeconomic patterns of health in Aboriginal and non-Aboriginal populations

Table 9.2 includes all results of the regression analyses, and presents odds ratios adjusting for age and sex. These are complemented with a graphical illustration of socioeconomic disparities in Figures 9.1–9.7, which display estimates of proportions from cross-tabulations. In addition to illustrating the shape of socioeconomic disparities in health, the figures highlight the absolute difference in outcomes between Aboriginal and non-Aboriginal children at every level of SES.

Overarching patterns

Overall, there were considerable differences in the direction, shape and magnitude of the SES-health associations by both SES indicator and health outcome/action. This observation applies to each of the three population groups (Aboriginal and non-Aboriginal children in non-remote areas and remote Aboriginal children) and to comparisons between these groups.

Consistent socioeconomic patterns of health

Notwithstanding this diversity, the patterns for hayfever and injury were generally similar and characterised by a reverse socioeconomic gradient (Table 9.2; Figures 9.1 and 9.2)—where the poorest outcomes were seen in the highest SES category, with improvements in health at each step down the socioeconomic ladder. For hayfever, the similarities extend only to Aboriginal and non-Aboriginal groups in non-remote areas—although the results for non-Aboriginal children by household income were an exception to the reverse patterns, and exhibited a small and statistically insignificant positive association (Figure 9.1A). The magnitude of the association with overcrowding was similar for Aboriginal and non-Aboriginal populations: the relative odds of hayfever for those living in a house requiring two or more additional bedrooms (compared with those with no overcrowding) was 0.25 in both non-remote Aboriginal (95% CI: 0.19–0.32) and non-Aboriginal (95% CI: 0.23–0.27) populations. In contrast, the disparity by SEIFA was larger in non-remote Aboriginal populations (lowest vs. fourth/fifth quintile: OR=0.41; 95% CI: 0.36–0.46) when compared with non-Aboriginal children in these areas (OR=0.81; 95% CI: 0.80–0.82).

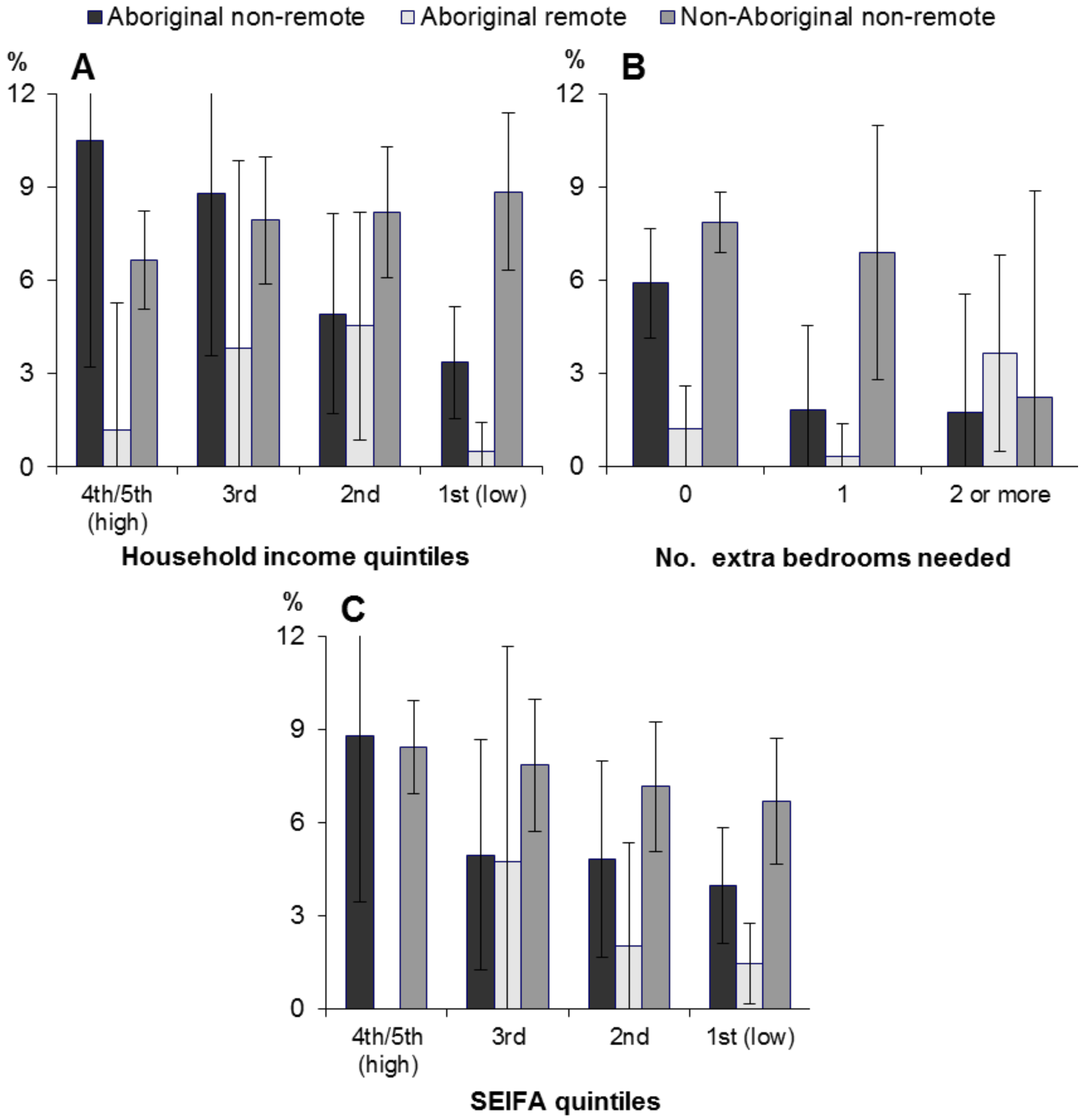


Figure 9.1: Socioeconomic disparities in hayfever among Aboriginal and non-Aboriginal children, by Remoteness, 2004–05.

The reverse gradients for injury were consistently observed in all three population groups (Figure 9.2). The magnitude of the associations tended to be largest in remote populations of Aboriginal children: the most striking result was a six-fold disparity in the relative odds of injury for those in the lowest SES category compared with the highest for household income (OR=0.17; 95% CI: 0.14–0.20). The disparities for overcrowding (OR=0.44; 95% CI: 0.39–0.49) and SEIFA (OR=0.39; 95% CI: 0.31–0.48) were more modest by comparison but nevertheless represent substantial effect sizes. There was generally less than a two-fold disparity in injury by SES within non-remote populations.

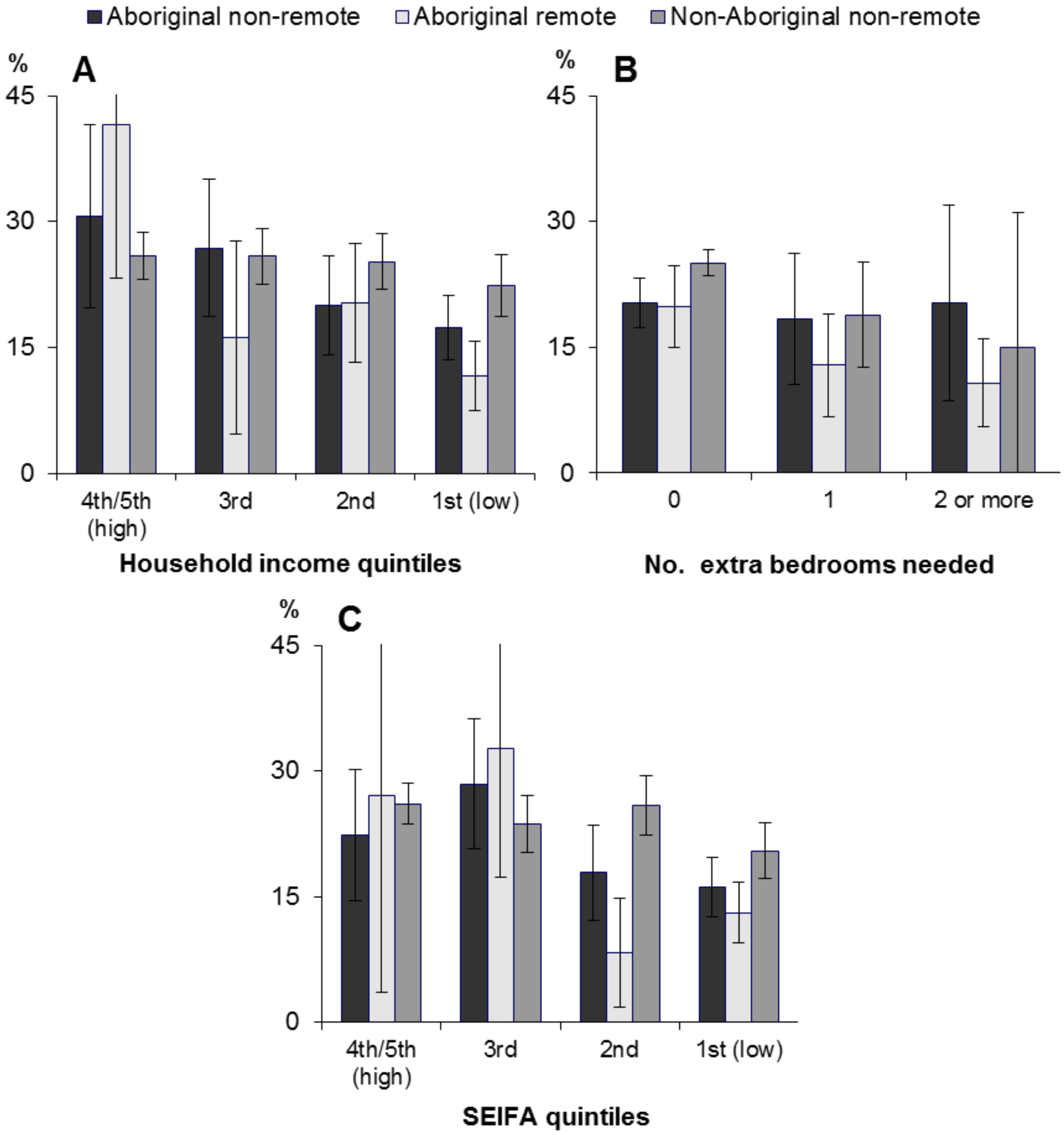


Figure 9.2: Socioeconomic disparities in injury among Aboriginal and non-Aboriginal children, by Remoteness, 2004–05.

Contrasting socioeconomic patterns of health

There are distinct differences in the nature of the socioeconomic patterns in asthma by Aboriginal status. The patterns in both remote and non-remote Aboriginal populations tend to be characterised by reverse associations—although these patterns are less clear in non-remote populations. While the magnitude of disparities was larger in remote areas, only those in the top category of household income and SEIFA had an elevated likelihood of asthma, reflecting a reverse threshold effect (Figure 9.3). For example, the relative odds of asthma for Aboriginal children in the lowest SEIFA category (compared with quintiles 4–5) was 0.31 (95% CI: 0.25–0.39) in remote areas and 0.86 (95% CI: 0.80–0.93) in non-remote areas. There was a positive association with SES among non-Aboriginal children in non-remote areas: the odds ratios for household income were modest in size and reflect a gradient pattern; and a threshold effect was observed for overcrowding—whereby those in the highest SES category were almost three times more likely to have asthma than those in the lowest—although less than 1% of children in this population group were in the lowest category (Table 9.1).

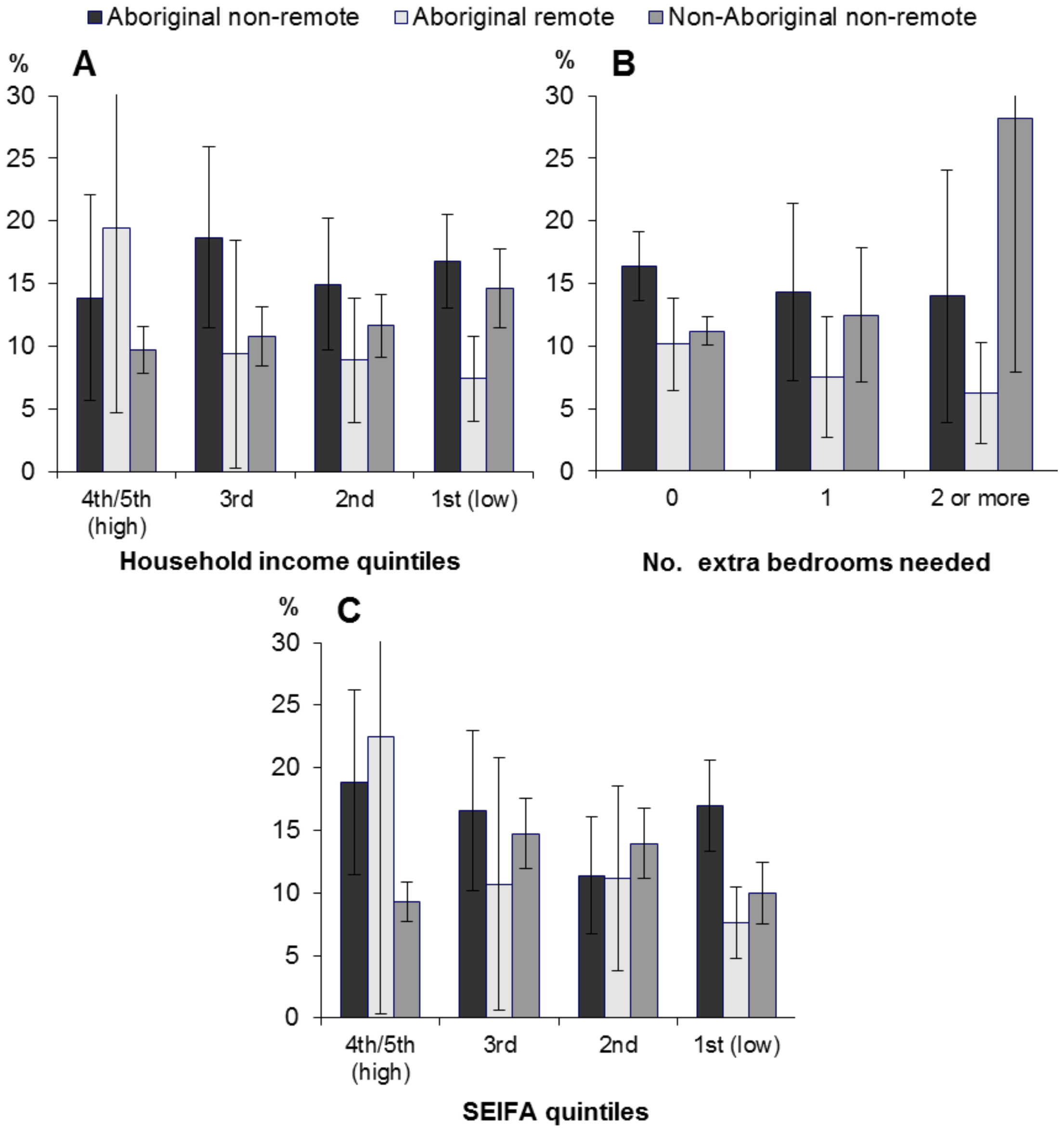


Figure 9.3: Socioeconomic disparities in asthma among Aboriginal and non-Aboriginal children, by Remoteness, 2004–05.

The socioeconomic disparities in eye disease are different in Aboriginal and non-Aboriginal populations. For Aboriginal children, they tend to be in the reverse direction—like those for hayfever, injury and asthma—although the shape and magnitude differ depending on the SES indicator considered. While there were relatively strong effects for all three SES indicators in remote Aboriginal populations, and for household income and overcrowding in non-remote Aboriginal populations, the shapes rarely followed a continuous gradient (Figure 9.4). There was no clear pattern in this outcome for non-Aboriginal children in non-remote areas, for any of the SES indicators.

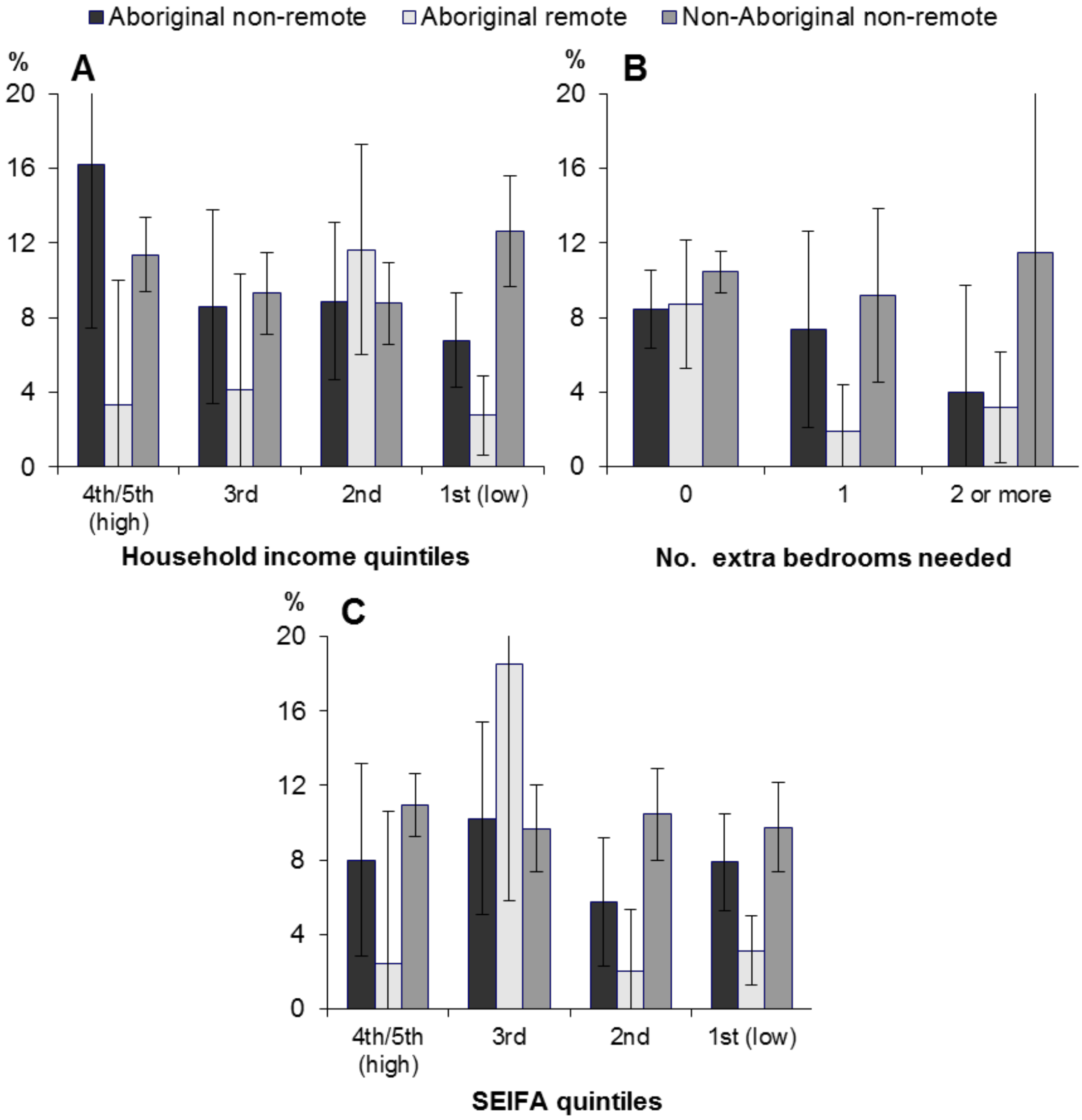


Figure 9.4: Socioeconomic disparities in eye disease among Aboriginal and non-Aboriginal children, by Remoteness, 2004–05.

There are clear and consistent socioeconomic patterns in ear disease among Aboriginal children in remote areas and mixed findings in other population groups. The relative and absolute disparities tended to be largest in remote Aboriginal populations: in addition to a marked positive gradient effect in all SES indicators (disparities between the highest and lowest SES categories ranged from 1.5 to 2.8-fold), there was a greater prevalence of ear disease in this population group across most SES categories (Figure 9.5). There were few significant effects in non-remote populations, with the exception of a reverse association with overcrowding among non-Aboriginal children (one vs. no additional bedrooms needed: OR=0.30; 95% CI: 0.28–0.32) and a U-shaped relationship with SEIFA among Aboriginal children (lowest likelihood in the second vs. fourth/fifth quintile: OR=0.50; 95% CI: 0.44–0.56).

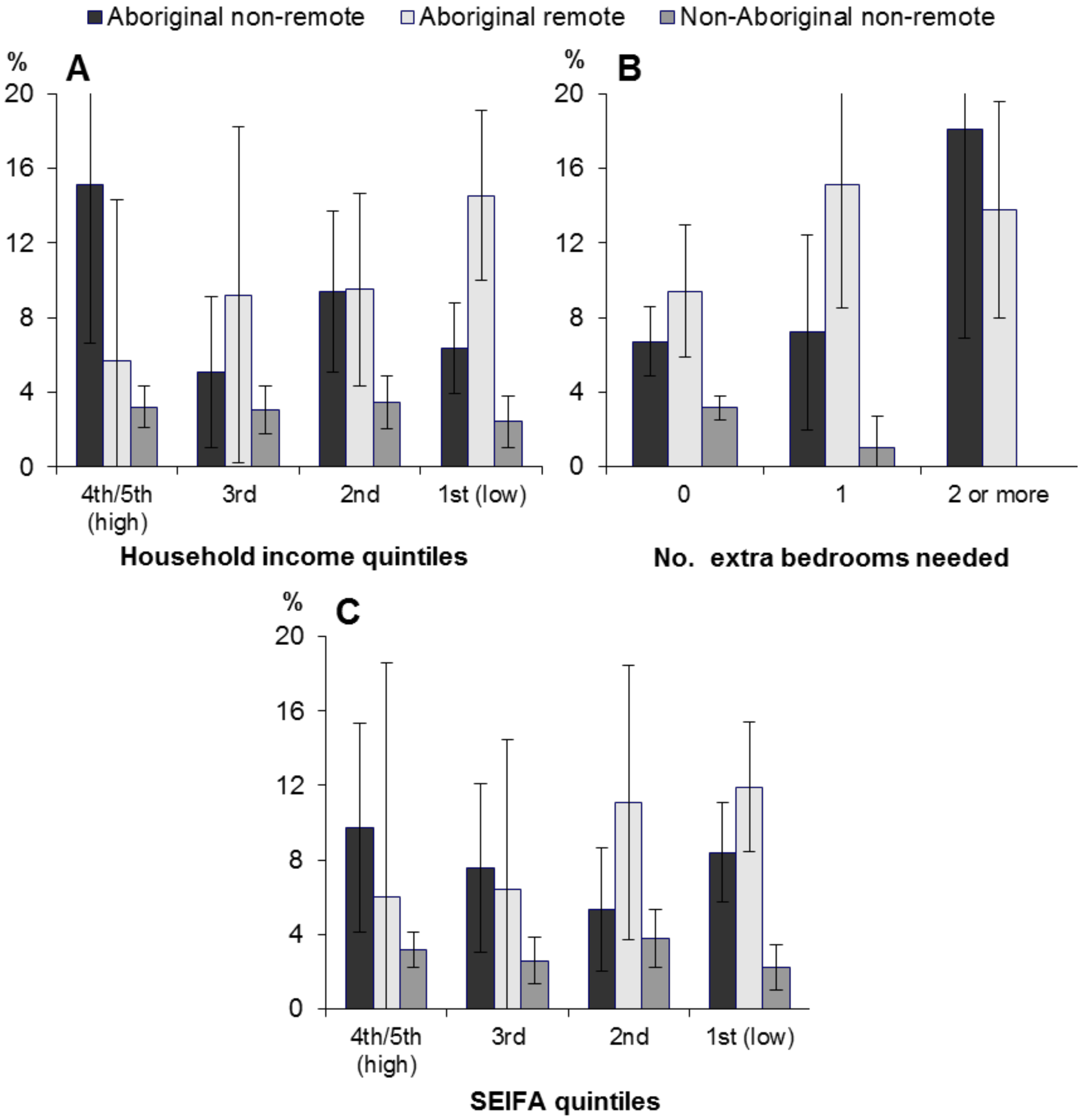


Figure 9.5: Socioeconomic disparities in ear disease among Aboriginal and non-Aboriginal children, by Remoteness, 2004–05.

The patterns for long-term conditions were mixed, and characterised by generally modest effect sizes and a lack of consistency in the direction of associations between and across population groups (Figure 9.6). The largest disparity was observed for overcrowding in non-Aboriginal children in non-remote areas, where children living in houses that required at least two additional bedrooms were 3.2 (95% CI: 3.1–3.3) times more likely to have a long-term condition (for which a health care action was taken) than those with no overcrowding.

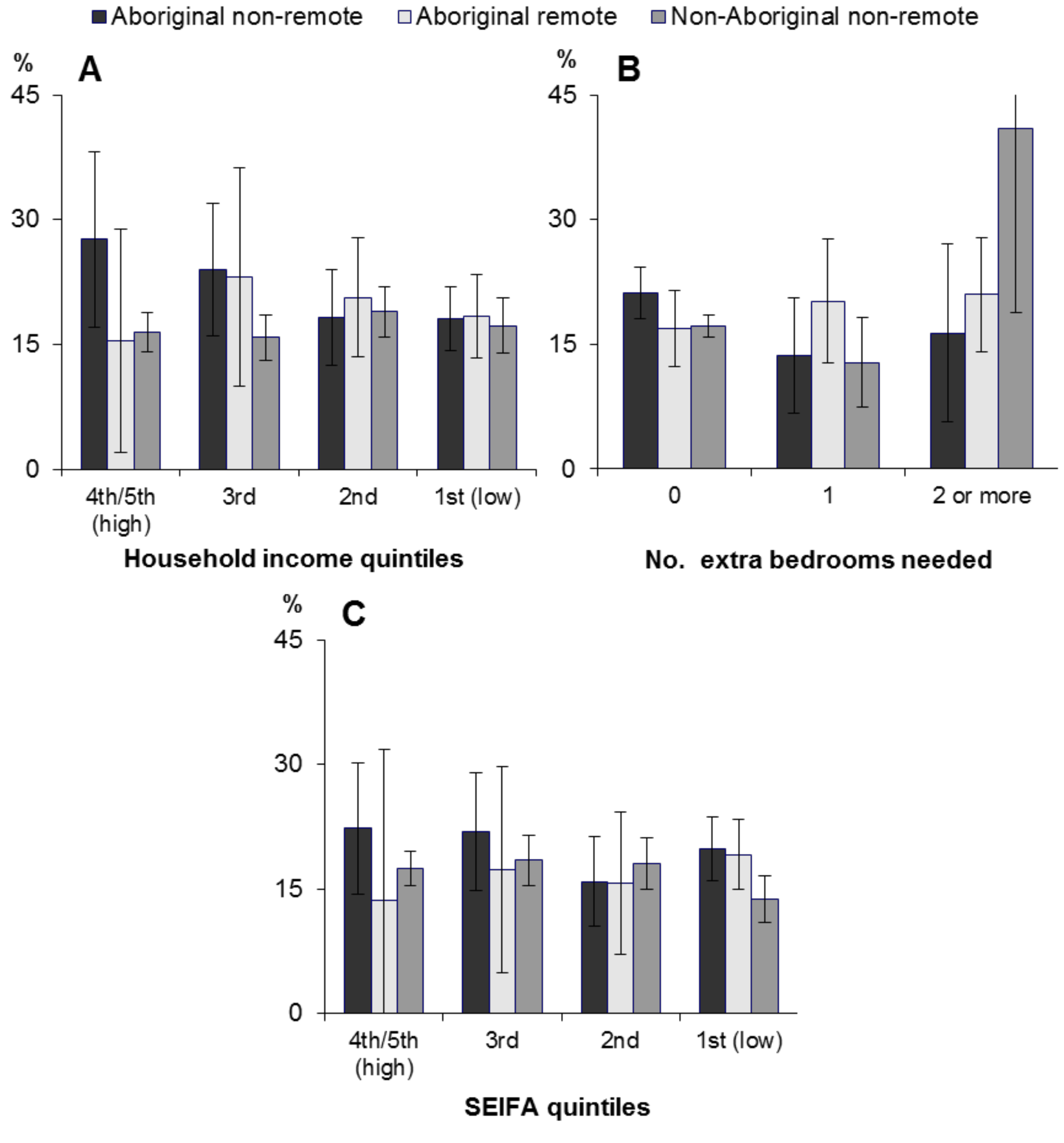


Figure 9.6: Socioeconomic disparities in long-term conditions (for which a health care action was taken) among Aboriginal and non-Aboriginal children, by Remoteness, 2004–05.

There were stark contrasts in the pattern of hospital admissions. While the results for all three SES indicators were consistent within each population group, they were different between groups. There was a strong positive association with hospitalisations for remote Aboriginal children, particularly for household income (lowest vs. fourth/fifth quintile: OR=3.0; 95% CI: 2.2–3.9) and SEIFA (lowest vs. fourth/fifth quintile: OR=3.3; 95% CI: 2.4–4.7). There appeared to be a U-shaped relationship with all three SES indicators among Aboriginal children in non-remote areas, and no apparent relationship among non-Aboriginal children in these areas (Figure 9.7).

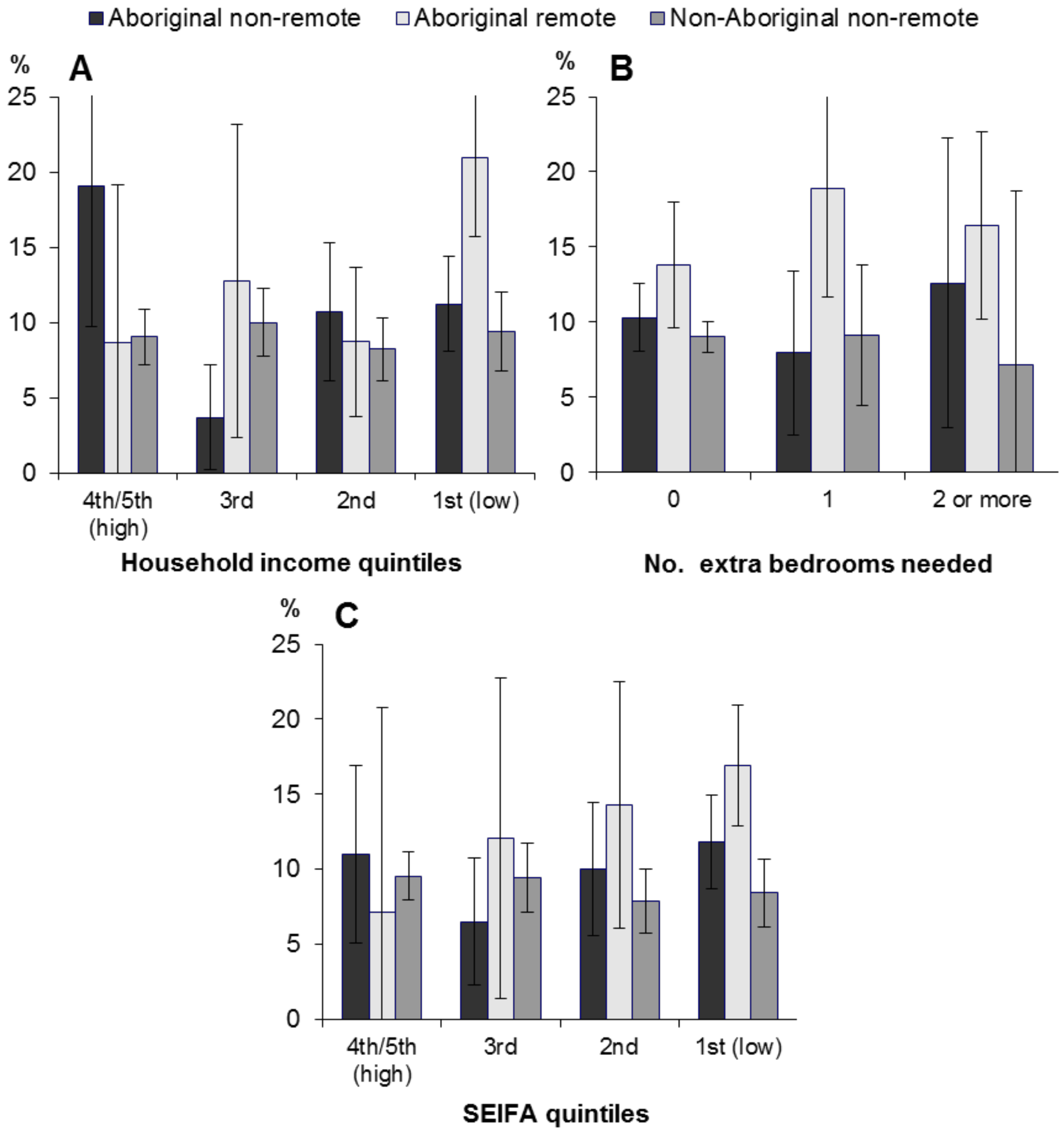


Figure 9.7: Socioeconomic disparities in hospital admissions among Aboriginal and non-Aboriginal children, by Remoteness, 2004–05.

Table 9.2: Socioeconomic disparities in selected health indicators among Aboriginal and non-Aboriginal children aged 0–14 years, Australia, 2004–05[a].

	Aboriginal				Non-Aboriginal non-remote	
	Non-remote		Remote			
Socioeconomic indicator	OR	95% CI	OR	95% CI	OR	95% CI
Asthma						
Household income (quintiles)[b]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	1.29	1.14–1.45	0.48	0.36–0.65	1.12	1.11–1.13
Second	1.06	0.94–1.19	0.43	0.34–0.54	1.19	1.18–1.21
First (low)	1.21	1.09–1.34	0.33	0.26–0.41	1.56	1.54–1.58
Overcrowding (number of extra bedrooms needed)						
0	1.0	..	1.0	..	1.0	..
1	0.88	0.81–0.95	0.71	0.61–0.83	1.10	1.08–1.12
2	0.80	0.72–0.88	0.61	0.53–0.70	2.88	2.79–2.97
SEIFA (quintiles)[c]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.83	0.76–0.91	0.46	0.35–0.59	1.65	1.63–1.67
Second	0.52	0.47–0.57	0.48	0.37–0.62	1.59	1.58–1.61
First (low)	0.86	0.80–0.93	0.31	0.25–0.39	1.10	1.08–1.11
Ear disease						
Household income (quintiles)[b]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.25	0.22–0.30	1.66	1.11–2.49	0.91	0.89–0.93
Second	0.51	0.45–0.58	1.83	1.28–2.60	1.00	0.98–1.02
First (low)	0.35	0.31–0.39	2.79	1.98–3.94	0.71	0.69–0.73
Overcrowding (number of extra bedrooms needed)						
0	1.0	..	1.0	..	1.0	..
1	1.13	1.01–1.26	1.55	1.36–1.76	0.30	0.28–0.32
2	3.19	2.89–3.53	1.51	1.34–1.70	—	—
SEIFA (quintiles)[c]						

Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.73	0.65–0.82	1.13	0.75–1.71	0.78	0.77–0.80
Second	0.50	0.44–0.56	1.88	1.26–2.81	1.20	1.18–1.22
First (low)	0.84	0.76–0.93	1.89	1.30–2.74	0.66	0.65–0.68
Eye disease						
Household income (quintiles)[b]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.42	0.37–0.48	1.14	0.64–2.01	0.79	0.78–0.80
Second	0.43	0.37–0.48	4.19	2.62–6.68	0.78	0.77–0.79
First (low)	0.33	0.29–0.37	1.03	0.64–1.66	1.12	1.11–1.14
Overcrowding (number of extra bedrooms needed)						
0	1.0	..	1.0	..	1.0	..
1	0.79	0.71–0.89	0.23	0.18–0.31	0.88	0.85–0.90
2	0.37	0.31–0.44	0.45	0.37–0.54	1.12	1.07–1.17
SEIFA (quintiles)[c]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	1.35	1.20–1.53	7.21	3.95–13.14	0.86	0.85–0.87
Second	0.62	0.54–0.70	0.73	0.37–1.43	1.00	0.99–1.01
First (low)	0.94	0.84–1.05	1.33	0.73–2.41	0.95	0.94–0.96
Hayfever[d]						
Household income (quintiles)[b]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.72	0.62–0.83	3.38	1.53–7.49	1.26	1.24–1.28
Second	0.40	0.35–0.47	3.42	1.65–7.11	1.31	1.30–1.33
First (low)	0.28	0.24–0.32	0.57	0.26–1.25	1.41	1.39–1.43
Overcrowding (number of extra bedrooms needed)						
0	1.0	..	1.0	..	1.0	..
1	0.28	0.23–0.34	0.40	0.21–0.76	0.83	0.81–0.86
2	0.25	0.19–0.32	4.79	3.63–6.31	0.25	0.23–0.27
SEIFA (quintiles)[c]						
Fourth/fifth (high)	1.0	..	—[e]	—	1.0	..

Third	0.54	0.47–0.62	—	—	0.92	0.91–0.93
Second	0.48	0.42–0.55	—	—	0.86	0.85–0.87
First (low)	0.41	0.36–0.46	—	—	0.81	0.80–0.82
Injury[f]						
Household income (quintiles)[b]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.84	0.77–0.93	0.25	0.20–0.33	0.97	0.96–0.98
Second	0.59	0.54–0.65	0.29	0.24–0.35	0.92	0.91–0.93
First (low)	0.49	0.45–0.53	0.17	0.14–0.20	0.82	0.81–0.83
Overcrowding (number of extra bedrooms needed)						
0	1.0	..	1.0	..	1.0	..
1	0.91	0.84–0.98	0.66	0.58–0.75	0.68	0.66–0.69
2	1.12	1.03–1.23	0.44	0.39–0.49	0.50	0.49–0.52
SEIFA (quintiles)[c]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	1.41	1.30–1.52	1.13	0.89–1.43	0.84	0.83–0.85
Second	0.78	0.72–0.85	0.23	0.17–0.30	0.96	0.96–0.97
First (low)	0.68	0.63–0.73	0.39	0.31–0.48	0.69	0.69–0.70
Hospital admissions[g]						
Household income (quintiles)[b]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.17	0.14–0.19	1.91	1.35–2.70	1.13	1.11–1.14
Second	0.55	0.49–0.62	1.18	0.87–1.60	0.90	0.89–0.91
First (low)	0.56	0.51–0.62	2.95	2.22–3.94	1.06	1.05–1.08
Overcrowding (number of extra bedrooms needed)						
0	1.0	..	1.0	..	1.0	..
1	0.78	0.70–0.86	1.56	1.38–1.75	1.03	1.01–1.06
2	1.47	1.32–1.63	1.15	1.03–1.28	0.83	0.79–0.87
SEIFA (quintiles)[c]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.58	0.52–0.66	3.04	2.10–4.40	1.01	0.99–1.02

Second	1.00	0.90–1.11	2.66	1.84–3.84	0.79	0.78–0.80
First (low)	1.15	1.04–1.26	3.35	2.37–4.73	0.84	0.83–0.85
Long-term condition[h]						
Household income (quintiles)[b]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.77	0.69–0.85	1.61	1.23–2.10	0.96	0.95–0.97
Second	0.57	0.51–0.62	1.39	1.11–1.76	1.19	1.18–1.20
First (low)	0.56	0.51–0.61	1.20	0.96–1.50	1.04	1.03–1.05
Overcrowding (number of extra bedrooms needed)						
0	1.0	..	1.0	..	1.0	..
1	0.56	0.52–0.61	1.20	1.07–1.33	0.69	0.68–0.71
2	0.70	0.64–0.77	1.33	1.21–1.46	3.20	3.11–3.28
SEIFA (quintiles)[c]						
Fourth/fifth (high)	1.0	..	1.0	..	1.0	..
Third	0.96	0.89–1.04	1.35	1.02–1.79	1.05	1.04–1.06
Second	0.62	0.57–0.67	1.14	0.85–1.52	1.06	1.05–1.07
First (low)	0.85	0.79–0.92	1.42	1.10–1.85	1.42	0.75–0.77

— Too few cases to establish an estimate.

[a] Results are derived from logistic regression models. All models are adjusted for age and sex. Each SES-health variable pair represents a separate model.

[b] Measure of gross weekly household equivalised income. Missing records (9% of the sample aged 0–14 years) were excluded. Quintiles were determined based on the distribution of values for all Australian CDs (for Aboriginal and non-Aboriginal children).

[c] Index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs (for Aboriginal and non-Aboriginal children).

[d] Includes allergic rhinitis.

[e] No cases of hayfever or allergic rhinitis recorded in the reference category, hence odds ratios cannot be calculated.

[f] Includes injuries sustained from an event in the four weeks prior to the survey, and for which action was taken.

[g] In last 12 months.

[h] For those who had taken a health care action only. Actions include being discharged from hospital inpatient episode, visited casualty/emergency/outpatients, consulting a doctor (General Practitioner and specialist), consulting a dentist, consulting another health professional, days away from work or study, other days of reduced activity, and other actions.

9.4 Discussion

The results presented in this chapter highlight considerable diversity in the socioeconomic pattern of child health in both Aboriginal and non-Aboriginal populations, although there was a preponderance of reverse associations. The mixed findings are not surprising given the range of health indicators that have been examined here and the likelihood that the role of SES on the causal pathway to each health outcome and action is likely to be different.[2] The findings here for Aboriginal populations are generally consistent with the results of the earlier literature review (Chapter 3) and the empirical work contained in Chapters 6–8. More specifically, the patterns displayed for asthma and injury outcomes among Aboriginal children in Western Australia, in Chapter 7, mirror the reverse associations shown here using national data. Collectively, the work to date confirms that SES is one facet of the complex set of factors that influence Aboriginal child health.

Overall, the socioeconomic patterns of child health in Aboriginal and non-Aboriginal child populations differ markedly—at least in non-remote settings. Even the basic nature or direction of the associations was inconsistent for five of the seven health indicators that were examined (asthma, ear disease, eye disease, long-term conditions and hospital admissions). This lends support to the notion that socioeconomic factors have a differential impact on Aboriginal and non-Aboriginal population health. The implication of this for policy is that a single approach to stimulating socioeconomic conditions will not have equal benefits to child health outcomes in Aboriginal and non-Aboriginal populations. While the evidence here underscores the validity of the well-worn edict that “one size does not fit all” in Indigenous health policy,[76] it also reinforces the need to examine health disparities *within and across* Aboriginal and other population groups in order to better inform policy and practice.[155]

Notwithstanding the general diversity of results between Aboriginal and non-Aboriginal populations across most health indicators, there were similarities in the socioeconomic patterning of hayfever and injury. The findings for these outcomes were in the reverse direction and generally exhibited a gradient effect, suggesting that those with higher SES had poorer health than those in lower SES groups. There are examples in the mainstream literature that are consistent with this pattern, for both hayfever and injury.[227, 229] Importantly, while the direction and shape of disparities was similar, the magnitude tended to be larger in the Aboriginal population—this was particularly noticeable for hayfever which featured up to four-fold disparities across SES categories. Prima facie, these results run counter to the notion that disparities may be weaker in Aboriginal than non-Aboriginal populations.[8, 9] It is difficult to articulate policy recommendations from these results because the reverse associations imply that a trade-off exists between investments in SES and health—or at least that there needs to be a focus on reducing the risk exposure that is associated with higher SES. Given the exploratory nature of this work and the understanding that disparities in the reverse direction can be an artefact of measurement error (e.g. labelling and reporting bias) and methodological constraints (e.g. no available information on factors that are known to vary with SES, such as the affordability, accessibility and quality of health services, the ability of parents to diagnose health problems in their children and their responsiveness in seeking care for those problems), a more detailed investigation is required to shed light on the socioeconomic pathways to hayfever, allergic rhinitis, and injuries.

In addition to these elevated disparities, in relative terms, for hayfever and injuries, there are differences in absolute risk for some health indicators. Most notably, Aboriginal children in non-remote areas have a higher prevalence of asthma and ear disease than their non-Aboriginal counterparts in *all* categories of household income and SEIFA. This suggests that SES explains only part of the difference in the prevalence of these outcomes in non-remote areas and that other factors are having a detrimental impact on health across all social strata. These are likely to include racism and high stress, which are acknowledged as prominent determinants of Aboriginal health (as discussed in Chapters 2 and 3) and have been shown empirically to pervade the spectrum of Aboriginal society,[35, 279] and the multiple social and economic disadvantage faced by many Aboriginal people.[75] The findings here and the results of Chapter 8 suggest that future research should consider a range of potential mediating factors in the examination of socioeconomic pathways to health, including those that characterise Aboriginal circumstances, families and culture in the past and present day.

There were a number of important differences in the patterns of child health *within* the Aboriginal population. In particular, this chapter has highlighted that the shape of disparities for hayfever and hospitalisations were divergent in remote and non-remote settings. The prominent positive associations for hospitalisations in remote areas accords with the findings for Aboriginal children aged 0–17 years in Western Australia for hospital admissions related to gastrointestinal, ear and non-wheezing lower respiratory infections.[128] The U-shaped associations found in hospitalisations in non-remote areas are not directly supported by the extant literature, although Gray and Boughton have reported this pattern for health care actions (which includes hospitalisations) among Aboriginal adults.[127] Aside from these differences by remoteness, three of the seven health indicators—asthma, eye disease and injury—showed consistent reverse associations in both remote and non-remote areas. Overall, the magnitude of disparities in remote areas tended to be larger (featuring some effects of substantial size) than those in non-remote (Aboriginal or non-Aboriginal) populations.

Further, while nine of the 21 effect estimates calculated here were in the reverse direction for Aboriginal children in remote areas, they were more likely to be positive for this group (seven of 21) when compared with non-remote Aboriginal populations (one of 21). It seems clear, given the diversity of results shown here, that location accounts for some of the variation in health within the Aboriginal population. This is not surprising as health determinants and environmental conditions vary across geographic remoteness,[11] e.g. there tends to be fewer health care services in more remote areas. Furthermore, Aboriginal Australia is a vastly heterogeneous population group and differences in culture, language and socio-demographic circumstance between sub-populations and tribal groups concord with geographic remoteness. For the same reasons that I have examined differences across population groups by Aboriginality and remoteness here, future research will need to focus on a finer disaggregation of the Aboriginal population in order to provide a more accurate picture of health patterns among different Aboriginal cultural and language groups.

Ultimately, the goal here is to provide insights to policy that will increase the pace of change toward health equity in Australia.

9.4.1 Strengths and limitations

To the best of my knowledge the analysis in this chapter is the first internationally to look at differences in the socioeconomic patterning of child health between Indigenous and non-Indigenous populations using nationally representative data. The chapter has employed rigorous analytical methods to datasets that were collected using robust and culturally appropriate practices. These collections were run in parallel and shared a common design and questionnaire, which has enabled comparisons between Aboriginal and non-Aboriginal children using identical measures of SES.

There are a number of limitations to what I have presented here, and these overlap with the issues presented in Chapters 5–8 (see Sections 5.5.1, 6.5.1, 7.5.5 and 8.5.1). The main limitations include the cross-sectional nature of the NATSIHS and NHS which limits an assessment of the causal relationships between SES and health, limited information on the SES characteristics of parents and caregivers of children and geography, and the use of questions that rely on carer perception and recall which can result in the misclassification of both health and SES. Collectively these limitations have curbed the breadth of potential analyses and what can be inferred from our results.

The measurement of SES—like the earlier empirical chapters—has been a central feature of the analytic framework of this chapter. SES has been measured here using three available variables from both the NATSIHS and NHS (household income, overcrowding and area-level disadvantage). These provide a measure of the characteristics of households and neighbourhoods, although none describe the characteristics of parents. While the SES indicators used for Aboriginal and non-Aboriginal children are identical, they may have a different meaning and level of relevance in each group. It has been suggested that traditional measures of SES can be less relevant to Aboriginal populations and have limited applicability in some Aboriginal contexts (see Section 2.4).[9, 70, 71] Income is an important case in point.

Research highlights that the participation and attachment of Aboriginal people to the formal labour market is distinct to other Australians. As a result, Aboriginal people tend to earn less and be more reliant on government transfer payments as their main source of income,[31] and are more likely to receive in-kind remuneration for informal productive activities,[64] than other Australians. Income that is earned is more often shared among extended family members when compared with other Australian families.[72, 140] This raises questions about the socioeconomic comparability of Aboriginal and non-Aboriginal children in our sample that are from households with a similar income. Moreover, it poses a challenge to assessing the pattern of SES-health relationships and comparing them between Aboriginal and non-Aboriginal populations.

The indicators of ear and eye disease and injuries used in this chapter have been derived from responses to a range of conditions and events. Ear disease includes partial or complete deafness, diseases of the middle ear (such as otitis media) and tinnitus, for example. Eye disease refer to range of conditions, such as visual disturbances and blindness, myopia (short sight), hyperopia (long sight), cataracts, astigmatism, colour blindness and other diseases of the eye and adnexa. Injuries include events that resulted in fractures, dislocations, sprains, strains, torn muscles/ligaments, open wound, bruising, burns and scalds, and poisoning, among others. While the prevalence of some of these conditions and events was too low to enable separate analysis, their aggregation may have obscured a different SES patterning of health for each condition and injury event.

Access and use of health services is likely to have affected the reporting of a number of the health outcomes used in this analysis. If children from families with more socioeconomic resources had better access and greater utilisation of health services, then the results may underestimate the magnitude of disparities in health that are in the positive direction, or overestimate reverse disparities. While this limitation is likely to apply to both Aboriginal and non-Aboriginal populations, it is difficult to assess the degree of bias in each group.

9.5 Conclusion

The study presented in this chapter is the first to explicitly examine whether the socioeconomic patterning of child health differs in Aboriginal and non-Aboriginal populations. The findings highlight substantial socioeconomic disparities in some aspects of health within both groups, but a lack of consistency in the direction and magnitude of these disparities between Aboriginal and non-Aboriginal populations, at least in non-remote areas. Disparities that followed a similar pattern tended to be of a larger magnitude in Aboriginal populations. While poor Aboriginal child health is a ubiquitous finding in the literature, the results here highlight an elevated prevalence of some conditions in all SES categories relative to non-Aboriginal children. This suggests that factors other than SES have a prominent influence on Aboriginal child health. Finally, the findings in remote areas reinforce the notion that Aboriginal Australia is heterogeneous, and that the socioeconomic patterning of health is likely to vary—and perhaps substantially—across different Aboriginal groups.

The findings broadly support the notion that policy responses that are suitable for the general population need to be modified in order to significantly benefit the health of Aboriginal peoples. The preponderance of reverse associations shown here, however, create a vexing problem in terms of addressing disparities in health because they suggest that improving health requires a reduction in socioeconomic wellbeing—or at least a reduction in the risk exposure that is associated with higher SES. In reality, these patterns may reflect the limitations of the data and approach, and suggest that we need a more complete examination of socioeconomic patterns of health across population groups and robust data to support this. This includes, but is not limited to, issues of data disaggregation, culturally appropriate measures of health and SES, objective measures of health status and health service use, and the exploration of mediating pathways. A more complete and routine examination of the joint effects of Aboriginality and SES on health will enhance the active discourse on the causes of health inequalities in Australia. And ultimately, insights into proximal causes and their precursors may help to increase the pace of change toward health equity in Australia.

CHAPTER 10

CONCLUSIONS AND DIRECTIONS

10.1 Introduction

The pervasive health and social disadvantage faced by Aboriginal peoples is an acknowledged part of Australian society. This thesis has summarised the extant data, and has presented new findings that describe and provide greater clarity about inequalities between Aboriginal and non-Aboriginal populations in most measurable aspects of health and wellbeing across the life cycle. These measures include indicators of development in early life, such as birthweight, infant mortality, hearing impediments, eye disease, asthma, as well as onward mental health, and educational attendance and performance.

The contemporary state of Aboriginal health and wellbeing has been profoundly shaped by the circumstances of the past: particularly by the events and conditions in Australia since colonisation in the late 18th Century. Dispossession, exclusion, discrimination and marginalisation are common experiences in historical accounts of the relationship between Aboriginal peoples and a dominant settler society. The entropic cycle between these experiences and inequalities across the spectrum of health and social conditions over time has served to perpetuate the disadvantage faced by Aboriginal Australians today, and has created a burden extending across generations for many Aboriginal families. The maltreatment of Aboriginal peoples is a central feature of the discourse on the determinants of Aboriginal population wellbeing, and its effects are underscored by a growing body of empirical literature.

With the increased awareness of the Aboriginal circumstance in the Australian public in recent decades, a consequent consensus of opinion has emerged that the levels of disadvantage are unacceptably high.[280] This has been mirrored in the political arena, which has focussed on practical reconciliation since the mid-1990s and devoted considerable policy effort to improving Aboriginal education, employment and housing.[78] The current major policy initiative is the 2009–2013 *National Partnership*

Agreement on Closing the Gap in Indigenous Health Outcomes, which establishes a framework for reducing the inequalities in health outcomes between Aboriginal and non-Aboriginal Australians in a generation.[48] Despite the increased awareness and disapproval of these inequalities in health, and policy efforts to reduce them, the inequalities persist.

If we assume that recent public and political action reflects a genuine interest to improve the plight of Aboriginal peoples, then why have we observed a lack of progress? In terms of the domain of health, it is reasonable to assume that we still do not adequately understand the pivotal causes of Aboriginal ill health and disease. And if there are marked knowledge gaps then we need fresh insights from the research agenda.

Internationally, examining and reporting socioeconomic disparities in health has been a routine part of public health monitoring for many years, and has provided insights into both the relative importance of socioeconomic status (SES) to health and how social disparities in health can be alleviated.[2, 69, 281] A robust international literature has consistently shown that socioeconomic factors influence population health. These factors reflect the way in which society is ordered according to wealth, prestige, power, social standing or one's control over economic resources,[3] and their pattern of association with health has almost always depicted better health for those who are better off.[69, 109] That is, the health of population groups normally follows a gradient pattern.

The exploration of the relationship between SES and health has been given less prominence in Australia, and has tended to be described from estimates of the total Australian population differentiated by various social strata. To date, the quantitative research effort has tended to focus on inequalities between Aboriginal and non-Aboriginal populations with little focus on the within-population differences among Aboriginal peoples. A small body of research in Australia has highlighted that SES accounts for a portion of the gap in health but this does not imply that they account for health differences within Aboriginal population groups.[117, 282] An examination of the socioeconomic pattern of health within Aboriginal populations is likely to offer a greater insight into the relative importance of SES to health disparities in Australia, and may offer insights into the discouraging lack of improvement in Aboriginal circumstances despite concerted efforts to address this.

Accordingly, the work in this thesis assesses the pattern of socioeconomic disparities in the health and development of Aboriginal populations, with a specific focus on children. I have focused on three key objectives: to (1) describe the developmental status of Aboriginal children and the mechanisms that influence this status (Chapter 5); (2) determine the pattern (direction, shape and magnitude) of associations between socioeconomic factors and the physical and mental health outcomes of Aboriginal children (Chapters 6–8); and (3) reveal the significant differences (and similarities) in the socioeconomic pattern of child health between Aboriginal and non-Aboriginal populations (Chapter 9). This final chapter summarises the findings of the research project and presents the implications of these findings for policy and future research.

10.2 Summary of findings

10.2.1 Aboriginal child development: status and mechanisms (Objective 1)

The first set of results in this thesis described the developmental status of Aboriginal children by estimating the population prevalence of key markers of child health and development and their risk factors, using a robust nationally representative survey. Perhaps contrary to popular belief, these data highlighted that most Aboriginal children were reported by carers to be in excellent or very good overall health (79%). However, there were some developmental danger signs for a significant number of children, and these were evident from the earliest stages of life. For example, 11% of Aboriginal children were born at low birthweight and close to a quarter (24%) were born pre-term, with substantial proportions reporting ear and hearing problems (8.5%), eye and sight problems (7.2%), and dental problems (36%) in childhood.

Chapter 3 showed that developmental strengths are influenced by a small set of mechanisms that either prompt, facilitate or constrain their development. The empirical results in Chapter 5 subsequently confirmed that many of the factors that prompt or facilitate child development were either missing in the lives of Aboriginal children or were too limited to produce sustainable benefits and opportunities in life. These factors included: dietary sufficiency and quality, adequate level of carer education, and engagement of carers in informal learning activities. Moreover, the profile of constraints suggests that when skills and abilities are sufficiently acquired their benefits are often likely to be overwhelmed by the influences of the living environment. Some of these constraints are characteristics of individuals or families, and have a direct influence on Aboriginal children. Others are population-wide characteristics that impact on children in indirect ways, and reflect the fact that Aboriginal populations have a diminished capability base relative to other Australians. Importantly, the thesis revealed that stress and discrimination are part of many Aboriginal children's lives, and from an early age: 44% of children aged 0–3 years experienced at least one stressful event in the previous year. It was not uncommon for young children to have experienced serious events such as the death of a close family member or friend, having a bad illness or accident, and being physically hurt by someone.

10.2.2 The socioeconomic pattern of physical and mental health outcomes among Aboriginal children (Objective 2)

The literature review in Chapter 3 made it clear that the relationship between risk factors and Aboriginal child outcomes is still largely uncharted. This observation extends to the widely acknowledged critical determinants of health, such as socioeconomic status. Chapter 6 provided an initial assessment of the socioeconomic pattern of Aboriginal health and development by testing the relationship of a small set of socioeconomic factors with a subjective indicator of the general health status of Aboriginal children in Australia. There was no clear relationship between health and either carer education or area-level disadvantage. This provides incremental evidence that some of the prime policy levers of government—that is, investments that can modify socioeconomic conditions—may not have an appreciable impact on the population health outcomes of Aboriginal children.

In contrast, household income exhibited a moderate positive (and non-linear) association (or effect) with overall health. In other words, the relationship exhibited threshold properties rather than a continuous 'dose' pattern. This association was only slightly attenuated after accounting for factors known to influence health in early life: stress, carer engagement in informal activities with the child, bullying and discrimination.

The results in Chapter 7 provided a deeper examination of the SES-health relationship among Aboriginal children, with a focus on physical health outcomes in Western Australia. The findings highlighted that while there were significant disparities in physical health, their direction, shape and magnitude varied considerably, by both socioeconomic measure and health outcome. For ear infections, recurring chest infections and sensory function problems, the patterns were generally consistent with a positive socioeconomic gradient—where better health was associated with higher SES. The reverse pattern was found for asthma, accidents and injuries, and oral health problems, although this was primarily observed for area-level SES indicators. The socioeconomic characteristics of carers, households and neighbourhoods all had an influence on the physical health of Aboriginal children, with area-level measures of SES having the strongest impact.

The results in this thesis revealed novel insights into the social pathways to mental health problems. They showed that higher SES was associated with a reduced risk of clinically significant emotional or behavioural difficulties (mental health problems) in Aboriginal children. Housing and neighbourhood SES characteristics featured prominently in these analyses, with housing tenure, housing quality and neighbourhood-level disadvantage all having a strong direct effect on child mental health. For example, children living in poorer quality housing (three or more indicators of poor quality) were 3.1 times more likely to be at high risk of clinically significant emotional and behavioural difficulties than those in the top category (no indicators of poor quality), after adjusting for age, sex and geographic isolation. This is consistent with the prevailing pattern in the mainstream literature[255, 256, 274, 283-287] and the small set of studies of Aboriginal child, youth and adult populations in Australia,[46, 95, 279, 288] and the findings provide incremental evidence of a social gradient in the mental health of Aboriginal populations.

The circumstances of families and households with Aboriginal children emerged as an important explanatory mechanism in the relationship between child mental health and both carer employment status and family financial circumstances. This suggests that factors such as parenting quality, stress, family composition, overcrowding, residential mobility, racism and family functioning may have a substantial mediating role in the pathway from material wellbeing to poor mental health.

Importantly though, there was a lack of clear evidence of a relationship between the educational level of the primary carer and child mental health. This was surprising, considering the substantial body of literature that highlights the positive impact of parental education—particularly that of the mother—on child development and wellbeing more generally.[4, 232, 274] Just why this is so is more a matter of speculation. It may reflect Aboriginal peoples' often adverse interactions with mainstream Australia since colonisation and the associated legacies. Western education systems have been heavily implicated in the past policies and practices of forced separation from family and kinship networks.[275] While the removal of children into missions and other institutions may have provided more formal education for some, it had profound detrimental effects on the psychosocial functioning of these "stolen generation" children.[90, 276] These experiences, in conjunction with the pervasive effects of racism and other stresses in modern-day Australia, can limit the ability of Aboriginal parents to promote optimal child development and may overwhelm the protective effects of parental education on child mental wellbeing. Whatever the fundamental basis for the weaker relationship, addressing it is a critical step in onward improvement of health outcomes in Aboriginal children.

In summary, the empirical analyses conducted in Chapters 6–8 have highlighted that there are socioeconomic disparities in the health of Aboriginal children in Australia. The patterns of inequalities are not universal, although they are more consistent for mental than physical health. The largest disparities in child physical health were observed for area-level SES indicators, while housing characteristics and area-level SES both had a strong direct effect on child mental health. The overarching implication is that socioeconomic factors matter to Aboriginal child health, although—and importantly—they are one facet of the unique and complex set of factors that influence Aboriginal child health and wellbeing.

10.2.3 Comparing SES-health patterns in Aboriginal and non-Aboriginal children (Objective 3)

Chapter 9 addressed whether Aboriginal children have a unique socioeconomic pattern of health. I compared the patterns in Aboriginal and non-Aboriginal children in non-remote areas and showed that they differ markedly. Even the basic nature or direction of the associations was inconsistent for five of the seven health indicators that were examined (asthma, ear disease, eye disease, hospital admissions and long-term conditions). Notwithstanding this general diversity of results, there were similarities in the socioeconomic patterning of hayfever and injury. The findings for these two outcomes exhibited a reverse gradient effect, showing that those with higher SES had poorer health than those in lower SES groups.

The magnitude of effect sizes tended to be larger in the Aboriginal population—this was particularly noticeable for hayfever which featured up to four-fold disparities across SES categories. Prima facie, these results run counter to the notion that disparities may be weaker in Aboriginal than non-Aboriginal populations.[8, 9] In addition to these differences in relative risks between groups, there were differences in the absolute risks for some health indicators; most notably, Aboriginal children in non-remote areas had a higher prevalence of asthma and ear disease than their non-Aboriginal counterparts in *all* categories of household income and SEIFA. This suggests that SES explains only part of the difference in the prevalence of these outcomes in non-remote areas. These findings, along with the results of Chapters 6 and 8, also indicate that other factors are having a detrimental impact on health across all social strata.

There were a number of important differences in the patterns of child health *within* the Aboriginal population. The shape of disparities for hayfever and hospitalisations were divergent in remote and non-remote settings, while asthma, eye disease and injury showed consistent reverse associations independent of remoteness. Overall, the magnitude of disparities among Aboriginal children in remote areas tended to be larger than those in non-remote (Aboriginal or non-Aboriginal) populations. The findings revealed some effects of substantial size in remote Aboriginal populations: this included a six-fold disparity in the odds of injury by household income and a three-fold disparity in the odds of asthma by area-level disadvantage (both in the reverse direction).

10.3 Implications

This is one of the few studies internationally to explicitly investigate the socioeconomic patterning of health within an Indigenous population, and the first to examine these patterns among Indigenous children using population-representative data. The findings have important implications for both research and policy in Australia and internationally, and these form the basis of the discussion in this section. Many of the points are broad guiding principles for those with a stake in implementing public policy relating to Aboriginal Australians, and this reflects the broad scope of the study and the exploratory nature of some of the work. I recognise that gaps in the evidence base remain and some of the policy insights presented here will be strengthened by further research and improvements in the available data—accordingly, the points presented here should be read in conjunction with the recommendations for future research, below (Section 10.4).

Before presenting the conclusions and recommendations it is worth noting a few of the overarching reasons why monitoring socioeconomic disparities in health is important for policy. First, it elucidates whether investing in SES is likely to improve population health. More importantly though, the strength and direction of the association may provide important signals about the magnitude of inputs required for change and the time horizon over which they must operate to produce observable progress. And second, they can add a layer to policy formulation by guiding policy makers as to the type of investment that is needed to benefit health. For example, population health disparities that exhibit a threshold effect, i.e. highlighting poor health only for those in poverty, would lend support to targeted interventions that support those in the low end of the SES spectrum. Whereas a linear gradient pattern (see Figure 3.3 for an example) suggests that interventions targeting those at greatest disadvantage need to be considered concurrently with strategies that focus on risks across the whole social spectrum.[155]

With this said, the implications of the findings are as follows:

10.3.1 Addressing SES will have differential effects across the range of health outcomes

The results of Chapters 6–9 have broadly demonstrated that socioeconomic characteristics can have an independent influence on the health of Aboriginal children. This includes conventional notions of social position and class (such as income and employment), alternative measures of material wellbeing (financial strain and housing quality) and an Aboriginal-specific measure of area-level socioeconomic disadvantage. And it extends to SES factors in different domains and at multiple levels, including the characteristics of carers of children, their families and households, and the neighbourhoods and communities in which they live. The overarching implication is that addressing SES has the potential to significantly improve the health status of, and reduce the health inequalities within, Aboriginal populations. However, strategies that attempt to reduce social inequalities in health within Aboriginal populations need to be mindful that social processes will vary depending on the population context and, concomitantly, give consideration to the multiple facets of SES that can influence Aboriginal health.

The empirical findings of this thesis suggest that improving SES will benefit physical health, although different approaches are required depending on the outcome of interest. The population prevalence of ear infections is likely to be sensitive to investments in education and improvements in the living environment. Chest infections may be reduced by strategies that bolster employment and material wellbeing. While increasing tertiary educational attainment may subsequently benefit the sensory functioning of Aboriginal children. The results also highlight that the wellbeing of the neighbourhood and community has a bearing on the prevalence of ear and chest infections.

The study findings for mental health provide reasonably specific guidance for policy. They indicate that improving the social, economic and psychological conditions of

Aboriginal families has a considerable potential to reduce the mental health disparities within Aboriginal populations and, in turn, to close the substantial racial gap in mental health. Interventions that target housing quality, home ownership and neighbourhood-level disadvantage are likely to be particularly beneficial. Further, part of the goal should be to reduce the number of life stresses faced by Aboriginal families, which is likely to have significant payoffs for Aboriginal child wellbeing and development.

Collectively, this body of work confirms that SES is an important aspect of the complex set of factors that influence Aboriginal child health. The findings provide both tacit (in Chapters 3, 7 and 9) and explicit (in Chapters 6 and 8) evidence that the family and community environment and the characteristics of Aboriginal cultures can influence the pathway from SES to child health. This includes involvement in cultural events and ceremonies and participation in cultural activities. Moreover, some of these factors have a detrimental impact on health across all social strata. Inequalities in health between Aboriginal and non-Aboriginal peoples will not be alleviated until there are substantial efforts to address prominent, population-wide problems, such as widespread toxic stress. Reducing stress is, of course, a complex problem that has its origins in the adverse interactions of Aboriginal people with mainstream Australia from colonisation. While the primary causes of psychological stress among Aboriginal people are known, substantial and ongoing policy responses are required for them to be alleviated. Overcrowding and racism are two crucial factors in this regard.[35, 96, 270, 282] Inroads to the former require political will and appropriate funding, and the current *National Partnership Agreement on Remote Indigenous Housing* (NPARIH) is an important step in this direction.[289] Reductions in the latter require a broad spectrum of strategies and a major shift in the attitude of Australians to diverse cultural groups.[209] These issues are discussed in more detail in subsequent sections of this chapter.

10.3.2 The key role of housing and neighbourhoods

The influence of neighbourhood SES and housing on health has been a reasonably consistent feature of this study, despite the overall diversity of results. These aspects of SES and their relevance to policy require some elaboration here, especially given the scale of the problems. For example, in 2008, 25% of Aboriginal people were living in overcrowded conditions,[94] 26% of Aboriginal households had a dwelling with structural problems,[94] and 47% of Aboriginal children were residing in the most disadvantaged areas of Australia (lowest quintile; see Figure 5.4). Notionally then, interventions that prove effective at improving housing circumstances and neighbourhood characteristics are likely to have a substantial impact on the average level of health of the Aboriginal population because they will benefit large numbers of Aboriginal people.

The evidence from this thesis adds to the wide body of literature acknowledging that the features of neighbourhoods can contribute to health inequalities.[264] Here I have shown that living in more advantaged areas or neighbourhoods is protective of child mental health and infections (ear and chest) but poses a risk to asthma, accidents and injuries, sensory function problems and oral health. The findings reinforce that the contexts in which Aboriginal children live are critically important to their health, in both positive and negative ways and signals a paradox of socioeconomic advantage at the area level which needs further inquiry in future research.

The neighbourhood-level variables used in this study (SEIFA and IRISEO) are general measures of SES that use a broad definition of relative socioeconomic disadvantage.[204] Given this, they are likely to be measuring a number of the attributes of both the physical and social environment of an area. Accordingly, it is impossible to identify the specific neighbourhood factor(s) that are most relevant to Aboriginal child health from the empirical results of this study,[264] and therefore the specific policy mechanism that could be most beneficial to alleviating neighbourhood-level inequalities in health. The extant literature suggests that the characteristics of the social environment have the most prominent influence on mental health, e.g. stressors, social norms, social cohesion, and community violence, and this may also be relevant to the finding of substantial neighbourhood-level socioeconomic disparities in mental health in this study.

A potential alternative approach to raising neighbourhood SES is to shift people from areas of relative poverty into higher SES areas. An intervention study in five cities in the US highlighted that this was generally beneficial to the physical and mental health of participants over time,[290, 291] although it appeared to have detrimental effects on male young people in the medium-term.[292] This may have been the result of increased cultural conflict or a sense of being in relative deprivation compared with peers in higher SES areas, and led to maladaptive behaviour.[292] Aside from the possibility of these adverse consequences, an intervention of this type is impractical in many parts of Aboriginal Australia given the strong connection to traditional lands, and the importance of this to cultural continuity, kinship networks and spiritual wellbeing.[39]

The study results indicate that physical (asthma, ear infections, oral health problems) and mental health outcomes were sensitive to an index of housing quality that measured elements of the design, construction and maintenance of the family home. While this composite indicator of housing quality is unable to tease out the separate effects of each of these elements, they can all pose a risk to health.[269] The literature suggests that this is particularly the case in remote and isolated communities, where the housing-related risks to health often include a lack of access to safe and reliable water and power supplies and sewerage infrastructure.[32, 293] The quality of the water supply is central to the support of hygienic practices in the home and therefore to minimising the spread of disease, but is deficient in many Aboriginal communities.[294-296]

There have been myriad initiatives to address the quality of Aboriginal housing infrastructure in Australia, including broad-level policy statements, funding schemes and maintenance programs, among others.[269] Few of these have been formally evaluated and, as such, it is difficult to assess which interventions offer the greatest promise for gains to health.[268] There is, however, a growing recognition that housing programs need to be multifaceted in order to minimise the risks to child health posed by poor housing.[271] Practical home management programs have been relatively effective in this regard, although they have not been delivered widely.[269] These types of programs can improve the hygiene habits of household members for the prevention of disease.[268] A systematic process of monitoring and evaluation will help to inform policy makers as to progress in housing quality and what works to stimulate this progress.[293] These efforts will also provide guidance to the future research agenda. The foundation for positive change is adequate funding, that is guided by stable and reliable management and governance systems for Aboriginal housing programs in Australia.

The thesis has also demonstrated that housing tenure can be important to Aboriginal child health. The positive association with mental health, in particular, is consistent with the acknowledged psychosocial benefits of home ownership. Owning or paying off a home may confer a sense of security or feelings of control over the living environment and choice of neighbourhood for Aboriginal families.[216, 269] These benefits are likely to be reinforced by the health benefits that stem from financial security. The findings also indicate that children in families that own their home outright have a reduced risk of asthma when compared with those paying off their home or renting it.

While there have been incremental improvements in recent decades, the best available national data suggest that the level of Aboriginal home ownership is less than half that of non-Aboriginal Australians.[53] The lower rates among Aboriginal people may be a reflection of preferences: not all Aboriginal people aspire to owning their own home;[297] and community-shared ownership arrangements are a recognised alternative in more remote settings (which would typically be classified as a renting arrangement in statistical collections). Lower rates may also reflect less opportunity: for example, there are legislative barriers to ownership in areas where native title is involved.[53] In addition, the meaning of, and motivation for, home ownership can differ between Aboriginal and non-Aboriginal people and this can plausibly lead to differences in the propensity of these populations to purchase a home. Long-term rental arrangements may be considered as a form of ownership by some Aboriginal families, and eventually lead to a formal purchase as a longer-term social investment for the family.[297] Notwithstanding these issues, there appears to be considerable scope for improving rates of Aboriginal home ownership. Constructing additional houses will create more opportunities for ownership, especially in communities with an acute shortage of housing. The current *National Partnership Agreement on Remote Indigenous Housing* (NPARIH) is likely to be pivotal in this regard—it is designed to address these shortages by delivering up to 4200 new homes in remote Aboriginal communities, in addition to improving the conditions of around 4800 existing homes from 2008–2018.[289] These opportunities need to be supplemented with programs that financially support families with more limited means to build and maintain a home.

If sustainable solutions to Aboriginal housing problems can be achieved then we are likely to see a network of benefits to health and wellbeing. These may include less stressful family environments and better functioning families, fewer mental health problems, improved nutrition, a reduction in the spread of infection and disease, and less accidents and injuries that stem from structural deficiencies.[269]

10.3.3 Implications of weak SES gradients in child health

Flat and weak social gradients in Aboriginal child population health are one of the features of the diverse set of results in this thesis. They particularly apply to conventionally measured education, income and occupation. From an Aboriginal policy perspective, these patterns are problematic because they imply that traditional policy levers will either not produce benefits to Aboriginal population health and/or fail to operate over expected time horizons. This increases the risk of children remaining trapped in poor health.[118]

It is difficult to underestimate the implications of this for Aboriginal Australia. The current policy imperative is one that aims to “close the (developmental) gap” between the mainstream and Aboriginal population within a generation.[47] The varied results, which include evidence of weak associations between traditional indicators of SES and health, suggest that either the policy expectation is overly ambitious or that greater effort will be needed to compensate for the reduced effect size.

The weak gradients for carer education in Chapters 6 and 7 are particularly noteworthy, considering the substantial body of literature that highlights the positive impact of parental education on child development and wellbeing.[4, 232, 274] These results do not imply that parental education is not important to the health and development of Aboriginal children or that improving education, for example, is unwarranted. Instead they are likely to reflect that: (1) Aboriginal populations have a diminished capability base relative to other Australians; and (2) that there are other circumstances in the social and physical environment that disrupt these associations for large segments of the Aboriginal population.[194] These findings underscore what is already known in Aboriginal policy settings: that endeavours to improve health need to be multifaceted and will require considerable extra and more nuanced effort over a sustained period of time. The insights from the human development literature support an approach that:

1. Addresses the urgent and overwhelming developmental chaos that many Aboriginal children face and other, population-wide psychosocial constraints, and
2. Diverts government resources and energies to the longer and slower process of enabling demographic restitution of capability.

The approach requires the explicit engagement of Aboriginal adults to develop strategies to reduce the level of chaos that children are exposed to. It is designed to increase the proportion of Aboriginal children that receive high quality early childhood educational daycare and support into primary school. The goal here is to prolong enrolment, attendance and retention so that substantial proportions of Aboriginal children progress to upper secondary school and complete vocational and tertiary training. This will build greater human capital. It will have the ultimate effect of expanding choices for Aboriginal adults and, concomitantly, improve the wellbeing and life opportunities of Aboriginal populations. The hypothetical effects on health of investments that target psychosocial constraints and build human capabilities are illustrated in Figure 10.1, whereby all sections of society benefit so that the whole curve is shifted upwards. As noted above, the process outlined here is commencing from a very low base and it is unlikely that there is any generational short-cut in the time that it will take to effect true change.

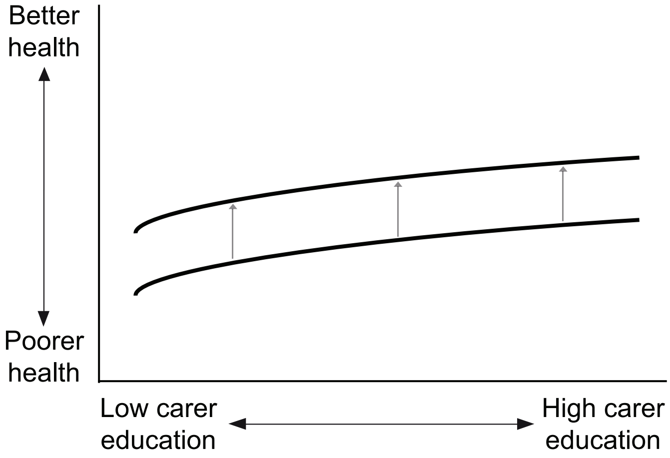


Figure 10.1: The effects on health of investments to alleviate population-wide psychosocial constraints and build human capabilities.

This thesis has primarily focused on health disparities and observed that addressing SES may not always lead to improved health outcomes in Aboriginal populations or a reduction in health disparities in Australia. It is important to note that, despite this, addressing socioeconomic disadvantage and eliminating racial and ethnic disparities in education, income and other measures of poverty remain critically important issues of social justice, human development, equal opportunity and human rights.

10.3.4 Acknowledging heterogeneity in the social pathways to health

The thesis has compared the socioeconomic patterning of Aboriginal child health with that for non-Aboriginal children. Importantly, the findings: (1) lend support to the notion that socioeconomic factors have a differential impact on Aboriginal and non-Aboriginal population health; and (2) challenge the notion that social gradients in Aboriginal health are weaker than those in mainstream society,[8, 9, 116] because disparities that followed a similar pattern tended to be of a larger magnitude in Aboriginal populations.

The primary implication for policy is that a single approach to stimulating socioeconomic conditions will not have equal benefits to child health outcomes in Aboriginal and non-Aboriginal populations. While the empirical evidence in Chapter 9 underscores the validity of the well-worn edict that “one size does not fit all” in Aboriginal health policy,[76] it also reinforces the need to examine health disparities *within and across* Aboriginal and other population groups in order to better inform policy and practice.[155] This is because comparisons of this nature can highlight both the relative and absolute disparities in health in Aboriginal and non-Aboriginal populations—and both perspectives are needed to understand whether stimulating socioeconomic conditions will improve Aboriginal population health *and* reduce the health inequalities that exist between Aboriginal and non-Aboriginal populations.

The magnitude of disparities among Aboriginal children in remote areas tended to be larger than those in non-remote areas. This reinforces the notion that Aboriginal Australia is heterogeneous, and that the socioeconomic patterning of health is likely to vary—and perhaps substantially—across different Aboriginal groups.

10.3.5 Translating research into action

The discussion above describes the policy relevance of the study findings, however there are difficulties in taking the insights from this evidence base and applying them to the development of effective interventions. One of the generic limitations in this field is that studies typically consider the influence of broad constructs of SES on health and not necessarily the practical ways that these SES constructs can be influenced by policy.[298] For example, I have shown that the general health of an Aboriginal child is likely to improve if their level of household income increases (in Chapter 6). However, it is unclear as to which specific interventions are likely to influence household income and, more particularly, what the timing, dose and duration of the intervention needs to be to benefit material wellbeing and subsequent health. Will one-off income transfers that are targeted to disadvantaged families be as effective as an increase in the nation’s minimum wage?

Clearly these are complex problems that economists and policy makers have grappled with for many decades. In an Aboriginal context they are made even more difficult by the entrenched nature of social disadvantage (outlined in Chapter 2). Many Aboriginal families have faced multiple forms of disadvantage for generations (wealth, income, education, neighbourhood, etc.) and arresting that pattern is not an easy exercise. Further, there are examples in the health disparity literature of interventions to improve SES having an effect on health that countered the predicted benefits proposed by the theory and empirical evidence, i.e. where improvements in

SES have actually been harmful to health.[292] While the benefits to health may be realised at a later point in time in this example, the scenario could also be a reflection of some of the prime failings of the evidence-base to support policy development. Only a fraction of studies have rigorously assessed the causal pathways from SES to health, or established the effectiveness of interventions that target SES for the betterment of population health.[298] The risk, therefore, is that decisions are made on the basis of imperfect or misleading information, leading to the implementation of inappropriate policies and interventions.

10.4 Future directions in research

This thesis has made extensive use of a number of the key population-representative surveys of Aboriginal health and development, including data from official collections of Australia's national statistical agency. While these data are the most pertinent for exploring the aim and objectives of this study, they are not able to support an examination of every aspect of the topic. In addition, I have not exhausted all possible avenues of investigation in the available data. Accordingly, this section of the thesis provides recommendations for enhancing the information base that can be used to analyse socioeconomic patterns in Aboriginal child health and potential areas of further enquiry.

10.4.1 An increased focus on SES disparities in Aboriginal health

The thesis has shown that SES exerts an influence on a range of health outcomes and proposes that aspects of physical and mental health are likely to be sensitive to investments in SES. However, the extent to which such investments would translate into significant health benefits in Aboriginal populations depend, in part, on the strength of the SES-health association. The empirical results provide some evidence of the strength (effect size) of SES-health relationships in Aboriginal child health but they do so for a snapshot of health outcomes at select points in time. Quite simply, more empirical research is required so that health patterns can be assessed across a broader spectrum of outcomes and over time, and compared with non-Aboriginal populations. This will require a shift in the way that researchers and governments approach the analysis of Aboriginal health disparities: whereas Aboriginal status is generally used as a covariate to explain differences in population health by SES, greater consideration needs to be given to the moderating effects of Aboriginal status on the SES-health relationship. This will necessitate an examination of health patterns by SES and Aboriginal status jointly and separately.[155]

A more robust empirical evidence base may enable meta-analyses to be conducted on specific health factors in the future, which will support the interpretation of research findings and provide more specific guidance to the application of policy interventions.

Socioeconomic disparities in health should form part of the systematic reporting requirements of governments. Ideally, the health of Aboriginal and non-Aboriginal populations should be compared at every level of SES, in order to shed light on both the absolute and relative disparities in health within and between these populations. Information on both absolute and relative disparities is required to monitor inequalities over time because increases in one can be accompanied by decreases in the other.[299] This knowledge would complement, and significantly add value to, current efforts to monitor the gaps in health between Aboriginal and non-Aboriginal Australians. Regular reporting, however, needs to be supported by data that includes a robust sample of Aboriginal participants and is collected frequently.

10.4.2 Expanding the data options

Currently, there are few data sources that are suitable for analysing health disparities within populations of Aboriginal children. Apart from the data collected by surveillance and administrative systems, there are three main survey sources that have: (1) a sample size with sufficient power to enable robust, representative estimates of the current circumstances of Aboriginal children; (2) information at a unit record level on the socioeconomic status of Aboriginal persons, families, households and/or communities (preferably indicators with at least three categories); *and* (3) information at a unit record level on the health characteristics of Aboriginal children (health status, outcomes, risk factors and/or health care action). These include the *National Aboriginal and Torres Strait Islander Social Survey* (NATSISS), *National Aboriginal and Torres Strait Islander Health Survey* (NATSIHS) and the *Western Australian Aboriginal Child Health Survey* (WAACHS). Two of these sources are collected regularly (NATSISS and NATSIHS), although the six-yearly frequency only permits an analysis of intermittent trends.

Clearly, increasing the frequency of collection of existing cross-sectional data sources is desirable, especially in support of more systematic reporting of socioeconomic disparities in Aboriginal child health. Naturally also, expanding the array of SES variables that are available for children and including objective measures of health (see Section 10.4.3) will enrich the value of these data for the purposes of elucidating health determinants and patterns. Encouragingly, the next iteration of the NATSIHS will—for the first time—include objective biomedical tests of nutritional status and chronic disease markers but only for adult participants aged 18 years and over.[300]

There are other information sources that satisfy some of the essential criteria listed above but all have deficiencies that limit their utility for a study of Aboriginal health disparities. A noteworthy example is the *Footprints in Time Study* (*Longitudinal Study of Indigenous Children*)—which features a longitudinal design but a small, non-representative sample drawn from 11 study sites across five of the seven States and Territories of Australia.[185] Notably though, this study includes a rich source of conventional and alternative SES measures and a wide range of health outcome indicators. As such, while population-representative estimates cannot be generated from this sample, it does not detract from the utility of the *Footprints in Time Study* for examining the causal pathways from SES to child health outcomes.

Developing a population-representative longitudinal survey of Aboriginal children is unrealistic given the already substantial investment by the Australian Government in the *Footprints in Time Study* and *Growing Up in Australia: The Longitudinal Study of Australian Children*. It would also add to the considerable survey burden already placed on Aboriginal peoples by the research community. These constraints provide an imperative for unlocking the power of existing data sources. Linked administrative health data provide an opportunity to monitor socioeconomic patterns in health on a more regular basis than existing national surveys. While these datasets are a rich source of objectively measured health information, there are typically trade-offs in breadth and quality. Two of the primary concerns in using administrative data for a study on this topic are that these datasets generally have a limited array of socioeconomic data items and incomplete and inconsistent information from which to identify Aboriginal people.[301]

Accurately identifying Aboriginal people in administrative health datasets is a particularly vexing problem. There are myriad issues that make it almost impossible to get an accurate and reliable picture of the Aboriginal population in these data sources. The increased propensity to identify as Aboriginal over time and changes in collection methods and protocols represent some of the more prominent reasons for discrepancies within datasets. In addition, it is not always clear whether missing data on Aboriginal status constitutes non-response or a choice of 'non-Aboriginal'. The status of a person can also differ between administrative datasets, reflecting contrasting methods, e.g. self-identification versus the assessment of status by a health service provider/professional, and the choice of Aboriginal people to identify in some settings and not others. These problems have been acknowledged by data custodians and researchers for some time, and can have a substantial impact on the accuracy of estimates of Aboriginal health and therefore the size of the gaps in health between Aboriginal and non-Aboriginal populations.[186, 302-304] Encouragingly, this issue is currently the subject of collaborative efforts to improve the process of collecting, recording and identifying Aboriginal people in linked administrative data sources.[301] This is urgent and important work that will have a direct impact on the usefulness and relevance of administrative sources for assessing the status of Aboriginal health.

Linking administrative sources to existing cross-sectional data is a salient way of overcoming the limitations of administrative data with regards to measuring SES. For example, a survey with information on family income for Aboriginal children could be linked with administrative data on hospital admissions to enable an examination of whether those in poverty were more likely to suffer from a range of diseases. In addition to enhancing the value of administrative data, this is a relatively cost-efficient method of enabling longitudinal analysis of child health outcomes.[305]

10.4.3 Measuring SES and health

SES is a multidimensional construct that encompasses the overlapping concepts of social stratification and social class, and the way that it is measured has been a central feature of this study. While doubts have been raised about the relevance of using conventional SES measures for Aboriginal and other disadvantaged groups,[64, 150] the empirical results of this thesis have shown that they have some influence on the health of Aboriginal children—and this extends to measures of social class and material wellbeing (education and employment status) and contextual SES indicators (area-level disadvantage).

While the thesis confirms that the health of Aboriginal children can differ by conventional measures of SES, the diversity of results implies that these measures alone are inadequate for explaining variations in health outcomes in Aboriginal contexts. More specifically, I found that health was variably associated with alternative (proxy) measures of the material wellbeing of Indigenous families and households (a subjective rating of financial strain and an index of Aboriginal housing quality) and an Aboriginal-specific measure of area-level socioeconomic disadvantage. This is consistent with the theoretical perspective: that there are differences in the social context of Aboriginal and non-Aboriginal populations and therefore there are likely to be alternative ways of conceptualising and measuring SES that are important for Aboriginal populations.[71] For example, social status in more traditional communities may be more a function of knowledge than of material resources, or it may reflect control over resources more than ownership of them.[64] The results of this thesis and the theoretical literature underscore the need to reconceptualise existing notions of SES to gain a better understanding of the complexities of their relationship with Aboriginal health. While some excellent work has already been done in this area—notably by the Centre for Aboriginal Economic Policy Research—it needs a continued focus. Critically, research in this area needs to be fully informed by Aboriginal peoples' views on the concept of health and its determinants.

This study has largely relied on the use of self-reported measures of health. Self-reported measures of morbidity have been criticised in the past as being misleading, particularly among socially disadvantaged people who may underreport or understate poor health outcomes.[142] This can give rise to a flatter health gradient compared with results that rely on objective assessments of health.[143] Future studies in this field will benefit from collecting information on both objective and self-reported health measures and comparing the patterns of their association with SES.

10.4.4 Analytic considerations and strategies

While there is a general need for a greater volume of research in this field, our understanding of the relationship between SES and Aboriginal health will be enhanced by more advanced study designs and the application of new analytic techniques. These types of developments need to facilitate our understanding of the mediating pathways from SES to poor (and good) health and support a more fine-grained analysis of Aboriginal sub-populations. Importantly, the research agenda needs to be guided by the views of Aboriginal people and supplemented with insights from alternative methods. These points form the core of the recommendations for analytic strategies in this area of research and are discussed in more detail, below.

Examining the multiple domains of SES

Any approach to measuring SES needs to reflect that it is a broad construct which encompasses the characteristics of individuals, households, families, neighbourhoods and communities. A deeper understanding of the relationship between SES and health in Aboriginal contexts will require the separate and simultaneous use of SES variables at each of these levels. Part of the analytic strategy of this study has been to conduct analyses within a multi-level framework in order to tease out the compositional and contextual/community effects on health. Broadly speaking, the largest disparities in child physical health were observed for area-level (contextual) SES indicators, which may relate to the greater importance that Aboriginal peoples place on social connections with family and community than to individuals. Area-level SES also featured prominently in the examination of child mental health and, in addition to housing characteristics, had a strong direct effect on this outcome. This has provided valuable insights on the nature of social inequalities in Aboriginal health and is an essential consideration for future work in this field.

Accounting for heterogeneity

The heterogeneity of Aboriginal Australia has been touched upon throughout this thesis. There is a vast diversity of Aboriginal cultures, languages and socio-demographic characteristics and this is likely to account for differences in health outcomes (and most likely their determinants) between Aboriginal communities and across areas of geographic remoteness. While this premise is supported by the empirical results of the thesis, future research will benefit from a finer disaggregation of the Aboriginal population in order to provide a more accurate picture of health patterns among Aboriginal peoples. Clearly this ambition needs to be matched by the capacity of the available data. At present, linked administrative health data is the only population-representative source that can support an analysis of comparisons of health inequalities at a sub-State/Territory level, albeit using a highly restricted set of SES variables.

Mediating pathways

The thesis has primarily been concerned with the total effect of SES on child health but has discussed and examined the role of other factors in the SES-health pathway. In particular, I have shown that the circumstances of families and households with Aboriginal children are an important explanatory mechanism in the pattern of disparities in child mental health. However, there remains a critical need for future research to identify and quantify the pathways from SES to Aboriginal child health. This will entail the consideration of a range of potential mediating factors in the relationships between SES and health. The key factors of interest here are those that characterise Aboriginal circumstances, families and culture in the past and present day, such as the high levels of stress that Aboriginal peoples are typically exposed to in daily life, racism and loss of cultural continuity. These should be explored in conjunction with known determinants of specific child health outcomes and account for the geographic dispersion of the Aboriginal population. In addition, it will be important to gain an appreciation of how these determinants of child health impact on feelings of mastery and control throughout the lifecourse and the subsequent effects on adult health and wellbeing.

Our understanding of the factors that have a mediating role in the pathway from SES to Aboriginal child health can be enhanced by the use of longitudinal data and the application of more advanced analytic techniques to existing cross-sectional data (e.g. mediation models). Longitudinal data can elucidate the temporal sequence between SES and health and the factors that influence each of these. This can provide greater clarity on the direction of causality between health outcomes and their determinants (and whether they flow in both directions),[69] and therefore the mechanisms responsible for creating and maintaining SES disparities in Aboriginal child health. Sources of longitudinal information on Aboriginal children are discussed in Section 10.4.2.

Explaining reverse associations

The study has highlighted a number of curious, reverse associations for accidents, injuries, asthma, oral health problems, hayfever and allergic rhinitis. Given that this is the first time these patterns have been examined and the understanding that disparities in the reverse direction can be an artefact of measurement error and methodological constraints, a more detailed investigation of SES disparities for these outcomes is required.

Replicating these findings with the use of objective health measures would strengthen the observation that higher SES children are at greater risk of these outcomes. Moreover, future research should include a closer examination of the mediating pathways to poor outcomes, with a specific focus on the potential risk exposures that are associated with higher SES.

It is plausible that the pathways linking higher SES to poorer health in an Aboriginal context will entail both psychosocial and materialist explanations. Psychosocial explanations may include the effects of acculturative stress, which can be faced by Aboriginal people who are striving to maintain their cultural heritage, negotiate a relationship with the dominant culture and deal with ongoing discrimination.[306] These are the stresses associated with living in ‘two worlds’ that have incompatible values and beliefs,[307] which may be a stronger feature of the lives of Aboriginal people from higher SES groups.[35, 307] Generic materialist explanations are also likely to be relevant to the experience of Aboriginal children. For instance, children living in families with greater material resources may be at greater risk of accidents and injuries as a result of involvement in a wider range of recreational activities and greater access to recreational facilities. Furthermore, the reverse pathways may include a combination of psychosocial and materialist explanations. For example, higher SES parents may experience substantial life stress that prompts alcohol and illicit drugs abuse—but still have greater means for purchasing alcohol and illicit drugs—which can subsequently affect their ability to care for children.

Assessing the population impact of factors that produce inequalities

The thesis has shown that a range of SES and other factors was associated with Aboriginal child health. The results are primarily described using the relative odds (or risk) of poor health for each risk factor in conjunction with its underlying population prevalence. These two elements have not, however, been combined into a single metric for the purposes of defining the overall population level impact of each risk factor. This is a limitation of the analytic framework of this thesis and a pertinent future direction. Measures of Population Attributable Risk (PAR) take into account the level of exposure to a risk factor in the population and estimate the reduction in a health outcome that would occur in a population if that risk was removed.[308] As such, PARs are estimates of the proportion of disease or ill health that might be prevented if a risk exposure could be eliminated. In this way, they help target the most important population risk factors to health and health inequalities, and are useful in designing appropriate public health preventive measures.[309]

Insights from Aboriginal peoples

This section of the thesis has primarily been concerned with enhancing the development of a more robust empirical evidence base. While the developments in quantitative research in this field are important, this needs to be supplemented with qualitative surveys and ethnographic studies as they are likely to provide insights and lead to conclusions that are outside the reach of statistical analytic techniques, particularly in ethnic contexts.[127, 310] Given the relatively small size of Aboriginal populations and the difficulties in creating reliable statistical information at finer levels of geographic disaggregation, the application of alternative methods at regional and community levels will make a unique contribution to the knowledge base in this field. As such, the application of alternative methods is a crucial future direction.

Importantly, any future survey developments or studies that have a focus on Aboriginal peoples or issues need to be guided by Aboriginal people. Research needs to draw on experienced members of Aboriginal communities and relevant Indigenous organisations. This engagement needs to occur from the earliest stages of the study design and ensure that the interpretation of any findings incorporate an Aboriginal worldview.[183]

10.5 Summary and contribution

Despite abundant evidence that SES is a critical determinant of health, there is a paucity of research examining the relationship between SES and health among Aboriginal peoples of Australia. This study begins to bridge this knowledge gap by assessing the socioeconomic pattern of health among Aboriginal children. It is the first study of its kind and makes a number of important and original contributions to the literature on social disparities in Aboriginal health in Australia and the broader field of social determinants of health.

The thesis reveals that there are socioeconomic disparities—although not invariably—in the health of Aboriginal children, and confirms that this is a more consistent phenomenon in mental than physical health. Housing characteristics and neighbourhood SES featured prominently in this study, although the results have shown that both conventional and alternative notions of SES can influence Aboriginal health. The overarching proposition from these findings is that, while socioeconomic factors matter to both the physical and mental health of Aboriginal children, policy makers need to give careful consideration to social context when targeting SES to lever change in population health.

The diversity of findings implies that SES factors are one facet of the unique and complex set of determinants of Aboriginal child health and wellbeing. This is reinforced by the common observation that there were higher absolute risks of poor health between Aboriginal and non-Aboriginal children of the same status. So, while SES factors can improve aspects of child health, they will not overcome the appalling scale of the gaps in health between Aboriginal and non-Aboriginal children that exist in modern-day Australian society. This is because there are significant population-wide constraints that are specific to Aboriginal children and their families: racism, stress and the cumulative, inter-generational and pervasive legacies of colonisation are crucial factors in this regard. These constraints limit the health benefit that can accrue from improved SES and other mechanisms. This underscores what is already known in Aboriginal policy settings: that endeavours to improve health need to be multifaceted and will require considerable extra effort over a sustained period of time.

The findings of the thesis also support the view that socioeconomic factors have a differential impact on Aboriginal and non-Aboriginal population health, and challenge the notion that social gradients in Aboriginal health are weaker than those in mainstream society. This underscores the validity of the well-worn edict that “one size does not fit all” in Indigenous health policy. The implication of this for policy is that a single approach to stimulating socioeconomic conditions will not have equal benefits to child health outcomes in Aboriginal and non-Aboriginal populations.

In summary, I saw this study as an opportunity to examine health inequalities in Australia from a different perspective, with a view to providing insights into the most salient drivers of Aboriginal ill health. I believe that the findings have broadened the scope of this field of research with the recognition of social factors that play a critical role in Aboriginal health but fall outside the traditional domains of social determinants of health. It is hoped that the findings of this thesis generate an improved research agenda and are a catalyst for governments to systematically monitor socioeconomic disparities in health. This will lead to more effective government decision-making in terms of targeting social determinants of health that are of particular significance for Aboriginal populations and, ultimately, increase the pace of change toward health equity in Australia.

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APPENDIX A: ADDITIONAL TABLES

Table A.1: Relative odds of a mental health problem[a], by carer occupation[b] and factors related to the child's physical health, the physical and mental health of the carer, and the circumstances of the family and household[c].

Socioeconomic and other measures	Odds ratio: Model 1[d]	Adjusted odds ratio: Model 2[d]	Adjusted odds ratio: Model 3[d]	Adjusted odds ratio: Model 4[d]
Occupation[b]				
Managers/professionals	1.10	1.08	1.07	0.96
Tradespersons, clerical workers and labourers	1.00	1.00	1.00	1.00
Not employed	1.94***	1.91***	1.64**	1.17
Age				
4	1.11	1.23	1.21	1.26
5	1.00	1.00	1.00	1.00
6	1.42	1.62	1.58	1.49
7	1.34	1.80*	1.73	1.73
8	1.26	1.55	1.48	1.41
9	1.24	1.57	1.54	1.35
10	1.09	1.45	1.41	1.37
11	0.60	0.78	0.76	0.73
12	1.33	1.81*	1.68	1.38
13	1.18	1.58	1.52	1.49
14	1.07	1.54	1.34	1.25
15	0.38**	0.54	0.49	0.42*
16	0.53	0.80	0.69	0.65
17	0.43	0.61	0.49	0.41*
Sex				
Males	1.00	1.00	1.00	1.00
Females	0.49***	0.53***	0.52***	0.52***
Level of relative isolation				
None (Perth metropolitan area)	1.00	1.00	1.00	1.00
Low	0.70	0.70	0.68	0.74
Moderate	0.99	1.00	0.95	0.82
High	0.67	0.69	0.75	0.91

Extreme	0.21***	0.22***	0.22***	0.26***
Whether child had runny ears[e]				
No		1.00	1.00	1.00
Yes		1.91***	1.86***	1.63***
Whether child had normal vision in both eyes				
No		1.93***	1.86**	1.73**
Yes		1.00	1.00	1.00
Whether child had difficulty saying certain sounds				
No		0.28***	0.29***	0.32***
Yes		1.00	1.00	1.00
Whether the primary carer had used Mental Health Services[f]				
No			1.00	1.00
Yes			1.95***	1.58**
Don't know			1.00	1.08
Whether primary carer had a medical condition for 6 months or longer				
No			1.00	1.00
Yes			2.08***	2.02***
Quality of parenting[g]				
Very good				0.27***
Good				0.37***
Fair				0.49***
Poor				1.00
Family composition				
Two parent family				1.00
Sole parent				1.82***
Two parent step/blended				1.02
Other (e.g. Aunts/uncles)				2.43***
Overcrowding[h]				
Household occupancy level – Low				1.00

Household occupancy level – High				0.47***
Number of homes the child had lived in				
1-4 homes				0.69**
5 or more homes				1.00
Family functioning[i]				
Poor				1.81**
Fair				1.00
Good				1.32
Very good				0.78
Life stress events[j]				
0–2				0.57*
3–4				1.00
5–6				0.98
7–14				2.88***
Whether bothered by racism in the neighbourhood/community				
No				1.00
Yes				1.68***

Notes: *p < 0.1; **p < 0.05; ***p < 0.01; *p*-values are calculated using chi-square tests adjusted for the complex sample design.

[a] High risk of clinically significant emotional or behavioural difficulties (CSEBD).

[b] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. 'Managers and professionals' include occupational skill levels 1 & 2. 'Tradespersons, clerical workers and labourers' include occupational skill levels 3-5.

[c] Results are derived from multivariate logistic regression models using a multilevel framework.

[d] All models include age, sex, Level of Relative Isolation (LORI) and carer occupation. Model 2 also includes child physical health factors (whether child had runny ears, whether child had normal vision in both eyes, whether child had difficulty saying certain sounds). Model 3 further adds factors related to the physical and mental health of the carer (whether primary carer had a medical condition for six months or longer, whether the primary carer had used Mental Health Services). Model 4 further adds factors related to the circumstances of the family and household (quality of parenting, life stress events, family composition, overcrowding, number of homes the child had lived in, whether bothered by racism in the neighbourhood/community, and family functioning). Successive steps were conducted if the socioeconomic variable achieved marginal statistical significance (p < 0.1).

[e] A discharge from the ear as a result of an eardrum rupture (usually from otitis media, or infection of the middle ear).

[f] Contact with Mental Health Services in Western Australia.

[g] An index of quality of parenting derived from responses to three items: how often carers praise their children, how often they hit or smack their children and how often they laugh together with their children. These items were rated by carers on a five-point frequency scale from ‘Never’ through to ‘Almost always’. An overall score was produced by summing these three items. Scores were ranked and categorising into quartiles, and labelled ‘poor’, ‘fair’, ‘good’ and ‘very good’.

[h] Households with a high occupancy level are those where the number of people who usually sleep at the dwelling exceeds the number of bedrooms in the dwelling by four.

[i] A nine-item scale was used to measure the extent to which families have established an environment of cooperation, emotional support and good communication. Ratings from scores provided by carers were summed to produce an overall score that was categorised into quartiles, and labelled ‘poor’, ‘fair’, ‘good’ and ‘very good’.

[j] Primary carers were asked if any of fourteen major life stress events had occurred in the family in the preceding 12 months. These events included events such as illness, hospitalisation or death of a close family member, family break-up, arrests, job loss and financial difficulties.

Table A.2: Relative odds of a mental health problem[a], by family financial strain and factors related to the child's physical health, the physical and mental health of the carer, and the circumstances of the family and household[b]

Socioeconomic and other measures	Odds ratio: Model 1[c]	Adjusted odds ratio: Model 2[c]	Adjusted odds ratio: Model 3[c]	Adjusted odds ratio: Model 4[c]
Family financial strain				
Can save a lot	1.00	1.00	1.00	1.00
Can save a bit	1.75*	1.86**	1.95**	1.56
Some left over but spend it	1.61	1.72*	1.80*	1.25
Just enough to get by	1.79**	1.89**	1.90**	1.23
Spending more than we get	2.70***	2.72***	2.54***	1.34
Age				
4	1.27	1.34	1.31	1.36
5	1.00	1.00	1.00	1.00
6	1.40*	1.55**	1.51**	1.46*
7	1.24	1.51**	1.46*	1.45
8	1.25	1.43*	1.38	1.34
9	1.27	1.49**	1.46*	1.25
10	1.12	1.36*	1.34	1.31
11	0.80	0.96	0.93	0.87
12	1.25	1.53**	1.48*	1.31
13	1.26	1.53*	1.49*	1.48
14	1.11	1.40	1.28	1.19
15	0.56**	0.71	0.66	0.57**
16	0.72	0.93	0.84	0.78
17	0.61*	0.79	0.71	0.58*
Sex				
Males	1.00	1.00	1.00	1.00
Females	0.65***	0.67***	0.66***	0.63***
Level of relative isolation				
None (Perth metropolitan area)	1.00	1.00	1.00	1.00
Low	0.85	0.83	0.80	0.84

Moderate	0.97	0.98	0.95	0.86
High	0.88	0.87	0.90	1.02
Extreme	0.40***	0.40***	0.39***	0.39***
Whether child had runny ears[d]				
No		1.00	1.00	1.00
Yes		1.61***	1.58***	1.43***
Whether child had normal vision in both eyes				
No		1.63***	1.58***	1.47**
Yes		1.00	1.00	1.00
Whether child had difficulty saying certain sounds				
No		0.42***	0.43***	0.45***
Yes		1.00	1.00	1.00
Whether the primary carer had used Mental Health Services[e]				
No			1.00	1.00
Yes			1.58***	1.36**
Don’t know			1.05	1.11
Whether primary carer had a medical condition for 6 months or longer				
No			1.00	1.00
Yes			1.59***	1.62***
Quality of parenting[f]				
Very good				0.45***
Good				0.51***
Fair				0.65***
Poor				1.00
Family composition				
Two parent family				1.00
Sole parent				1.62***
Two parent step/blended				1.05
Other (e.g. Aunts/uncles)				1.99***

Overcrowding[g]				
Household occupancy level – Low				1.00
Household occupancy level – High				0.64***
Number of homes the child had lived in				
1-4 homes				0.78**
5 or more homes				1.00
Family functioning[h]				
Poor				1.38*
Fair				1.00
Good				1.11
Very good				0.82*
Life stress events[i]				
0–2				0.71*
3–4				1.00
5–6				1.10
7–14				2.13***
Whether bothered by racism in the neighbourhood/community				
No				1.00
Yes				1.41***

Notes: *p < 0.1; **p < 0.05; ***p < 0.01; *p*-values are calculated using chi-square tests adjusted for the complex sample design.

[a] High risk of clinically significant emotional or behavioural difficulties (CSEBD).

[b] Results are derived from multivariate logistic regression models using a multilevel framework.

[c] All models include age, sex, Level of Relative Isolation (LORI) and family financial strain. Model 2 also includes child physical health factors (whether child had runny ears, whether child had normal vision in both eyes, whether child had difficulty saying certain sounds). Model 3 further adds factors related to the physical and mental health of the carer (whether primary carer had a medical condition for 6 months or longer, whether the primary carer had used Mental Health Services). Model 4 further adds factors related to the circumstances of the family and household (quality of parenting, life stress events, family composition, overcrowding, number of homes the child had lived in, whether bothered by racism in the neighbourhood/community, and family functioning). Successive steps were conducted if the socioeconomic variable achieved marginal statistical significance (p < 0.1).

[d] A discharge from the ear as a result of an eardrum rupture (usually from otitis media, or infection of the middle ear).

[e] Contact with Mental Health Services in Western Australia.

[f] An index of quality of parenting derived from responses to three items: how often carers praise their children, how often they hit or smack their children and how often they laugh together with their children. These items were rated by carers on a five-point frequency scale from ‘Never’ through to ‘Almost always’. An overall score was produced by summing these three items. Scores were ranked and categorising into quartiles, and labelled ‘poor’, ‘fair’, ‘good’ and ‘very good’.

[g] Households with a high occupancy level are those where the number of people who usually sleep at the dwelling exceeds the number of bedrooms in the dwelling by four.

[h] A nine-item scale was used to measure the extent to which families have established an environment of cooperation, emotional support and good communication. Ratings from scores provided by carers were summed to produce an overall score that was categorised into quartiles, and labelled ‘poor’, ‘fair’, ‘good’ and ‘very good’.

[i] Primary carers were asked if any of fourteen major life stress events had occurred in the family in the preceding 12 months. These events included events such as illness, hospitalisation or death of a close family member, family break-up, arrests, job loss and financial difficulties.

Table A.3: Relative odds of a mental health problem[a], by housing tenure and factors related to the child's physical health, the physical and mental health of the carer, and the circumstances of the family and household[b]

Socioeconomic and other measures	Odds ratio: Model 1[c]	Adjusted odds ratio: Model 2[c]	Adjusted odds ratio: Model 3[c]	Adjusted odds ratio: Model 4[c]
Housing tenure				
Owned or being paid off	1.00	1.00	1.00	1.00
Renting	1.93***	1.90***	1.83***	1.54***
Other	2.60***	2.55***	2.48***	1.78*
Age				
4	1.23	1.30	1.28	1.31
5	1.00	1.00	1.00	1.00
6	1.37	1.53**	1.49**	1.42
7	1.22	1.50*	1.46*	1.45
8	1.24	1.44*	1.39	1.34
9	1.24	1.45*	1.43*	1.23
10	1.09	1.32	1.30	1.28
11	0.80	0.96	0.93	0.86
12	1.26	1.55**	1.49*	1.31
13	1.26	1.53*	1.49*	1.45
14	1.10	1.41	1.29	1.19
15	0.58**	0.74	0.69	0.59*
16	0.75	0.96	0.87	0.79
17	0.63	0.82	0.74	0.59*
Sex				
Males	1.00	1.00	1.00	1.00
Females	0.65***	0.67***	0.66***	0.64***
Level of relative isolation				
None (Perth metropolitan area)	1.00	1.00	1.00	1.00
Low	0.80	0.79*	0.77*	0.81
Moderate	0.91	0.94	0.91	0.86
High	0.70	0.71	0.74	0.90

Extreme	0.29***	0.29***	0.29***	0.34***
Whether child had runny ears[d]				
No		1.00	1.00	1.00
Yes		1.57***	1.55***	1.41***
Whether child had normal vision in both eyes				
No		1.66***	1.60***	1.50**
Yes		1.00	1.00	1.00
Whether child had difficulty saying certain sounds				
No		0.42***	0.43***	0.45***
Yes		1.00	1.00	1.00
Whether the primary carer had used Mental Health Services[e]				
No			1.00	1.00
Yes			1.54***	1.32**
Don’t know			1.12	1.15
Whether primary carer had a medical condition for 6 months or longer				
No			1.00	1.00
Yes			1.61***	1.63***
Quality of parenting[f]				
Very good				0.44***
Good				0.52***
Fair				0.65***
Poor				1.00
Family composition				
Two parent family				1.00
Sole parent				1.53***
Two parent step/blended				1.06
Other (e.g. Aunts/uncles)				1.92***
Overcrowding[g]				
Household occupancy level – Low				1.00

Household occupancy level – High				0.63***
Number of homes the child had lived in				
1-4 homes				0.80**
5 or more homes				1.00
Family functioning[h]				
Poor				1.38*
Fair				1.00
Good				1.14
Very good				0.83
Life stress events[i]				
0–2				0.72*
3–4				1.00
5–6				1.04
7–14				2.04***
Whether bothered by racism in the neighbourhood/community				
No				1.00
Yes				1.40***

Notes: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$; *p*-values are calculated using chi-square tests adjusted for the complex sample design.

[a] High risk of clinically significant emotional or behavioural difficulties (CSEBD).

[b] Results are derived from multivariate logistic regression models using a multilevel framework.

[c] All models include age, sex, Level of Relative Isolation (LORI) and housing tenure. Model 2 also includes child physical health factors (whether child had runny ears, whether child had normal vision in both eyes, whether child had difficulty saying certain sounds). Model 3 further adds factors related to the physical and mental health of the carer (whether primary carer had a medical condition for 6 months or longer, whether the primary carer had used Mental Health Services). Model 4 further adds factors related to the circumstances of the family and household (quality of parenting, life stress events, family composition, overcrowding, number of homes the child had lived in, whether bothered by racism in the neighbourhood/community, and family functioning). Successive steps were conducted if the socioeconomic variable achieved marginal statistical significance ($p < 0.1$).

[d] A discharge from the ear as a result of an eardrum rupture (usually from otitis media, or infection of the middle ear).

[e] Contact with Mental Health Services in Western Australia.

[f] An index of quality of parenting derived from responses to three items: how often carers praise their children, how often they hit or smack their children and how often they laugh together with their children. These items were rated by carers on a five-point frequency scale from ‘Never’ through to ‘Almost always’. An overall score was produced by summing these three items. Scores were ranked and categorising into quartiles, and labelled ‘poor’, ‘fair’, ‘good’ and ‘very good’.

[g] Households with a high occupancy level are those where the number of people who usually sleep at the dwelling exceeds the number of bedrooms in the dwelling by four.

[h] A nine-item scale was used to measure the extent to which families have established an environment of cooperation, emotional support and good communication. Ratings from scores provided by carers were summed to produce an overall score that was categorised into quartiles, and labelled ‘poor’, ‘fair’, ‘good’ and ‘very good’.

[i] Primary carers were asked if any of fourteen major life stress events had occurred in the family in the preceding 12 months. These events included events such as illness, hospitalisation or death of a close family member, family break-up, arrests, job loss and financial difficulties.

APPENDIX B: COPIES OF PUBLISHED ARTICLES

Copies of published articles are included in the following order:

1. Shepherd CCJ, Li J, Zubrick SR. Social Gradients in the Health of Indigenous Australians. Am. J. Public Health. 2012; 102(1):107-117.
2. Shepherd CCJ, Zubrick SR. What shapes the development of Indigenous children? In: Hunter B, Biddle N, editors. Survey Analysis for Indigenous Policy in Australia: Social Science Perspectives, CAEPR Research Monograph No. 32. Canberra: ANU E-Press; 2012.
3. Shepherd CCJ, Li J, Zubrick SR. Socioeconomic disparities in physical health among Aboriginal and Torres Strait Islander children in Western Australia. Ethn. Health. 2012; 17(5):439-461.
4. Shepherd CCJ, Li J, Mitrou F, Zubrick SR. Socioeconomic disparities in the mental health of Indigenous children in Western Australia. BMC Public Health. 2012; 12:756.

Social Gradients in the Health of Indigenous Australians

Carrington C.J. Shepherd, BEc, Jianghong Li, PhD, MSc, and Stephen R. Zubrick, PhD, MSc, MA

The pattern of association between socioeconomic factors and health outcomes has primarily depicted better health for those who are higher in the social hierarchy. Although this is a ubiquitous finding in the health literature, little is known about the interplay between these factors among indigenous populations. We begin to bridge this knowledge gap by assessing evidence on social gradients in indigenous health in Australia. We reveal a less universal and less consistent socioeconomic status patterning in health among Indigenous Australians, and discuss the plausibility of unique historical circumstances and social and cultural characteristics in explaining these patterns. A more robust evidence base in this field is fundamental to processes that aim to reduce the pervasive disparities between indigenous and nonindigenous population health. (*Am J Public Health.* 2012;102:107–117. doi:10.2105/AJPH.2011.300354)

It is an almost universal truth that indigenous peoples of the world have poorer health than their nonindigenous counterparts.[1,2] Although a lack of high-quality data limits an accurate assessment of the health disparities between indigenous and nonindigenous populations in many countries,[3] the disparities in Australia, for example, are well documented and striking.[4,5] Life expectancy for Australian Aboriginal peoples is between 11 and 14 years lower than that for non-Aboriginal people,[6] a signal that indigenous health problems in Australia are pervasive and potentially worse than those of indigenous populations in other developed countries.[7–10]

A recent study highlights that socioeconomic variables (such as weekly cash income, source of cash income, and completed years of schooling) explain between one third and one half of the gap in self-assessed health status between Australian Aboriginal and non-Aboriginal people.[11] Although socioeconomic factors assume some significance in explaining these health disparities, they do not necessarily account for health differences within indigenous population groups.

The relationship between social factors and health has been discussed and acknowledged for centuries.[12] There is now a robust international literature that supports the notion that health inequities are the result of factors and processes that fall outside of the conventional domains of health. They are heavily influenced by the structures of society and the social conditions in which people grow, live, work, and age—or what are now popularly known as the social determinants of health.[13]

The pattern of association between social class (or status) and health is typically characterized by poorer health for those at lower levels of the social hierarchy[14,15]—that is, health outcomes follow a social gradient. Importantly, social gradients reflect more than differences between the high and low ends of the distribution—at any point along this continuum, people will tend to have poorer health than those above them. This observation is not limited to a subset of measures, but extends to most measurable socioeconomic constructs (such as poverty, employment, occupational status, education, housing, and income)[13] and across a range of health outcomes (including most aspects of physical and mental health).[14,16]

Despite the ubiquity of these observations, providing an explanation for the social gradient has proven to be a challenge.[17] Researchers continue to shed light on the pathways to disease and poor health and how these can differ between population groups. In particular, there is growing understanding of how psychosocial factors and the social environment (in addition to poor material conditions and health-related behaviors) can affect physical and mental health and resultant longevity.[13,18]

Krieger outlines 3 causal frameworks that underpin the relationship between social inequalities and health outcomes each with a different emphasis on social and biological factors.[19] Psychosocial theories focus primarily on factors in the social environment that influence susceptibility to disease and illness; they point to stress as the link between lower perceived social standing and behaviors and choices that pose risks to health.[20] Theories of the social production of disease place greater emphasis on economic and political determinants in which the most important influences on health tend to be more distal factors that shape material well-being and principally have an indirect effect on health outcomes. Ecosocial theories and frameworks attempt to integrate theories of the social production of disease with biological explanations of disease by considering the dynamic interrelationship among social, biological, and ecological attributes and their joint and cumulative impact on health.[19] Although social gradients are clearly implicated in these theories and frameworks, no single theory accounts for the graded relationship between socioeconomic status (SES) and health.[21]

SOCIAL GRADIENT IN INDIGENOUS HEALTH AND WHY IT IS IMPORTANT

Amid the theoretical frameworks and emerging evidence, there is uncertainty whether the social gradients observed in the general population hold true for indigenous populations.[22–25] Indigenous status is typically used as a covariate to explain differences in population health by SES, and scant attention has been paid to the potential moderating effect of indigenous status on the SES–health relationship. Moreover, there are inherent difficulties in comparing indigenous outcomes across SES levels. Key among these is the overrepresentation of indigenous peoples in the lower levels of all constructs of SES, which reduces statistical power for comparing outcomes across SES levels and potentially obscures the nature of the SES–health relationship.

Nevertheless, there is a theoretical basis for expecting that the association of traditional SES indicators with health will be different in an indigenous context. First, exclusion and discrimination, which are implicated in the production of relatively flat gradients among African American populations in the United States,[26] are often entrenched in the lives of indigenous peoples[3] and may limit the health benefits that normally accrue from improved SES. Second, profound marginalization, which many indigenous cultures have faced over generations, can constrain human development, placing children at a disadvantage from the earliest stages of life and limiting the acquisition of skills that can be drawn upon for the benefits of health at every level of SES. Third, there may be social factors other than SES that exert a greater influence on indigenous health, including the well-being of the community and kinship network, cultural continuity, and connection to traditional lands that enables indigenous people to maintain spirituality central to the indigenous notion of health.[2,27,28]

Knowledge of possible differences in the relationship between SES and health in indigenous populations has clear ramifications for both research and policy. For research, this knowledge will help broaden the scope of the field of social gradients in health with the recognition of social factors that may play a critical role in indigenous health but fall outside the traditional domains of social determinants of health. For policy, this knowledge can lead to more effective government decisionmaking. In Australia, for example, both federal and state governments have committed to closing the gap in key health and social indicators between mainstream and Aboriginal populations within a generation.[29] Although a worthy aspiration, this commitment is in part predicated on the assumption that the relationship between policies governing education, employment, and income transfers on the one hand, and health outcomes on the other, operate similarly in the Aboriginal and non-Aboriginal populations. If, in reality, there is a weak association between education and health among Aboriginal populations, then government investment in education, although generally beneficial, is unlikely to result in a significant improvement in Aboriginal population health or a substantial reduction in health disparities between Aboriginal and non-Aboriginal peoples. The implications in this scenario are that marginalized Aboriginal populations are likely to get trapped in poor health and that the policy expectation is unachievable unless efforts are devoted to addressing other, more salient, drivers of ill health.[30]

DEFINITION OF INDIGENOUS STATUS

In the context of this review, it is important to recognize that there is no globally accepted definition of what constitutes an “indigenous” population. Nor is there agreement on whether a definition is even needed. The current view of the United Nations is that “a single definition will inevitably be either over- or under-inclusive, making sense in some societies but not in others.”[31(p6–7)] Self-identification is therefore seen as a more relevant means of determining the indigenous status of an individual.[32,33] However, despite the ongoing debate, there is general agreement on the core aspects of the concept of “indigenous.” Most agree that indigenous communities and peoples are those that

1. demonstrate historical continuity (and have occupied land) before colonization or invasion,
2. consider themselves distinct from the societies that now prevail on ancestral land,
3. have a distinct culture and language,
4. tend to form nondominant parts of society and have a unique geographic dispersion, and
5. preserve and maintain their ancestral land and culture.[3,33,34]

This description applies to hundreds of separate cultures, incorporating approximately 370 million people across 90 countries.[31]

We sought to assess the evidence for the direction and strength of social gradients in indigenous health and to comment on their potential implications for onward research and policy. We focused on Australian Aboriginal and Torres Strait Islander populations, which provide the most robust evidence base for the examination of this topic.

SEARCH STRATEGY AND SELECTION CRITERIA

We used a variety of information sources, including major citation databases and relevant Web sites (data providers, academic institutions, and reference sources). Searches were limited to articles published no later than April 2010 and were conducted with no language restrictions.

ISI Web of Science and OVID platform databases (MEDLINE, EMBASE, Global Health, and PsycINFO) were the prime sources of academic literature. Generic keywords for the target population group included “Indigenous,” “Aboriginal,” “Aborigines,” and “Torres Strait Islander.” Population keywords were linked with a combination of subject matter terms, such as “gradient,” “social gradient,” “health inequality,” “socioeconomic,” “socio-economic,” “determinant,” “social status,” “social class,” and “health.”

We accessed the substantial body of gray literature on indigenous health issues via the Indigenous Australian Health*InfoNet*, a range of index databases on Informit and other relevant Web sites. Consultation with experienced indigenous health researchers netted a number of other relevant published reports and unpublished work.

We included studies in the review if they (1) featured an examination of the relationship between at least 1 socioeconomic factor (preferably with at least 3 categories) and a health outcome, health risk factor, or health care action (i.e., seeking or accessing health care); (2) included some quantitative assessment of this relationship; and (3) described this relationship within an Indigenous Australian population group.

We focused on the nature of the association between health and SES and considered the direction of the association, the statistical significance of the original study findings, and, to a lesser degree, effect size. We present results as reported in the original study. The wide range of health and socioeconomic variables used in eligible studies precluded use of formal meta-analytic techniques. Instead, we provide a narrative synthesis of review findings, supplemented with an aggregate overview of effect estimates.

REVIEW FINDINGS

The electronic search of ISI Web of Science and OVID platform databases identified 774 articles. After screening titles and abstracts, we identified 61 articles as potentially relevant; 9 satisfied the criteria for inclusion in this review, 3 of which duplicated the findings of another study. We included another 9 articles after an electronic search of sources of indigenous research and gray literature. One article was sourced from the library of the author (S.R.Z.).[35] After we removed duplicates,[36–38] a total of 16 studies, reports, and books satisfied the criteria for inclusion in this review. Data on each study's design, sample, measurement of SES and health, and results are summarized in Table 1.

Population Groups and Study Designs

Most studies had at least 1 methodological limitation relating either to study design, scope, sample size, or analytic techniques. The majority of the study samples consisted of more than 1000 indigenous people (14 studies, or 88%) and, typically, were representative of populations of Aboriginal and Torres Strait Islander peoples at a national (10 studies) or state or territory (3 studies) level.

Seven studies examined outcomes for all adult age groups and 5 focused on children. Four studies examined outcomes for all age groups. Differences in target populations may be a source of heterogeneous results, as the literature suggests that the strength and shape of social gradients differ by age group.[15]

All studies used a data source with an observational design and most (13 studies) were cross-sectional, with 2 cohort studies (both retrospective) and 1 ecological study. The ecological study in this review was limited to assessing the associations between SES and health at an aggregate geographic level. Many of the cross-sectional data sources used in review studies have considerable breadth, and although their designs are unable to discount reverse causation, they enable adjustment for covariates in the analysis of SES–health relationships. Five cross-sectional studies adjusted for the effects of demographic (e.g., age and gender) and other known covariates (e.g., health service access and health history),[35,40,41,43,45] whereas 2 adjusted for demographic variables only.[44,48] Only 1 of the 2 cohort studies accounted for covariates.[53] In the context of this review, it is important to note that overall only 2 studies assessed the impact of cultural factors in mediating the relationship between SES and health.[35,41] Hypothetically, multivariate analyses of variables that measure intrinsic characteristics of an indigenous culture can help to determine whether an observed social gradient is attributable to that culture or explained by more generic forces. By contrast, 9 studies (56%) exclusively examined bivariate relationships between SES and health variables using simple cross-tabulation or correlation techniques; studies from the gray literature were more likely to solely use these techniques (70%) than those sourced from the academic literature (33%).

Health Outcomes

Because a number of studies reported multiple outcomes, the 16 in-scope studies provided findings on 60 separate associations between SES and health. Most of these associations (42, or 70%) examined a health outcome, with 13 (22%) focused on a health risk factor and 5 (8%) on a health care action measure. Health outcomes were predominantly an aspect of physical health (40 associations) as opposed to mental health (2 associations).

Many (62%) of the health outcome measures were derived from self-reports that included measures of general health, disability and long-term illness, respiratory problems, gastrointestinal infections, arthritis, diabetes, kidney disease, cancer, back pain, hearing and sight limitations, mental health, and problems with heart and circulatory system. Many of the health measures were simple indicators of the presence or absence of a disease or an event and did not include any information on severity, duration, or age of onset or occurrence.

Socioeconomic Status Measures

The studies identified by this review used a wide range of SES indicators, including those that measure the SES characteristics of individuals (7 studies), families and households (7 studies), and neighborhoods and communities (6 studies). Few studies examined multiple SES indicators simultaneously, and only 1 used a multilevel framework to adequately measure the effects of SES at various levels.[35] We noted that most (n=10) in-scope studies used only indirect markers of material well-being (e.g., education and labor force status) and 2 focused solely on absolute measures (e.g., income and home ownership); 4 studies made use of both types of measures.

Evidence of Social Gradients in Indigenous Health

The majority of studies (10 of 16) reported a positive gradient in some aspect of health—that is, better health was associated with higher SES. Two studies highlighted a U-shaped relationship between education and health. Three studies found no relationship between health and SES, and 2 reported inconclusive evidence (e.g., a trend that was not statistically significant).

There were 33 separate associations that exhibited a statistically significant positive gradient. Most of the associations with general health (62%), health risk factors (62%), and indicators of mortality and morbidity (53%) displayed a positive gradient. Only 2 of the 5 effect estimates for health care actions (40%) were in a positive direction (Figure 1).

The majority of estimates based on multivariate regression models exhibited a positive gradient (61%)—that is, a positive effect remained after control for at least 1 additional variable; adjusting for additional variables generally diluted the strength of the association between SES and health—or "flattened" the social gradient. By comparison, 51% of bivariate associations displayed a positive gradient. Objectively measured health variables more commonly revealed a positive relationship with SES (69%) than self-reported measures (52%).

There is evidence to suggest that social gradients in indigenous health exist at all 3 levels of SES: individuals, families or households, and neighborhoods or communities (Figure 2). When no association was found between SES and health, the SES indicator was more often an indirect marker of material well-being than an absolute measure.

SUMMARY OF ORIGINAL STUDY FINDINGS

In this section, we provide a narrative synthesis of review findings, using original study results.

TABLE 1—Summary of Results From Studies Examining the Relationship Between Health and Socioeconomic Status in Australian Aboriginal Populations

References	Study Type	Year(s) of Study	Indigenous Sample Size[a]	Scope (Age, Years)	Outcome Variables	SES Variables	Pattern of Association Between SES and Health[b]
Cass et al.[39]	Ecological	1993–1998	36 areas	All ages	End-stage renal disease (registry notifications)	Area-based measures (unemployment; household income; overcrowding)	Positive gradient[c]
Cunningham et al.[40]	Cross-sectional	2003–2005	777	15–64	Diabetes (oral glucose tolerance test)	Housing tenure; household income; employment; education	Positive gradient; inconclusive with 1 SES measure[d]
Cunningham et al.[41]	Cross-sectional (secondary analysis)	1994	8782 (nationally representative)	≥15	General health (self-rated)	Labor force status; home ownership; education; household income	Positive gradient; inconclusive with 1 SES measure[d]
Glover et al.[42]	Retrospective cohort	1997–1999	4378 (total population data in 4 states/territories)	All deaths	Mortality (registrations)	Area-based measure (relative disadvantage)	Positive gradient[c]
Gray and Boughton[43]	Cross-sectional (secondary analysis)	1994	15 700 (nationally representative)	0–14	Health care actions (self-report)	Parental education	U-shaped
Gray et al.[44]	Cross-sectional (secondary analysis)	1995	1536 (nationally representative–nonurban areas)	All ages	General health (self-rated)	Household income	Inconclusive
Oddy et al.[45]	Cross-sectional (secondary analysis)	2000–2002	5289 (representative of WA)	0–17	Chest, ear, and gastrointestinal infections and hospitalizations (self-report and administrative data)	Area-based measure (relative disadvantage)	Mixed findings (chest and gastrointestinal infections); inconclusive (ear infections)[d]
Australian Bureau of Statistics[46]	Cross-sectional	2002	9400 (nationally representative)	≥15	General health; disability; smoking; alcohol consumption (self-report)	Education; labor force status	Positive gradient (general health, disability, smoking); reverse gradient (alcohol consumption)[c]; some U-shaped associations with education
Australian Bureau of Statistics[47]	Cross-sectional	2004–2005	10 439 (nationally representative)	≥15	General health; long-term conditions; health care actions; obesity; smoking, alcohol consumption (self-report)	Labor force status	Positive gradient (general health, some health care actions, smoking, and a range of long-term conditions); reverse gradient (alcohol consumption); no association (asthma, cancer, obesity, some health care actions)[c]; inconclusive (back problems, ear or hearing problems)

Continued

TABLE 1—*Continued*

Thomas et al.[48]	Cross-sectional (secondary analysis)	2002	9400 (nationally representative)	≥15	Smoking (self-report)	Household income, education, labor force status, financial stress, housing tenure	Positive gradient[d]
Hetzel et al.[49]	Various sources (secondary analysis)	1997–2001	Various[e]	Various[f]	Life expectancy (derived measure using death registrations); smoking in pregnancy (self-report)	Area-based measure (relative disadvantage)	Positive gradient (life expectancy); inconclusive (smoking in pregnancy)[c]
Jamieson et al.[50]	Cross-sectional (secondary analysis)	2002–2003	4414 (representative of NT)	4–13	Oral health (examination)	Area-based measure (relative disadvantage)	Positive gradient[c]
Hunter[51]	Cross-sectional (secondary analysis)	1994	3433 households (nationally representative)	≥15	Long-term health problems (self-report)	Household income	No association
Hunter[52]	Cross-sectional (secondary analysis)	1994	3433 households (nationally representative)	≥15	Long-term health problems (self-report)	Labor force status	Inconclusive
Titmuss et al.[53]	Retrospective cohort	2002	1706	All births	Birth weight (measured)	Area-based measure (relative disadvantage)	Inconclusive
Zubrick et al.[35]	Cross-sectional	2000–2002	5289 (representative of WA)	0–17	Mental health (validated measure)	Parental education; financial strain	Inconclusive

Note. NT = Northern Territory of Australia; SES = socioeconomic status; WA = state of Western Australia.

[a] Numbers refer to persons unless otherwise stated.

[b] A positive gradient is defined as better health for those with higher SES (i.e., a positive association); a reverse gradient is defined as better health for those with lower SES (negative association); inconclusive is defined as a trend or effect that was not statistically significant or a study with too many methodological limitations to support definitive conclusions.

[c] Defined as studies that established a positive association between SES and health in simple bivariate or cross-tabulation analyses, without controlling for other factors or confounders.

[d] Defined as studies that accounted for at least some other confounding (usually demographic) variables in establishing a positive association between SES and health.

[e] Study estimates are generally based on data from government administrative sources and are representative of relevant populations in the state of South Australia.

[f] Life expectancy estimates are based on mortality records for all ages; data for smoking during pregnancy is generally limited to women aged 15 years and older.

General Health

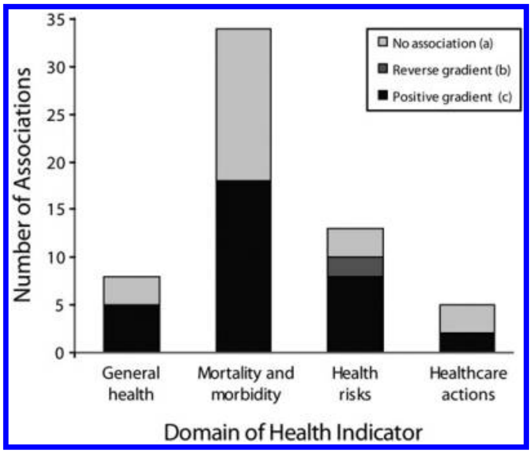
Four studies examined general health status, with all using a self-rated measure.[41,44,46,47] Three studies found a positive relationship with SES for adults, which included measures of education, labor force status, and home ownership.[41,46,47] The evidence for household income was weaker. Gray et al. showed that indigenous persons in high-income families generally had slightly better health after adjusting for age, although the differences were not statistically significant.[44] The results of Cunningham et al. also highlighted a positive gradient with household income, although this association was attenuated after adjustment for demographic, socioeconomic, and cultural factors.[41] In summary, although self-rated general health is consistently associated with education, labor force status, and home ownership, the evidence for household income is inconclusive.

Mortality

Two studies examined indicators of mortality, with both finding a positive association with area-based measures of SES.[42,49] One study examined administrative mortality data across 4 states and territories of Australia; it found that Aboriginal people living in the most disadvantaged areas had higher death rates than Aboriginal people living in the least disadvantaged areas: 1.52 times higher ($P < .001$) for males and 1.61 times higher ($P < .001$) for females.[42] The other study focused on life expectancy and reported a positive association (although not a continuous gradient) in bivariate analyses.[49]

Physical Morbidities and Birth Weight

Three studies used nationally representative samples to examine disability and long-term health conditions in adults, with mixed results.[46,47,52] There was no association with self-reported household income in a study by Hunter.[52] One study found a positive gradient with labor force status[46]; another suggested that labor force status was largely unrelated to the presence of disability or a long-term condition, although these findings are suggestive of variation by gender and geographic location.[52] One study reported a generally positive gradient by education, although those with a nonschool qualification had an elevated likelihood of this

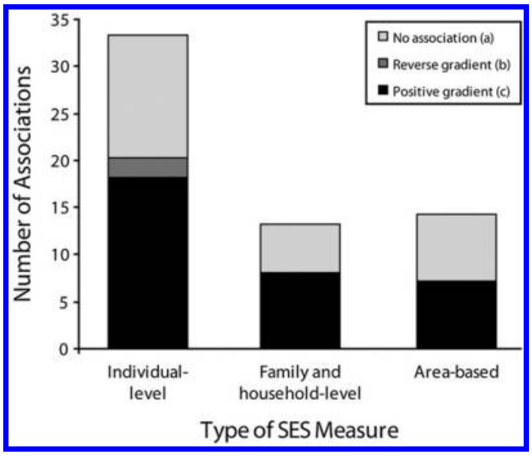


Note. SES = socioeconomic status. No association (a) indicates no relationship was found between SES and health, the trend was not statistically significant, or there were too many methodological limitations to support definitive conclusions; reverse gradient (b) indicates better health was associated with lower SES; and positive gradient (c) indicates better health was associated with higher SES.

FIGURE 1—Nature of the associations between SES and health in Australian Aboriginal populations, by domain of health indicator.

outcome relative to those who had only completed their secondary schooling.[46]

Two studies examined kidney disease, with both finding a positive association.[39,47] Registry notifications of end-stage renal disease were strongly correlated with household income ($r=0.71$, $P<.001$), overcrowding ($r=0.84$, $P<.001$), and a composite index of relative disadvantage ($r=0.88$, $P<.001$) in an ecological study.[39] A national cross-sectional survey highlighted that the self-reported prevalence of this relatively uncommon outcome was higher among those not engaged in the labor force (4.1%; 95% confidence interval [CI]=3.0%, 5.2%) than among employed adults (1.7%; 95% CI=1.1%, 2.3%).[47]



Note. SES = socioeconomic status. No association (a) indicates no relationship was found between SES and health, the trend was not statistically significant, or there were too many methodological limitations to support definitive conclusions; reverse gradient (b) indicates better health was associated with lower SES; and positive gradient (c) indicates better health was associated with higher SES.

FIGURE 2—Nature of the associations between SES and health in Australian Aboriginal populations, by type of SES measure.

The 2 studies on ear and hearing problems were inconclusive.[45,47] One study found the prevalence of self-reported ear and hearing problems to be similar across labor force status categories in a simple cross-tabulation.[47] The other study showed that both the occurrence of recurring ear infections (parent reported) and hospital admissions for ear infections (objectively reported) had a weak positive association with area-based SES in multivariate analyses, although the effects were statistically insignificant.[45]

The 2 studies that examined diabetes showed consistent evidence of a positive gradient.[40,47] Cunningham et al. demonstrated strong associations between an objective test of diabetes and self-reported measures of housing tenure, household income, employment status, and an area-based index of disadvantage among urban indigenous people in the city of Darwin, and a weaker, statistically insignificant, positive association with education.[40] The broader, national study of the self-reported prevalence of diabetes highlighted a positive gradient with labor force status.[47]

Two studies examined respiratory infections and conditions with mixed results.[45,47] A large study of indigenous children in the state of Western Australia showed a positive, but not continuous, gradient between area-based SES and the prevalence of both parent-reported recurring chest infections and objectively reported hospital admissions for nonwheezing lower respiratory infections; no association was found with hospital admissions for either upper respiratory infections or wheezing lower respiratory infections.[45] The other study reported no association between asthma and labor force status in a nationally representative sample of indigenous adults.[47]

One study examined oral health and highlighted a positive gradient among indigenous children in the Northern Territory of Australia.[50] The study analyzed the number of decayed, missing, and filled teeth in the deciduous and permanent dentition of children aged 4 to 13 years on the basis of dental examinations, with consistent patterns in the bivariate relationship with area-based SES.[50]

The single study on gastrointestinal infections was inconclusive.[45] Although it showed a positive association with an area-based index of disadvantage, the pattern was neither continuous nor statistically significant.[45]

The single study on birth weight was inconclusive.[53] This study used data collected at a large urban hospital and lacked sufficient power to compare values across the full spectrum of SES. Although it reported a lower mean birth weight for babies in families living in the most disadvantaged areas (for lowest quintile, mean=3101 g; 95% CI=2868 g, 3333 g) compared with all others (mean=3413 g; 95% CI=3254 g, 3572 g), the finding was not statistically significant.[53]

The evidence for other physical morbidities was sourced from a single study.[47] This national study focused on the labor force status of indigenous adults and reported a positive gradient for self-reported arthritis, eye and sight problems, and heart and circulatory problems; inconclusive evidence for back pain and problems; and no association with the relatively rare outcome of cancer.[47]

Mental Health

The single study on mental health was inconclusive.[35] There was no association between parental education and a child being at high risk of clinically significant emotional and behavioral difficulties. There was a positive gradient for family financial strain that was mostly explained by demographic factors, the physical and mental health status of the primary caregiver, and exposure to people experiencing problems with alcohol.[35]

Health Risk Factors

Four studies assessed the relationship between SES and smoking,[46–49] 3 of which showed a consistent positive gradient with self-reported smoking status.[46–48] Two of these studies applied different analytic techniques to the same nationally representative data source and revealed that unemployed persons and those with less education were the most likely be smokers.[46,48] One study showed a general trend for higher rates of smoking during pregnancy among those living in more disadvantaged areas, although the statistical significance of the effect was not reported.[49]

Both of the studies that examined alcohol consumption found the lowest prevalence of risky alcohol consumption among adults who were not engaged in the labor force, suggesting a reverse association between this behavior and SES.[46,47] One study calculated body mass index based on self-reported height and weight and found that the prevalence of overweight or obesity was unrelated to labor force status in a simple cross-tabulation.[47]

Health Care Actions

Two studies examined health care actions with mixed results.[43,47] One study found a U-shaped relationship between (1) any of 8 health care actions taken for children and (2) the education of the mother after controlling for demographic factors, health status indicators, and objective measures of health service access. In this study, health care actions were highest among indigenous children whose mothers had less than 14 years (odds ratio [OR]=1.55; $P<.05$; reference category=14 years) and 17 or more years (OR=1.40, $P<.05$) of formal education.[43] The other study assessed 4 separate actions among indigenous adults in bivariate analyses and found that persons in the labor force were more likely than others to have been admitted to a hospital and to have visited a general practitioner or specialist; there was no association between visiting a casualty–outpatient service or a dentist and this measure of SES.[47]

The Impact of Cultural Factors

Only 2 studies assessed the joint impact of cultural factors and SES on health,[35,41] and they reported contrasting results. Cunningham et al. broadly showed that cultural factors affected the general health of indigenous peoples in Australia above and beyond the effects of SES. Identifying with a clan, tribe, or language group appeared to be protective of health for men, whereas recognizing an area of land as traditional country or a homeland (among men only) and being taken away from the family as a child (among women only) were associated with worse health.[41] Zubrick et al. highlighted that the mental health of indigenous children in the state of Western Australia was not independently associated with either SES, the language spoken by the primary caregiver, or children's participation in cultural activities.[35]

EVALUATION

Our review of the empirical evidence on the relationship between SES and health in Australian Aboriginal populations leads to 3 primary conclusions. First, there is a dearth of research to date that has specifically focused on this topic and, on the basis of the limited research and varied findings across available studies, we are unable to make strong assertions about the nature and strength of the SES–health relationship. The mixed findings partly reflect the wide array of health and SES measures and a diversity of indigenous population groups and analytic techniques within a small number of eligible studies. Second, there is, however, consistent evidence supporting a positive social gradient in mortality, kidney disease, diabetes, and smoking status. This effect was also shown in single studies on arthritis, eye and sight problems, oral health, and heart and circulatory problems. Although general health status tended to exhibit a positive social gradient, the effects were not always statistically significant. Third, there are a number of methodological issues that make it difficult to interpret the study results and assess differences between them. There is also the potential that weak gradient effects merely reflect low variability in the distributions of SES and health measures in indigenous populations. Overall, the review findings call for continued efforts to improve the quantity and quality of research to provide more insights into the gradient effect (or absence of it) among indigenous population groups. The discussion that follows provides more detail on the limitations of review studies, the implications of the findings for policy, and directions for future research.

Our understanding of whether and to what extent the social gradient in health exists in Aboriginal Australia is primarily hampered by a scarcity of research. Although there is a need to improve the quantity of data that can be used by researchers to adequately examine this topic, existing data sets have been underused and should be investigated in more detail.

Study Limitations and Measurement Challenges

Low variability in the distribution of SES and health is a pertinent limitation. Indigenous peoples are vastly overrepresented in the lower levels of all constructs of SES used in review studies. For example, Oddy et al. reported that almost two thirds of indigenous children in Western Australia lived in the lowest quartile of disadvantaged areas.[45] Notwithstanding this, some measures of household income and poverty may have underestimated the extent of indigenous marginalization by not properly accounting for the size and structure of indigenous families and households or the nature of sharing of economic resources between extended family members.[54] The skew in the distribution of SES measures in indigenous populations can reduce statistical power for comparing outcomes across SES levels, particularly if conventional groupings are used (e.g., quintiles), and potentially obscure the nature of the SES–health relationship. Although this skewing is generally applicable to our review, a number of the studies we reviewed were based on population-level data with sufficient power to potentially detect an effect across the full spectrum of SES categories, despite an uneven distribution.

A deeper understanding of the SES–health relationship can be attained by the simultaneous use of SES variables at individual, household, family, and community levels.[16,55,56] The importance that indigenous peoples place on social connections with family and community, relative to the needs of individuals, suggests that a multilevel analysis that includes SES indicators at a contextual or community level may shed some light on the nature of social gradients in indigenous health.

Our findings highlighted that there was often no definitive evidence of an association with self-reported, or subjective, measures of health. Self-reported measures of morbidity have been criticized in the past as being misleading, particularly among socially disadvantaged people who may underreport or understate poor health outcomes.[57] This can give rise to a flatter health gradient compared with results that rely on objective assessments of health.[58] Future studies in this field will benefit from collecting information on both objective and self-reported health measures and comparing the patterns of their association with SES.

There are potentially many pathways through which SES influences health. Most of the studies examined in this review (and research more generally into indigenous–nonindigenous health inequalities) have not examined the range of psychosocial and environmental factors that define these pathways, or the factors that characterize indigenous cultures.[39] The results of the 2 review studies that incorporated cultural factors in their analytic framework suggest that they can influence, although not invariably, the relationship between SES and health. Strategies for testing social gradient effects need to consider the conceptual basis on which mediating variables are included in multivariate analyses. Researchers should report the effect of SES on health with and without mediating factors, so that the total, direct, and indirect effects of SES on a health outcome can be estimated.[58]

Health and Social Determinants in Indigenous Contexts

In addition to the range of methodological limitations in review studies, there are substantive social, cultural, and historical factors that may contribute to the mixed findings. Aboriginal Australia is not a homogenous group; as Bell states, "Aboriginal Australia is a network of interconnected Aboriginal nations, with their own languages and ways of life."[59(p4)] Health determinants may therefore differ by region or along cultural lines,[2] and these differences may predict variation in health outcomes within each group. Health determinants also differ between Aboriginal and non-Aboriginal populations of Australia,[25,60] which in part reflects 2 very different concepts of health. Australian Aboriginal peoples, like indigenous populations in many other countries, have a holistic view of health that goes beyond individual physical and mental well-being to include aspects of spirituality, connection to land, and the social, emotional, and cultural well-being of the community.[61–63] Australian Aboriginal peoples tend to ascribe their relatively poor health to broader, macrosocial factors.[64] Issues of dispossession and exclusion are key among these, and they extend to traditional land, kinship, language, and culture.[65,66] Racism is a common thread to indigenous people's history of being excluded from many aspects of social, political, and economic life in Australian society and is being cited more commonly in the literature as having adverse consequences for health.[67] Human rights contraventions are enmeshed in the postcolonial experiences of Australian Aboriginal peoples. Evidence suggests that there is a vicious cycle between human rights and health, particularly for marginalized and minority populations.[68,69] The health of Australian Aboriginals therefore may have been affected over time—directly by human rights abuses or indirectly by the systematic inequalities that they give rise to. Many of the issues discussed here—dispossession, exclusion, discrimination, marginalization, and inequality—are implicated in the unique stress profile of indigenous populations in Australia. It has been shown that chronic stress is a feature of the lives of Aboriginal people from all social classes,[70] and this may dampen the benefits that higher SES normally generates for health.

The validity of using standard SES measures in indigenous contexts has been questioned and is also central to the analysis of social inequalities in indigenous health.[71,72] Income, education, and employment can be decidedly different constructs among indigenous peoples (as are notions of health), and this reflects the different social contexts of indigenous and nonindigenous populations.[73] Social status in more traditional communities may be more a function of knowledge than of material resources, or it may reflect control over resources more than ownership of them.[72] This underscores the need to reconceptualize existing notions of SES to gain a better understanding of the complexities of their relationship with indigenous health.[60] Critically, this rethink needs to be fully informed by indigenous peoples' views on the concept of health and its determinants. These views may be varied but will most likely represent a complete paradigm shift from existing SES constructs.[71]

The health determinants of Australian Aboriginal peoples need to be considered in light of their unique population distribution. Although most Aboriginal people live in urban settings, they are also far more likely than are non-Aboriginal Australians to live in remote and isolated areas. Many of the factors that affect population health are unevenly distributed across areas of geographic remoteness. For example, there tend to be fewer health care services in more remote areas and a more limited range of job choices. Location is therefore likely to be an important factor that accounts for variations in health within the indigenous population.

Limitations to This Review

There are a number of limitations to this review. A focus on the published literature may have introduced publication bias that could potentially overstate the evidence supporting an association between SES and health. Our results point to a higher proportion of statistically significant associations in the academic literature (68%) than in the gray literature (47%). We did not compare social gradients between indigenous and nonindigenous populations, and this restricts the policy recommendations that can be drawn from specific review study findings.

In addition, this review focused only on studies of Indigenous Australian health, and the results may not be generalizable to indigenous populations in other countries. There is certainly evidence of positive health gradients among a number of other indigenous cultures, including Native Americans and Alaska Natives,[74–78] New Zealand Maori,[79–85] Canadian First Nations and Metis,[86–91] Inuit,[92–96] South American indigenous groups (Andean culture and Amazon Basin tribes,[97] Mapuche,[98] and Tsimane'[99]), Taiwanese Aboriginals,[100] and Indian Adivasis.[101] There is also, as we have found in Australia, variation in the available evidence among these indigenous populations; the US literature, for example, also features inconclusive evidence for measures of birth weight,[102] mental health,[103] general health status,[77,103] health risk behaviors,[76,104] and health care actions.[105]

Conclusions

Despite abundant evidence that SES is a critical determinant of health, there is a paucity of research that examines the relationship between SES and health among indigenous peoples. This review begins to bridge this knowledge gap by assessing evidence from the limited existing research on social gradients in indigenous health in Australia. The review reveals that, in contrast to the ubiquitous, strong associations between SES and health in the general population, there is a less universal and less consistent SES patterning in Indigenous Australian health. Notwithstanding some measurement issues in the existing studies, which may in part explain the varied findings, we believe the unique historical circumstances, social and cultural characteristics, and profound and persistent marginalization of indigenous populations in Australia are plausible explanations for a much less consistent social gradient in indigenous health. There is a critical need for future research to take into consideration these unique circumstances of indigenous populations in conceptualizing and operationalizing health and its social determinants. Future research will also need to identify and measure a range of plausible mediating factors that may help explain the social gradient or its absence. These factors include the high levels of stress that indigenous peoples are typically exposed to in daily life, loss of cultural continuity, racism, and geographic dispersion.

There is considerable potential for research on this topic to inform the development of policy and interventions that will improve the health status of indigenous peoples. Despite the mixed available evidence, our findings suggest that SES exerts an influence on a range of health outcomes and risk-taking behaviors, including mortality, kidney disease, diabetes, and smoking status. The implication here is that these aspects of health are likely to be sensitive to investments in SES. However, the extent to which such investments would translate into significant health benefits in indigenous populations will depend on the strength of the SES–health association. More rigorous research is required to assess the strength (effect size) of SES–health relationships in indigenous contexts, particularly in comparison with nonindigenous populations.

Further research is needed to provide greater insights into the gradient effect (or its absence) among indigenous population groups, with comparisons between indigenous and nonindigenous populations and between countries and regions within countries. In addition, more advanced designs (including longitudinal studies) and analytic techniques (including multilevel modeling) and alternative methods (qualitative and ethnographic studies) will enhance our understanding of the relationship between SES and indigenous health. A more robust evidence base may enable meta-analyses to be conducted on specific health factors in the future that will support the interpretation of research findings and provide more specific guidance to the application of policy interventions. ■

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Contributors

C.C.J. Shepherd conducted the review and synthesis and led the writing of the article. J. Li and S.R. Zubrick conceptualized the study and participated in writing the article.

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6. What shapes the development of Indigenous children?

Carrington Shepherd and Stephen R. Zubrick

Descriptions of the Australian Indigenous circumstance have been dramatically enriched through improvements in, and delivery of, high quality quantitative survey findings over the past 20 years. Since 1901 – when Indigenous Australians were effectively excluded from even being counted in the populations of the States of the Commonwealth (Briscoe 2003) – Australia has made significant improvements in its capacity to detail the demographic and developmental status of its Indigenous peoples. Amid this progress though, it still remains the case that good quality descriptions of the developmental circumstances of Indigenous children, as distinct from Indigenous adults, are surprisingly few and far between. The 2008 National Aboriginal and Torres Strait Islander Social Survey (NATSISS) provides an opportunity to specifically describe the health and development of Indigenous children using an important and high quality data source.

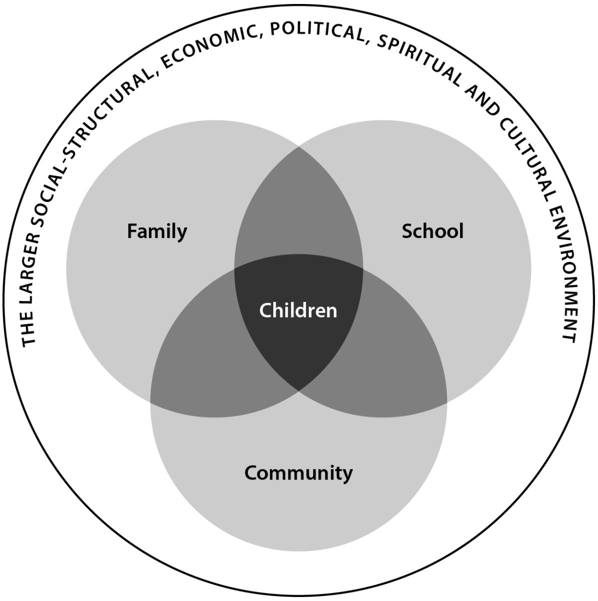
To make sense of the findings about the health and development of Australian Indigenous children, it is important to place their development in the context of the healthy development of *all* children. This is not to discount the vital and obvious importance of Indigenous culture. Rather, by starting with some principles of healthy development that apply universally to all children, some of the underpinnings of the current Australian Indigenous circumstance and its apparent intractability are brought into perspective. We believe this opening perspective offers opportunities for better policies, services and practices to improve the life prospects of Australian Indigenous people.

Early development in the course of human development

Healthy development in early life is important for all children. The empirical literature now provides abundant evidence confirming that a child's developmental pathway shapes the subsequent course of their life. Child development is influenced not just by what occurs in infancy and beyond, but by processes that take place in-utero and prior to conception. Exposures in the earliest stages of life – such as the effects of maternal drug use, for example – can affect early brain development and play a critical role in shaping health prospects into adulthood (Keating and Hertzman 1999).

The evidence-base supporting healthy child development has been built-up over the course of decades, from research fields as diverse as neurobiology, psychology and social sciences, and confirms that children and their development have many spheres of influence – as depicted in Fig. 6.1. A child's immediate family and the household environment have the most direct impact on their development, although extended family networks, schools, formal services, neighbourhood characteristics and elements of the broader social, economic and political society, can all impact on a family's ability to provide the necessary support to a child's development (Bronfenbrenner 1979; Jessor 1993).

Fig. 6.1 Children within contexts of influence



Source: Jessor 1993

The experiences of children at home and in daycare from birth to age of entry into kindergarten play a substantial role in their development, particularly in early cognitive and language development and in emotional and behavioural regulation. Young children who are well nurtured do better in school and develop the skills needed to take their place as productive and responsible adults (Zubrick et al. 2006).

Understanding the relationships between the factors that influence child development and their timing is important if communities and governments are to take appropriate action to ensure a fair start for all children. Nurturing children in their early years is vital for attacking the worst effects of disadvantage. Governments around the world are now seeking better ways to re-invest in their human service infrastructure to better meet the needs of children in order to bring about population-level improvements in health and human capability. The emerging consensus is that the greatest gains in overcoming disadvantage are likely to be achieved through universal preventions which give all children a better start in life. This is the preferred policy approach to reducing poverty being advocated by international agencies such as UNICEF and the World Bank and has been termed 'human development though early child development' (Young 2002).

Human development is broadly about expanding human capabilities, so that individuals can participate economically, socially and civically and choose lives that they value. Childhood is centrally located in models of human development, as it represents a critical period where skills are acquired and accumulated for benefit throughout the lifecourse. In the progression from childhood onwards there is a general consensus of evidence that human capability is optimised when individuals:

- are able to regulate their emotions
- are able to engage in exploratory behaviour
- are able to communicate effectively
- are self-directed
- have intellectual flexibility
- possess some degree of introspection, and
- possess self-efficacy in meeting life's challenges.

How these seven 'strengths' develop in childhood are critical in enabling onward capability – in essence, those that start at a low 'threshold' are likely to lose opportunities for further development at later stages in life (Zubrick 2010).

Quite importantly, the evidence in the child development literature supports a relatively *small* set of mechanisms that change developmental strengths. These mechanisms work in one of three ways – they either prompt, facilitate or constrain the development and maintenance of strengths. While these mechanisms will be elaborated on later in the paper, it should be noted that they operate similarly among Indigenous and non-Indigenous children, albeit in vastly different population contexts. They also operate across the lifecourse. Fig. 6.2 offers a lifecourse perspective on child development in the context of a selection of global and national events from 1945 to present, and highlights the variation in a hypothetical outcome of interest from birth to late life. The outcome could take many forms including specific health conditions, general health status, mental health, and any of the developmental strengths cited above. The variation in the outcome of interest can be thought of as the variation in the lifecourse of an individual life or as a time series of the population estimate over the relevant period. The occurrence of parental divorce, the onset of smoking and alcohol abuse, the sudden closure of an industry and unemployment are included as examples of exposures of interest. All of these exposures (and the outcome) can be influenced by broader, macrosocial factors – these include global and national events that occur over time, such as the introduction of free higher education in the 1970s or the emergence of the World Wide Web in the 1990s (Zubrick et al. 2009).

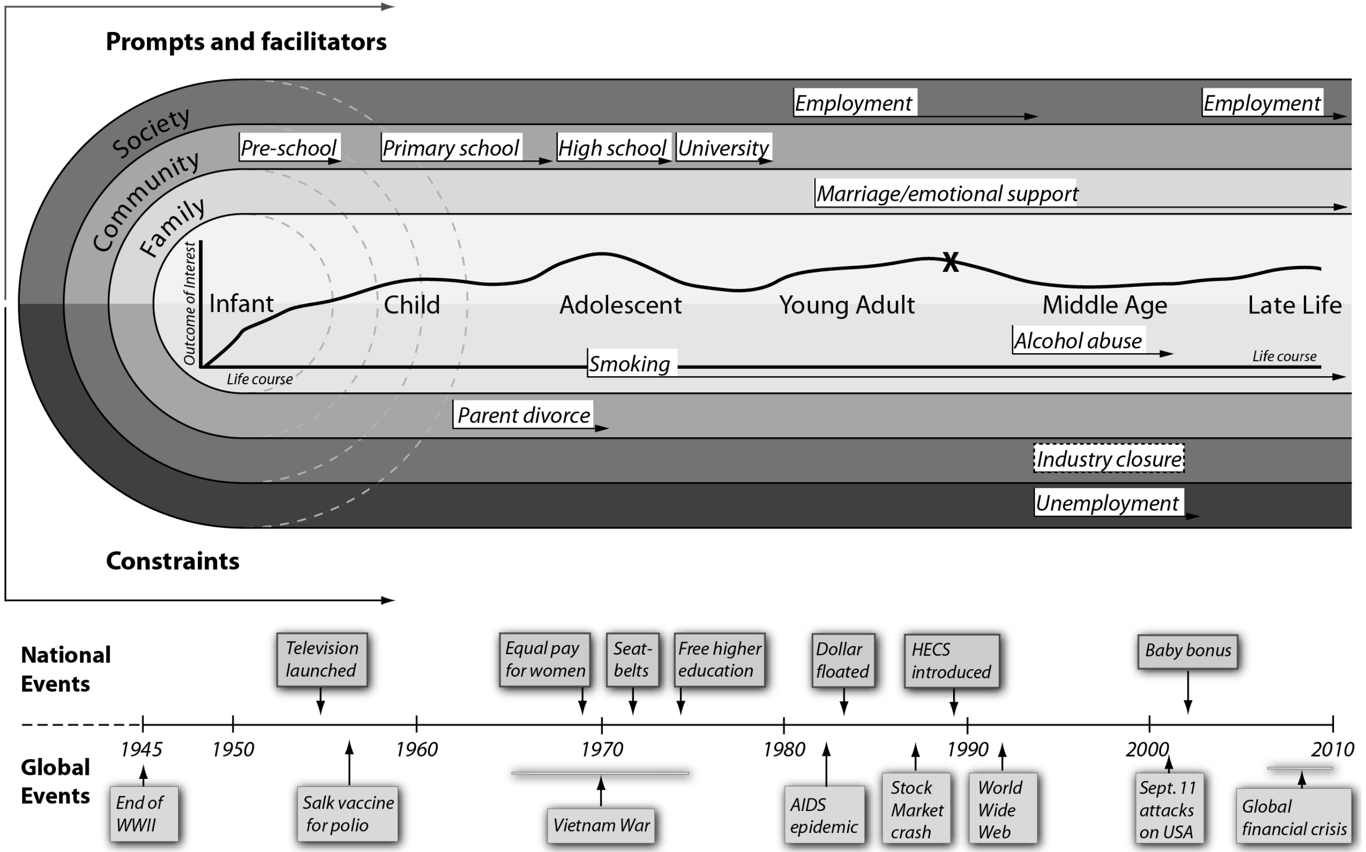
This paper uses a human development framework to explore the developmental status of Indigenous children in Australia, using data from the 2008 NATSISS. We examine how Indigenous children are faring in terms of some traditional markers of child development and the mechanisms that prompt, facilitate and constrain Indigenous child development. We also explore what the NATSISS can tell us about the relative importance of factors that influence key child development outcomes.

Child development and the 2008 NATSISS

The NATSISS is a vital source of data for addressing the human capability story in an Australian Indigenous context. The 2008 NATSISS is significant in that it enables, for the first time, an examination of the development of children. As such, it is one of the few reliable quantitative resources that have detailed information on both developmental outcomes and their risk factors for Indigenous persons aged 0–14 years.

In terms of child developmental outcomes, the 2008 NATSISS asked about birthweight and gestational age (for 0–3 year olds only), a global question on health status, and questions regarding specific problems with ears/hearing, eyes/sight and teeth/gums. In addition, some information can be gleaned on educational attendance. All responses for 0–14 year olds were provided by parents/guardians in most instances, or a member of the household with responsibility for the child. In addition, the NATSISS included a rich set of variables that can be described as either prompts, facilitators or constraints of child development. These include aspects of diet and nutrition, connection with culture, carer education, informal learning, stress and supports.

Fig. 6.2 Child development in the context of the lifecourse



Source: Zubrick et al. 2009

The large scale of the 2008 NATSISS (almost 5500 children were sampled) enables a robust analysis of child developmental outcomes and their antecedents, with potential for regional comparisons (by State/Territory or geographic remoteness). All analyses in this paper were conducted on the *State/Territory by ASGC Remoteness Structure Confidentialised Unit Record File* (CURF), accessed via the Australian Bureau of Statistics (ABS) Remote Access Data Laboratory (RADL). This CURF provided a dichotomous national remoteness data item (remote/non-remote) and a 13-part derived item that cross-classifies State/Territory by remoteness.

The depth (in terms of sample size) and breadth (in terms of data items) of the 2008 NATSISS offer considerable strength for the purposes of examining aspects of Indigenous child development. However, there are, as with any study, a range of limitations to the NATSISS data which restrict what can be achieved in this paper. First, the NATSISS uses a cross-sectional design which reduces any discussion of causal inference to a discussion about associations. Second, there is a lack of information on academic performance and social and emotional wellbeing, and a narrow range of educational attendance variables in the survey. This limits our ability to examine some of the key domains of child development. Third, all of the questions relating to 0–14 year olds rely on the perceptions and recall of parents and caregivers, which are inherently open to issues of bias (e.g. problems with interpretation, willingness to answer openly) and inaccuracy (Sen 2002). In relation to the 2008 NATSISS, the difficulties with interpreting a child's health are two-fold – a carer's views may not accord with that of a medical expert or with the view of the child themselves. Fourth, the available CURFs do not allow a full examination of the effects of geographic location. This is particularly limiting in Indigenous contexts because of the heterogeneity of Australian Indigenous population groups (Bell 1995) and the relative importance that a sense of place and connection to land has on the health of Indigenous peoples (Boddington and Raisanen 2009; Saggers and Gray 2007). Lastly, the CURF does not include stratum or Collection District (CD) information which precludes a multi-level analysis of the data, and therefore we are not able to fully examine the relationships between factors at the individual, family and neighbourhood level and child health outcomes.

Developmental outcomes for Indigenous children

Before we begin to describe the developmental status of Indigenous children we must ask the question, 'what constitutes an outcome?' In this paper, the overarching outcome is the capability to participate – economically, socially and civically. These outcomes are largely at the core of what public policy and its funding effort seeks to achieve. Public policy and expenditure on human services is deliberately organised to influence human capability with the express aim of enabling more people to choose lives that they value. There has been a heavy emphasis historically on economic participation and only in recent times have developed countries begun to listen to citizen demands that there is more to life than participating in the labour market – social participation and civic participation form part of the mix of what human development is all about (Fukuda-Parr and Kumar 2004).

Focusing on a human capability framework enables us to examine specific types of outcomes, i.e. diseases, good health, literacy, as well as those that may be considered as developmental 'means'. For example, the achievement of good health or the occurrence of specific diseases, are typically studied as 'outcomes' in their own right. These outcomes may also be thought of as the means through which the capability to participate economically, socially and civically is achieved or diminished. Using this as a guiding framework, we have selected seven outcomes for children from the 2008 NATSISS:

- birthweight
- gestational age
- overall (global) health status
- eye/sight problems
- ear/hearing problems
- teeth and gum problems, and
- educational attendance.

Birthweight

High rates of low birthweight in developing countries are primarily due to intrauterine growth restriction, which is associated with a range of poor outcomes that commence at birth (death, disability and poor health) and can lead to complications in childhood and the development of chronic illnesses in adult life (Australian Institute of Health and Welfare et al. 1999; Ford et al. 2003; Zubrick et al. 2008). Low birthweight babies are generally more prevalent in Indigenous populations, where population rates correspond more closely with those observed in developing nations (Steering Committee for the Review of Government Service Provision (SCRGSP) 2009).

Low birthweight is typically defined as less than 2500 grams, while those born less than 1500 grams are of very low birthweight. The NATSISS found that 11.2 per cent of Indigenous children aged 0–3 years in Australia were of low birthweight and 1.9 per cent were born at very low birthweight (Table 6.1).

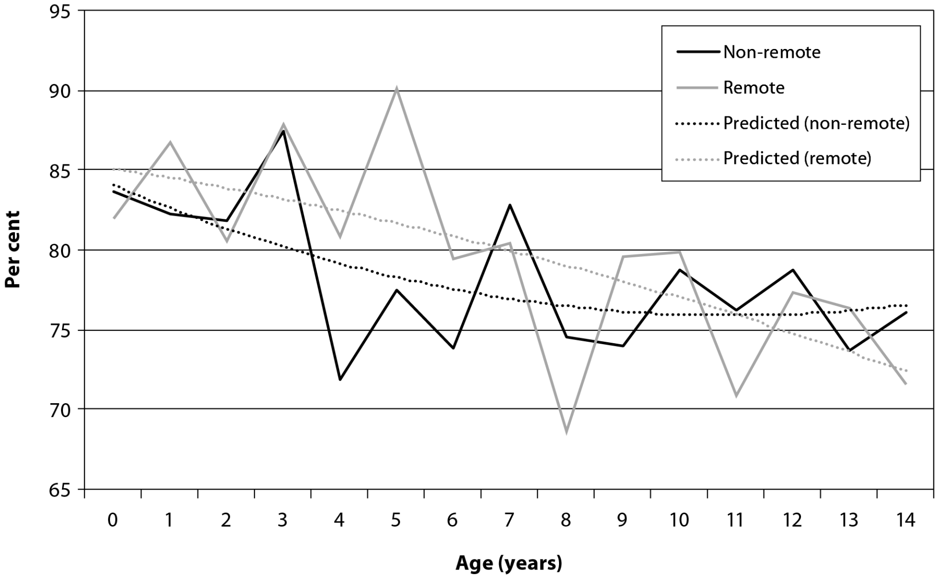
Gestational age

Babies born prior to 37 weeks gestation are considered to be 'preterm' or to have 'low' gestational age. This cut-off point aligns with the development of several organ systems, and evidence suggests that low gestation is associated with a greater risk of neonatal mortality and a range of morbidities into childhood and beyond (Kuh and Ben-Shlomo 2004). Close to one-quarter (24.1%) of Indigenous children aged 0–3 years were considered preterm at birth. A higher proportion of females than males were preterm (26.9% compared with 21.4%).

Global health

Global health status was assessed on a five-point ordinal scale: excellent; very good; good; fair; or poor. Less than 4 per cent of children aged 0–14 years had fair or poor health. The majority were in either excellent (46%) or very good health (32%). There was some variation by age, with older children generally less likely to be in excellent or very good health than younger age groups. This pattern can be observed in both non-remote and remote areas (see Fig. 6.3).

Fig. 6.3 Proportion of Indigenous children in excellent or very good health, by age, Australia, 2008[a]



a. The broken lines represent a 'best fit' line, based on the coefficients of a second order polynomial regression.

Source: Authors' customised calculations using the 2008 NATSISS (accessed using the RADL)

When aggregated together, global health levels were broadly similar in remote and non-remote areas of Australia – however, this masks differences that were evident at finer geographic levels. For example, only 72 per cent of Indigenous children in 'outer regional' areas of New South Wales were in excellent/very good health, whereas the same was true of 90 per cent of children in Queensland 'inner regional' areas.

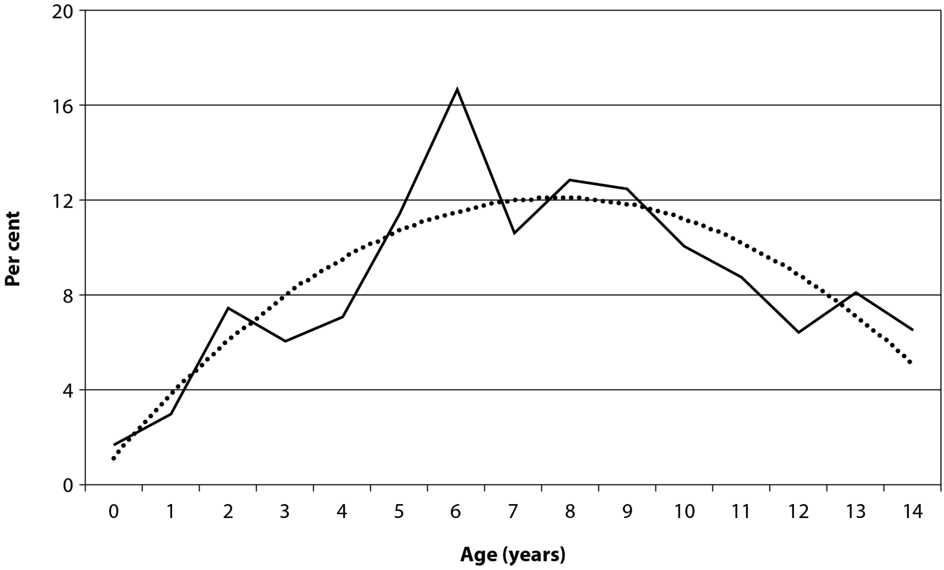
Hearing and vision

Hearing impediments can delay speech and language development in children, with undesirable consequences for both social development and a child's ability to engage in educational opportunities. Previous studies have highlighted that hearing loss and impediments are more prevalent among Indigenous children (ABS 2006), particularly in more remote communities with poor environmental health conditions (Coates et al. 2002; Zubrick et al. 2004). Middle ear infection, or otitis media, is a persistent problem in many Indigenous communities and is regarded as the most common cause of hearing impediments among Indigenous children (Morris et al. 2005).

From the NATSISS, 9 per cent of children aged 0–14 years had an ear or hearing problem, which includes partial or full hearing loss and conditions such as tinnitus, runny/glue ear and tropical ear. The trend by age is roughly a reverse U-shape, peaking at age six (see Fig. 6.4). While we may have expected ear/hearing problems to be more prevalent in remote areas, we found similar proportions in remote (10%) and non-remote areas (8%).

Only a small proportion (7%) of children had an eye or sight problem. These problems were mainly of a less severe nature (long or short sightedness), with relatively few cases of blindness, trachoma, glaucoma, and cataracts. Similar to the findings of the Western Australian Aboriginal Child Health Survey, there were fewer cases of eye or sight problems in remote (4%) than non-remote (8%) areas (Zubrick et al. 2004). This is likely to reflect differences between remote and non-remote areas in the factors that are associated with short sightedness (for example, type of school work undertaken and lifestyle factors).

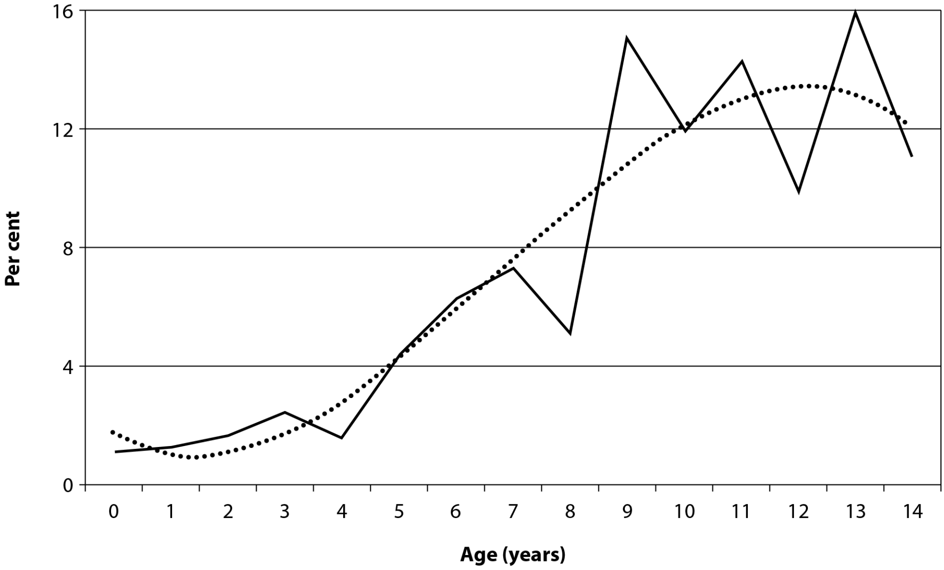
Fig. 6.4 Proportion of Indigenous children with ear or hearing problems, by age, Australia, 2008[a]



a. The broken lines represent a 'best fit' line, based on the coefficients of a second order polynomial regression.

Source: Authors' customised calculations using the 2008 NATSISS (accessed using the RADL)

Fig. 6.5 Proportion of Indigenous children with eye or sight problems, by age, Australia, 2008[a]



a. The broken lines represent a 'best fit' line, based on the coefficients of a third order polynomial regression.

Source: Authors' customised calculations using the 2008 NATSISS (accessed using the RADL)

Oral health

About 36 per cent of children aged 2–14 years had at least one problem with their teeth or gums – this includes cavities, decay, fillings, breakage, having no teeth, and bleeding or sore gums. The NATSISS highlights that dental problems were less prevalent among children in remote settings (26%) than non-remote areas (37%), which may reflect a greater reliance on bush tucker in the most remote regions of Australia and a correspondingly smaller reliance on diets high in energy derived from refined carbohydrates and saturated fats (National Health and Medical Research Council 2000). This is consistent with the findings for Indigenous children in Western Australia (Zubrick et al. 2004) but contrasts the evidence of Jamieson Armfield and Roberts-Thomson (2007) in a study of Indigenous children in New South Wales, South Australia and the Northern Territory. The discrepancy between studies is likely to be attributable to differences in sample characteristics, collection methods, or the measurement of oral health between studies. The binary, carer-reported measure of dental problems used here may be a greater reflection of dental services use than dental problems *per se*. If so, then our findings would suggest that dental services are more accessible (and affordable) to Indigenous children living in less remote areas.

Educational attendance

The NATSISS design did not allow the collection of a robust range of variables on child education, and this naturally limits what can be examined in this important domain of child development. The survey questions mainly focus on issues of attendance, although the included items could only be considered proxy indicators of attendance patterns. Encouragingly, the vast majority of 'eligible' Indigenous children were going to school (97.5%) and only a relatively small proportion of school children (7%) were seen to have a problem with attendance (not attending without permission).

The carers of 27 per cent of school children stated that they had missed at least one day of school in the previous week, with the modal response for this group being five days (all days) missed. About 30 per cent of absence was due to sickness/injury, although many reported that the absence was because the school was not available or not open. These results are difficult to interpret but almost certainly support the observation that Indigenous students have poorer rates of attendance than their non-Indigenous counterparts (SCRGSP 2009).

Despite no data in the NATSISS on child academic performance, this outcome merits a short comment here. Other studies demonstrate clearly that there are considerable gaps in the performance of Indigenous and other children at school (SCRGSP 2009; Zubrick et al. 2006). Importantly, disparities are evident at Year

1 and widen further in subsequent school years. These gaps are arguably the most important in terms of predicting onward disparities in human capabilities between Indigenous and other Australians.

Table 6.1 Proportion of Indigenous children with selected health/ development problems, Australia, 2008

Health/development factor	Non-remote (%)	Remote (%)	Total (%)
Birthweight[a]			
Less than 2 500 grams	11.9	8.8	11.2
Less than 1 500 grams	2.1*	1.4**	1.9*
Low gestation (less than 37 weeks)[a]	23.8	25.2	24.1
Global health			
Excellent	48.0†	41.4†	46.4
Very good	30.4†	38.3†	32.2
Good	17.8	17.0	17.6
Fair	3.0	2.6	2.9
Poor	0.8*	0.8*	0.8
Eye or sight problem	8.2†	3.9†	7.2
Ear or hearing problem	8.0	10.2	8.5
Teeth or gum problems[b]	37.1†	25.8†	34.4
Educational attendance			
'Eligible' children not going to school[c]	4.3	5.0	4.5
Problem with attendance[d]	5.4†	12.8†	7.0

a. 0–3 year olds only.

b. 2–14 year olds only.

c. Excludes those who are too young, too old or ineligible for school.

d. Of those attending school.

† Denotes a statistically significant difference (at 95% level of confidence) in the proportions in remote and non-remote areas.

* Relative standard error between 25% and 50%.

** Relative standard error greater than or equal to 50%.

Source: Authors' customised calculations using the 2008 NATSISS (accessed using the RADL)

Prompts, facilitators and constraints of child development

As we outlined earlier, developmental strengths are influenced by a small set of mechanisms that either prompt, facilitate or constrain their development.

- Developmental ‘prompts’ are particularly critical in the initiation of the acquisition and accumulation of skills. The developmental prompts of these skills include biology (including genes), expectations, and opportunities.
- Developmental ‘facilitators’ increase leverage from developmental prompts. These facilitators include: at least average intelligence; an easygoing temperament; emotional support in the face of challenge; and good language development.
- Developmental ‘constraints’ are those influences that impede or diminish the effects of the prompts or interact with the facilitators. These constraints include multiple accumulative stress, ‘chaos’ (i.e. war, social upheaval) that prevents the establishment of developmental stability, social inequality, and social exclusion.

Many of the factors that prompt or facilitate child development are either missing in the lives of Indigenous children or are too limited to produce sustainable benefits and opportunities in life. When skills and abilities are sufficiently acquired their benefits are, too often, constrained or overwhelmed by the influences of the living environment. Some of these constraints are characteristics of individuals or families, and have a direct influence on Indigenous children. Others are population-wide characteristics that impact on children in indirect ways, and reflect the fact that Indigenous populations have a diminished capability base relative to other Australians.

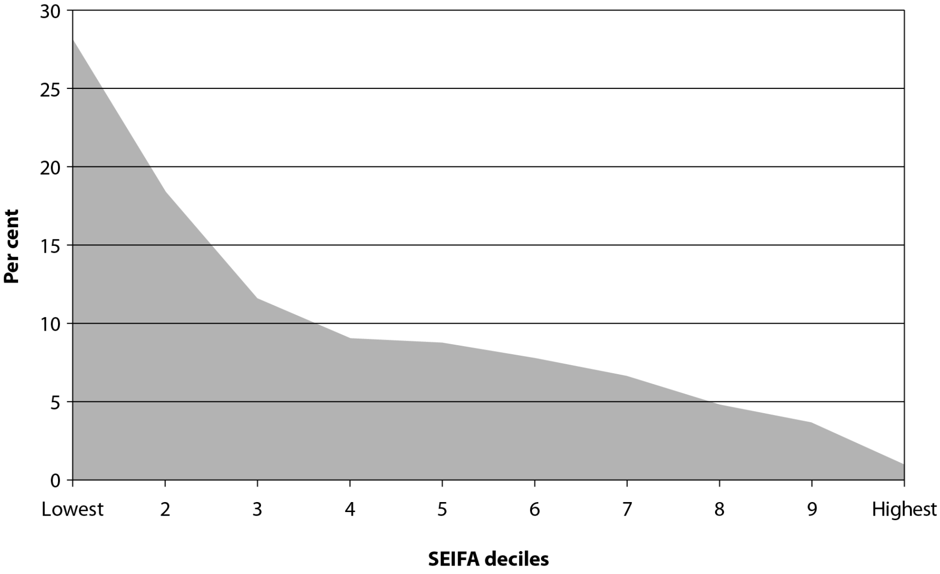
From a policy perspective, these prompts, facilitators and constraints offer avenues for deliberate investment at a variety of levels, from those that focus on individuals to those that affect national and global policy. There is plenty of flexibility to address them through one or more settings (e.g. family, school, care environments, work) using different instruments (legislation, remuneration, transfers and benefits, goods and services) to effect change.

Population-wide constraints

Population-wide constraints include lower life expectancy and higher fertility rates. These two factors conspire to produce a very young population (median age is 20 years) with a relatively low adult-to-child ratio. The NATSISS data highlight that there was 1.3 Indigenous adults (18+) for every Indigenous person aged 0–17 years, which compares with an approximate 3:1 ratio in the total population (ABS 2010). This indicates that Indigenous children have less access to older, experienced people available for care, protection, cultural guidance and general life-skills education (Silburn et al. 2006). This is compounded by high rates of imprisonment, father absence and family breakdown and consequent sole parent status. Over one-third (37%) of Indigenous children less than one year of age were in one parent families; this proportion rose to 46 per cent among those aged 14 years.

Furthermore, the socioeconomic disadvantage experienced by Indigenous peoples in the form of low levels of education, employment and income, can generate stress. These circumstances change the capacity of populations to participate in, and benefit from, mainstream services (Zubrick et al. 2008). Indigenous children are vastly overrepresented in the lower levels of all socioeconomic constructs included in the NATSISS, including the area-based Socio-Economic Indexes for Areas (SEIFA) measure (see Fig. 6.6).

Fig. 6.6 Distribution of Indigenous children aged 0–14 years by SEIFA deciles, Australia, 2008[a]



a. SEIFA deciles were determined based on the distribution of values for all Australian CDs.

Source: Authors' customised calculations using the 2008 NATSISS (accessed using the RADL)

A profile of prompts, facilitators and constraints

Here we attempt to categorise 2008 NATSISS items as either prompts, facilitators or constraints of child development (see Table 6.2). The NATSISS cannot fully inform the breadth of these constructs nor are they necessarily the most salient measures. In some instances the selected items are proxy indicators of the constructs discussed earlier – for example, we use carer involvement in informal activities as an indicator of early language development. Despite these shortcomings, the NATSISS items, collectively, provide insight into the capability profile of Indigenous children in Australia.

The most prominent feature of the data presented in Table 6.2 is the high prevalence of development constraints. They document a profile of stress and discrimination that are experienced at levels unique to Indigenous children. For example, 44 per cent of 0–3 year olds and 65 per cent of 4–14 year olds experienced at least one of the stressors that were asked about in the NATSISS. These stressors commonly included serious events such as the death of a close family member/friend, having a really bad illness/accident, and being physically hurt by someone. When these types of stressors occur frequently in early life they can have serious longer-term effects on the development of the brain, endocrine and immune systems, and are a key mechanism in the biological embedding of disadvantage (McEwen 1998). Carers also reported that 15 per cent of school children aged 6–14 years were bullied or treated unfairly at school because they were Indigenous, 9 per cent needed to stayed overnight somewhere else due to a family crisis in the six months prior to the survey, and 62 per cent of 5–14 year olds had moved house in the last five years.

Table 6.2 Summary of selected developmental prompts, facilitators and constraints of Indigenous child development, by remoteness, Australia, 2008

	Non-remote (%)	Remote (%)	Total (%)
Developmental prompts			
Birthweight[a]			
Less than 2,500 grams	11.9	8.8	11.2
Less than 1,500 grams	2.1*	1.4**	1.9*
Breastfeeding[a]			
Never been breastfed	24.6†	13.7†	22.2
Breastfed but less than 3 months	23.2†	10.0†	20.3
Does not usually eat fruit[b]	4.8†	2.3†	4.2
Does not usually eat vegetables[b]	3.5	2.4	3.3
Identified with a clan, tribe or language group[c]	40.6†	69.2†	47.4
Some involvement in cultural events, ceremonies or organisations in last 12 months[c]	66.5†	80.9†	70.0
Participation in cultural activities[c]	60.4†	79.4†	64.9
Developmental facilitators			
Education of main carer			
Completed Year 12	22.8	19.4	22.0
Non-school qualification	38.2†	23.6†	34.8

	Non-remote (%)	Remote (%)	Total (%)
Time spent by main carer doing informal learning activities with child in last week[d]			
None	3.3	4.1*	3.5
1–6 days	26.3	26.5	26.3
7 days	70.2	69.1	69.9
Type of informal learning activities main carer did with child in last week			
Read a book (0–6 year olds)	74.7†	54.6†	69.8
Told a story (0–6 year olds)	60.1	60.7	60.3
Listened to child read (7–10 year olds)	71.6†	53.3†	67.2
Developmental constraints			
Experienced a stressor in last 12 months			
0–3 year olds	46.6†	35.1†	44.0
4–14 year olds	66.3	59.8	64.8
Bullied or treated unfairly at school[e]	16.1†	10.8†	14.9
Stayed overnight somewhere else due to family crisis in the last 6 months	9.1	9.6	9.2
Affected by friends/family members with alcohol problem	11.6	13.2	12.0
Affected by friends/family members with drug problem	9.1	8.2	8.9
Moved house in the last 5 years[f]	63.3	57.6	62.0
Needed more formal child care[g]	12.8	17.3	13.8

a. 0–3 year olds.

b. 1–14 year olds.

c. 3–14 year olds.

d. 1–6 year olds.

e. 2–14 year olds that were attending school.

f. 5–14 year olds.

g. 0–12 year olds.

† Denotes a statistically significant difference (at 95% level of confidence) in the proportions in remote and non-remote areas.

* Relative standard error between 25% and 50%.

** Relative standard error greater than or equal to 50%.

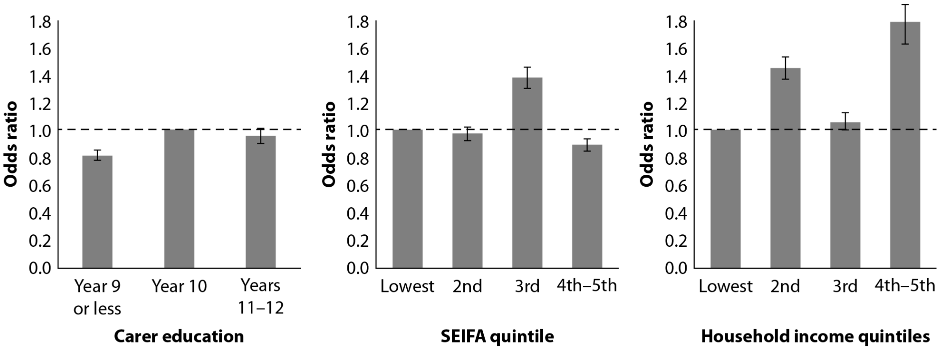
Source: Authors' customised calculations using the 2008 NATSISS (accessed using the RADL)

Associations with child developmental outcomes: An example using socioeconomic constructs

To this point we have presented some indicators of Indigenous child development, described the mechanisms that prompt, facilitate and constrain development and outlined some general principles for improving human capabilities in Indigenous contexts. Here we provide an insight into the relative importance of factors that influence Indigenous child development.

There is a relatively circumscribed literature on the nature of the associations between Indigenous child developmental outcomes and their antecedents. The empirical evidence suggests that there is a fairly weak relationship between income, education and employment of Indigenous adults and the developmental outcomes of their children (Zubrick et al. 2005). We test this observation with 2008 NATSISS data and focus on three constructs of socioeconomic status and their association with the overall (global) health of children: the educational attainment of the main carer of the child, household income (equivalised), and area-level relative disadvantage (SEIFA). We chose these for this analysis as they represent three different dimensions of socioeconomic status at multiple levels (parent, family and neighbourhood). The result of greatest interest is children who are reported to have excellent or very good health at the time of the survey. The shape and magnitude of the associations between socioeconomic status and child health is highlighted by Fig. 6.7, which shows the odds ratios from logistic regression analyses. There appears to be no association between the parent-rated measure of child health status and carer education and no statistically significant trend by the SEIFA measure, although those children in the third quintile of SEIFA were 1.4 times more likely (95% CI: 1.31–1.46) to be in excellent or very good health than those in the lowest quintile. Household income is positively associated with child health, although the relationship is non-linear in nature and only features an elevated odds of having excellent or very good health for children in the top two quintiles (OR = 1.8; 95% CI: 1.64–1.95) and second quintile (OR = 1.5; 95% CI: 1.39–1.54), relative to those in the lowest quintile. Household income continues to have a statistically significant independent effect on child health when analysed collectively with carer education and SEIFA (p=0.0024).

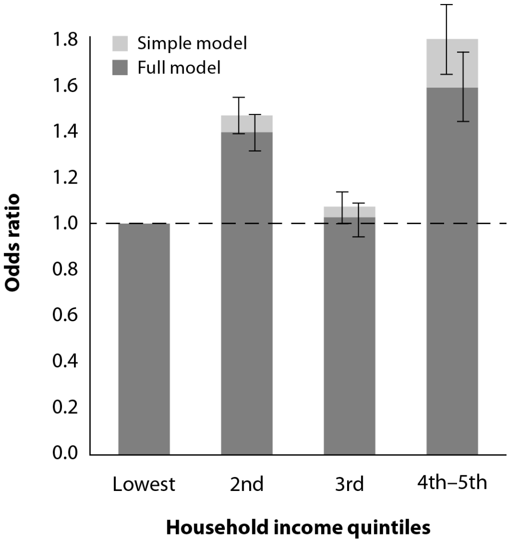
Fig. 6.7 Relative odds of excellent or very good health in Indigenous children, by constructs of socioeconomic status, Australia, 2008[a]



a. All logistic regression models include age and sex as covariates. Household income is derived using equivalence scales; quintiles have been derived based on the distribution of total household income for Indigenous and non-Indigenous households. SEIFA quintiles were determined based on the distribution of values for all Australian CDs.

Source: Authors' customised calculations using the 2008 NATSISS (accessed using the RADL)

Fig. 6.8 Relative odds of excellent or very good health in Indigenous children, by household income, Australia, 2008: Simple and full models[a]



a. 'Simple' logistic regression model includes age and sex as covariates. The 'full' model also includes the following covariates: remoteness, SEIFA quintiles, carer education, experience of stressors, carer engagement in informal activities with the child, whether bullied or treated unfairly, whether child stayed overnight somewhere else because of family crises, whether child was involved in cultural events, ceremonies or organisations or participated in cultural activities in last 12 months, and whether child eats fruit and vegetables. Household income is derived using equivalence scales; quintiles have been derived based on the distribution of total household income for Indigenous and non-Indigenous households.

Source: Authors' customised calculations using the 2008 NATSISS (accessed using the RADL)

The association between household income and child health is only slightly attenuated by the inclusion of other factors in the model that are known to influence health in early life (see Fig. 6.8). We found that stress, carer engagement in informal activities with the child, and bullying and discrimination were all factors significantly associated with a child being in excellent or very good health, and that household income has an effect on child health over and above the influence of these factors.

Implications

Our findings suggest that the strong associations characteristically seen in mainstream populations between child health and development outcomes and socioeconomic status do not necessarily hold in Indigenous populations. This does not imply that these factors are unrelated to the development of Indigenous children or that improving education, for example, is unwarranted. Instead it is likely to reflect that there are other circumstances in the social and physical environment that disrupt these associations for large segments of the Indigenous population (Zubrick et al. 2008).

Weak health gradients are particularly problematic for populations with low levels of health because they imply that there are greater barriers to improving health. If traditional levers do not produce improvements in health then these populations are in danger of being 'trapped' in poor health (Buttenheim et al. 2010). It is difficult to underestimate the implications of this for Indigenous Australia. The current policy imperative is one that aims to 'close the (developmental) gap' between the mainstream and Indigenous population within a generation (Department of Families, Housing, Community Services and Indigenous Affairs 2009). These findings of weak associations between determinants of human development and human capital formation would suggest that either the policy expectation is overly ambitious or that greater effort will be needed to compensate for the reduced effect size.

The findings here confront policy and practice settings with competing demands: the urgency to be seen to be 'doing something' to address the acute needs and demands of families overwhelmed by crises while at the same time diverting government resources and energies to the longer and slower process of enabling demographic restitution of capability. As noted above, this process is commencing from a very low base and it is unlikely that there is any generational short-cut in the time that it will take to effect true change. We have highlighted that Indigenous children have less access to older, experienced people available for their care, protection, cultural guidance and general life-skills education. The 'treatment' for this is primarily a demographic treatment: delay the onset of age of first pregnancy while concurrently increasing the proportion of Indigenous children that receive high quality early childhood educational daycare and support into primary school. The goal here is to prolong enrolment, attendance and retention into the upper secondary school to increase the proportion of the Indigenous population that has vocational and tertiary experiences – this will build greater human capital. It will have the ultimate effect of expanding choices for Indigenous adults and, concomitantly, improve the wellbeing and life opportunities of Indigenous populations.

While this is slowly transforming the capability profile of the Indigenous population, there is a need to specifically enrol Indigenous people in understanding how to reduce the developmental chaos which is the major constraint affecting Indigenous children. This will take different forms depending on where the child and family are living – the major areas here are demarked by the metropolitan setting (urban), transition zone (rural and remote regional centres) and extremely remote areas. The short-term strategies require establishing effective buffering around the child and stabilising the level of chaos the child is exposed to: reducing the effects of direct and indirect violence, improving the quality of the material environment particularly for children aged 2–4 years, establishing emotional support for the adult carer, and providing regularity in routine and setting realistic expectations for the child. The treatment for the population is a focus on slow, progressive, upstream and distal changes in human capital formation; the treatment for children living today is a proximal approach with an explicit engagement of Indigenous adults in enhancing life prospects.

Conclusion

We have been able to utilise the 2008 NATSISS to explore the developmental status of Indigenous children in Australia. We have demonstrated three significant results from the 2008 NATSISS data. First, the majority of Indigenous children are in excellent or very good overall health, although there are some developmental danger signs – that are evident from birth – for a significant number of children. Second, the profile of developmental constraints in Indigenous Australia is likely to overwhelm the critical acquisition of skills and abilities for many children. This analysis confirms that stress and discrimination are part of many Indigenous children's lives, and from an early age. Third, the associations between child development outcomes and determinants of human development may be weaker in Indigenous populations relative to mainstream Australia. This suggests that policy responses that are suitable for the general population need to be modified in order to significantly benefit the health of Indigenous peoples.

There are a number of limitations to what we have presented here. The cross-sectional nature of the NATSISS, the limited information on aspects of education, social and emotional wellbeing and geography, and the use of questions that rely on carer perception and recall, has curbed the breadth of potential analyses and what can be inferred from our results.

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Socioeconomic disparities in physical health among Aboriginal and Torres Strait Islander children in Western Australia

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Socioeconomic disparities in physical health among Aboriginal and Torres Strait Islander children in Western Australia

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Objective. Few empirical studies have specifically examined the relationship between socio-economic status (SES) and health in Indigenous populations of Australia. We sought to provide insights into the nature of this relationship by examining socio-economic disparities in physical health outcomes among Aboriginal and Torres Strait Islander children in Western Australia.
Design. We used a diverse set of health and SES indicators from a representative survey conducted in 2000–2002 on the health and development of 5289 Indigenous children aged 0–17 years in Western Australia. Analysis was conducted using multivariate logistic regression within a multilevel framework.
Results. After controlling for age and sex, we found statistically significant socio-economic disparities in health in almost half of the associations that were investigated, although the direction, shape and magnitude of associations differed. For ear infections, recurring chest infections and sensory function problems, the patterns were generally consistent with a positive socio-economic gradient – where better health was associated with higher SES. The reverse pattern was found for asthma, accidents and injuries, and oral health problems, although this was primarily observed for area-level SES indicators.
Conclusion. Conventional notions of social position and class have some influence on the physical health of Indigenous children, although the diversity of results implies that there are other ways of conceptualising and measuring SES that are important for Indigenous populations. We need to consider factors that relate specifically to Indigenous circumstances and culture in the past and present day, and give more thought to how we measure social position in the Indigenous community, to gain a better understanding of the pathways from SES to Indigenous child health.

Keywords: socio-economic; Aboriginal; physical health; Indigenous; inequality; Australia

Introduction

Socioeconomic factors have consistently been shown to influence population health (Adler 1999, Marmot and Wilkinson 2006). These factors reflect the way in which society is ordered according to wealth, prestige, power, social standing or one's control over economic resources (Mueller and Parcel 1981). The pattern of association between socio-economic status (SES) and health has almost always

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depicted better health for those who are better off, regardless of how SES is defined or measured – that is, the health of population groups normally follows a gradient pattern (Keating and Hertzman 1999), at all stages of the life course (Case *et al.* 2002, Chen *et al.* 2005, Adler and Rehkopf 2008). Despite the ubiquity of this observation in the empirical literature, there is uncertainty as to whether it applies to Aboriginal and Torres Strait Islander (herein referred to as Aboriginal) populations in Australia (Morrissey 2003, Anderson 2007).

There are important implications of improving our understanding of socio-economic disparities in health within Aboriginal populations. The magnitude and shape of disparities can provide insights into the relative importance of social conditions to health outcomes and may facilitate a better grasp of the complex underlying mechanisms that determine Indigenous health (Adler 1993, Macintyre 1994). Moreover, there are critical policy implications of improving our knowledge in this area. If the relationships between SES and health are relatively weak in Indigenous populations then investments aimed at stimulating employment, income and education, for example, are unlikely to improve the health outcomes of Indigenous populations or significantly reduce health disparities between Indigenous and other populations. This implies that policy responses that are suitable for the general population would need to be modified in order to benefit the health of Indigenous peoples.

The quality and quantity of data that describe the circumstances of Australian Aboriginal peoples has improved markedly in recent decades (Australian Bureau of Statistics 2007). These data reveal striking disparities between Aboriginal and non-Aboriginal populations in most domains of health and constructs of SES (Steering Committee for the Review of Government Service Provision (SCRGSP) 2009), which reflect a post-colonial history of marginalisation and exclusion from mainstream society, dispossession of traditional lands, forced separation from family and kinship networks, and racism (Saggers and Gray 1991, Hunter 1993, Human Rights and Equal Opportunity Commission 1997, Anderson *et al.* 2006, Paradies *et al.* 2008).

The comparatively poorer health status of Australian Aboriginals is evident across the life course, including the earliest stages of life. Aboriginal children are more likely than non-Aboriginal children to be born at sub-optimal weight, die in infancy, suffer from a range of long-term health conditions, and be hospitalised (Blair 1996, Alessandri *et al.* 2001, Freemantle *et al.* 2006, Leeds *et al.* 2007, Australian Bureau of Statistics and Australian Institute of Health and Welfare 2008). Some conditions affecting Aboriginal children are scarcely encountered outside of Third World countries (such as rheumatic fever) and, too often, child illnesses, hospitalisations, disabilities and deaths are caused by potentially preventable events (such as injury, poisoning, abuse and neglect) (Australian Bureau of Statistics and Australian Institute of Health and Welfare 2008). While Indigenous/non-Indigenous health disparities are now well documented, less is known about the health disparities that exist *within* Indigenous populations in Australia.

The empirical evidence on socio-economic disparities in health in Indigenous Australia covers only a narrow range of health and SES indicators, with little consistency in scope or analytical approach. There are examples of socio-economic gradients in mortality, cardiovascular disease, renal disease, diabetes, disability, oral health, infections and self-rated overall health (Cunningham *et al.* 1997, Australian Bureau of Statistics 2004, Cass *et al.* 2004, Glover *et al.* 2004, Jamieson *et al.* 2006, Cunningham *et al.* 2008, Oddy *et al.* 2008, Cunningham 2010a, 2010b), although the slope and direction of these gradients typically varies across studies. Mental health, asthma and long-term health conditions appear to be equally prevalent across SES categories (Hunter, 1999, 2000, Zubrick *et al.* 2005, Cunningham 2010c), and a single study on birthweight was inconclusive as to whether outcomes varied significantly by an area-based measure of relative disadvantage (Titmuss *et al.* 2008). In some cases, the SES–health pattern has been shown to vary depending on the SES construct used. For example, Cunningham *et al.* highlighted that better self-rated health was associated with better education and labour force outcomes and home ownership, but not with household income, in a 1994 survey of Aboriginal adults (Cunningham *et al.* 1997).

This study aims to provide insights into the nature of the relationship between SES and health among Aboriginal peoples, with a focus on the socio-economic disparities in physical health outcomes of Aboriginal children in Western Australia. We use a diverse set of health outcome indicators and investigate the pattern of their associations with conventional and alternative measures of SES, including the characteristics of individuals, families, households and communities.

Methods

Data are from the 2000–2002 Western Australian Aboriginal Child Health Survey, a population representative study of the health, development and education of 5289 (or one in six) Aboriginal children aged 0–17 years in the state of Western Australia, and their families and communities. The survey used an area-based clustered multi-stage sample design. Dwellings in selected census collection districts (CDs) were approached, with in-scope families defined by whether there was an Aboriginal or Torres Strait Islander child aged 0–17 years living in the dwelling. All Aboriginal children aged 0–17 years in in-scope families were selected to participate. Of eligible families, 84% consented to participate in the survey and useable information was obtained on 96% of participating children, predominantly from household interviews. In addition to data on the health of children, interviews were conducted among primary carers and, where possible, secondary carers of children to gather information on the demographic and social circumstances of families, households and the communities in which they lived. Primary and secondary carers were the people who spent the most time with survey children and knew them best. The primary carer was usually the mother of the child (80%). In the majority of cases, the secondary carer was the father of the child (77%) or another related person (19%). Most primary (83%) and secondary (79%) carers identified themselves as Aboriginal. All aspects of the survey were conducted under the direction of a steering committee of senior Aboriginal people from a cross-section of settings and organisations. The full details of the design and conduct of the study have been described elsewhere (Silburn *et al.* 2006).

Health outcomes

Six physical health indicators were analysed, including chronic conditions (asthma, sensory function problems, recurring chest infections and oral health problems) and acute conditions (ear infections and accidents and injuries). These conditions represent some of the most prevalent long-term conditions (e.g., asthma) and those with significant contributions to hospitalisation (e.g., ear infections), mortality (e.g., injury) and the overall disease burden in childhood and young adulthood (Australian Bureau of Statistics and Australian Institute of Health and Welfare 2008, Australian Institute of Health and Welfare 2009, Australian Institute of Health and Welfare 2011). Information on all health outcomes was gathered from primary carers of participating children. Questions on sensory function and oral health problems and accidents and injuries were restricted to 4–17-year-olds. To determine asthma prevalence, carers were simply asked whether the child had 'ever had asthma'. Four questions were used to assess whether a child had a sensory function problem: Does the child have normal hearing in both ears? Does the child have normal vision in both eyes? Do other people need help to understand what the child is saying? Does the child have difficulty saying certain sounds? A limitation in one or more of these areas was considered a sensory function problem for the purposes of this study. Children who had ever had holes in their teeth, teeth removed, fillings, or sore/bleeding gums were deemed to have had an oral health problem. A child was classified as having an ear infection if they experienced recurring ear infections or a single episode of discharging ear(s) (runny, tropical or glue ear). Accidents and injuries were assessed by asking whether the child had ever: broken a bone(s); been knocked out; or had a stay in hospital because of an accidental burn or poisoning.

SES measures

Socioeconomic status was measured using eight separate variables, including characteristics of parents/carers (educational attainment of both primary and secondary carers and highest occupational class of carers), families/households (family financial strain, housing tenure, housing quality) and neighbourhoods/communities (two composite indexes of socio-economic disadvantage). This array of measures was chosen for four main reasons. First, reliance on a single measure is unlikely to capture how socio-economic position shapes health disparities in any population. This is particularly true among Indigenous populations because they are more likely to be distributed at the lower levels of any SES construct. Second, it is necessary to measure different dimensions of SES at multiple levels in order to capture the complex set of factors that contribute to socio-economic disadvantage among Aboriginal populations. Third, use of multiple SES measures enables a comparison of compositional and contextual effects on health disparities. Fourth, it is important to test the saliency of conventional versus alternative SES indicators in shaping health disparities, particularly as there are doubts about the relevance of conventional SES measures for Indigenous and other disadvantaged populations (Altman 2000, Shavers 2007, Taylor 2008). We have included conventional indicators of social class (education and occupation) and used a subjective rating of financial strain as a proxy measure of material well-being. Financial strain is used in preference to a conventional measure of household income, for two main reasons: first, income data was not collected from all household members who contributed to its financial base; and second, income does not capture the nature of sharing of economic resources that can occur between extended members of Indigenous families (Hunter *et al.* 2003). Housing characteristics are afforded prominence in these analyses, given the importance of housing to Indigenous health (Bailie and

Runcie 2001). Housing tenure and quality are proxy indicators of income and wealth (Shaw 2004) and have been included to complement the measure of financial strain (income) in describing the material wealth of Indigenous families and households.

Information about the characteristics of primary carers, families and households was provided by the primary carers of participating children. Secondary carers provided separate responses on their educational attainment and occupational class. Housing quality was measured using a set of indicators based on a nationally agreed framework for the design, construction and maintenance of Indigenous housing (Silburn *et al.* 2006). This includes whether the house had facilities for washing people and clothes, removing waste safely, storing and cooking food and controlling the temperature. Households were classified into one of four categories: having none, one, two or three or more indicators of poor housing quality.

The Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product and Biddle's Index of Relative Indigenous Socioeconomic Outcomes (IRISEO) were used to measure area-level socio-economic disadvantage (Australian Bureau of Statistics 1998, Biddle 2009). The SEIFA index ranks the relative level of disadvantage of areas using the attributes of all persons (Indigenous and non-Indigenous) in each census CD. The SEIFA index used in this study includes measures of income, educational attainment, employment status and occupational skill but excludes the proportion of Indigenous people in the CD (Silburn *et al.* 2006). Quintiles were determined based on the distribution of values for all Australian CDs. Biddle's IRISEO is a rank order variable that measures the socio-economic outcomes of all 531 Indigenous Areas in Australia in 2001, based on the employment, income, education and housing characteristics of Indigenous persons only (Biddle 2009). Quintiles were determined based on the distribution of IRISEO values for all Australian Indigenous Areas.

Geographic isolation

Geographic isolation is defined using the Level of Relative Isolation (LORI) classification, which is based on the ARIA + + index (a widely used classification of remoteness in Australia). The five categories of isolation reflect differences in access to services, cultures and health outcomes for Aboriginal children in Western Australia, and range from none (Perth metropolitan area), to low, moderate, high and extreme (Zubrick *et al.* 2004).

Non-response and imputation

Analysis of non-response characteristics showed that the survey sample was broadly representative of the population of Aboriginal children living in Western Australia, although comparisons with population benchmarks showed that age, SES, household size and region were significantly associated with non-response. Post-stratification weighting was employed to adjust for differential non-response and produce unbiased estimates. There was only a small amount of item-level non-response. While an imputation procedure was employed to assign values to non-responding items, the percentage of imputed values was less than 1% for each variable and, based on this, imputation had no effect on the results of this study. Information was unable to be obtained on the characteristics of 15% of secondary carers, and we have treated all variables from these records as missing in the following analysis. More details about non-response characteristics, weighting and imputation are available elsewhere (Zubrick *et al.* 2004).

Analysis

Analysis was conducted using logistic regression techniques within a multilevel framework. Models were fitted with the method described by Pfeffermann *et al.* which takes into account the survey weights and the hierarchical structure of the data, i.e., selection of children within families and communities (Pfeffermann *et al.* 1998). All models report odds ratios, adjusted for age and sex, with 95% confidence intervals. Standard errors for survey estimates of totals were produced using the Ultimate Cluster Variance estimation technique (Wolter 1985). Standard errors for estimates of odds ratios and proportions were calculated using a modified form of the Jack knife variance estimation technique (Jones 1974). Standard chi-square tests and chi-square tests for trend adjusted for the complex sample design were used to assess the difference between categorical SES indicators and dichotomised health outcome variables. Spline curves were used to further describe the shape of the association between SEIFA and health, and to assess the impact of geographic isolation (LORI) on the SES–health relationship. We used the Generalized Additive Models framework to account for the possible non-linear nature of these relationships and fit a non-parametric Spline curve (Hastie and Tibshirani 1990). SAS version 9.2 was used for all analyses (SAS Institute Inc., Cary, NC, USA, 2000–2008).

Ethical approvals

This study was conducted under ethical approvals from Curtin University's Human Research Ethics Committee and the Western Australian Aboriginal Health Information and Ethics Committee, and was endorsed by the Aboriginal Collaborative Council Advising Research and Evaluation at the Telethon Institute for Child Health Research.

Results

Population characteristics

The six indicators of physical health ranged in prevalence, from 12% (for recurring chest infections) to 47% (for oral health problems) (Table 1). Aboriginal children were largely distributed in the more disadvantaged categories of most measures of SES, with few represented in the top category: only 5% of Aboriginal children had a primary carer with a post-secondary education, 5% lived in a family who could 'save a lot', 6% lived in houses who were owned by its occupants, and 5% lived in areas coded to the top two SEIFA quintiles. When area-level relative disadvantage was constructed using the characteristics of Aboriginal people only (IRISEO), 17% of our study population was in the top two quintiles (Table 1). This signals that, on average, Aboriginal children in Western Australia live in areas with less favourable socio-economic characteristics than other Aboriginal people across Australia.

Table 1. Health, SES and demographic characteristics of Aboriginal children aged 0–17 years in Western Australia, 2000–2002.[a]

	Number	Percentage (95% CI)
Health characteristics		
Asthma	6910	23.2 (21.6–24.9)
Ear infections	8160	27.4 (25.8–29.0)
Recurring chest infections	3660	12.3 (11.1–13.5)
Sensory function problem[b]	5560	24.3 (22.4–26.3)
Injury or accident[b]	5220	22.8 (21.2–24.4)
Oral health problem[b]	10,700	46.6 (44.3–48.9)
SES characteristics		
Education: primary carer		
Did not attend	740	2.5 (1.8–3.4)
Year 9 or less	6630	22.2 (20.3–24.3)
Year 10	12,800	42.9 (40.6–45.3)
Years 11–12	7240	24.3 (22.3–26.4)
13 or more years	1600	5.4 (4.0–6.9)
Education: secondary carer		
Did not attend	700	2.4 (1.6–3.4)
Year 9 or less	4880	16.4 (14.6–18.2)
Year 10	5910	19.8 (17.8–22.1)
Years 11–12	3050	10.2 (8.8–11.8)
13 or more years	710	2.4 (1.6–3.3)
No secondary carer	11,900	39.9 (37.5–42.4)
Occupation[c]		
Managers and professionals	3490	11.7 (10.1–13.4)
Tradespersons, clerical workers and labourers	10,800	36.3 (33.9–38.8)
Not employed	14,800	49.6 (47.0–52.2)
Family financial strain		
Spending more than we get	2630	8.8 (7.5–10.3)
Just enough to get by	13,300	44.5 (42.1–46.9)
Some left over but spend it	4010	13.5 (11.7–15.3)
Can save a bit	7680	25.8 (23.7–27.9)
Can save a lot	1420	4.8 (3.7–6.1)
Housing tenure		
Owned	1910	6.4 (4.9–8.1)
Being paid off	4120	13.8 (12.1–15.7)
Renting	21,800	73.0 (70.5–75.4)
Other	1230	4.1 (3.0–5.5)
Number of indicators of poor housing quality		
None	8930	29.9 (27.5–32.4)
One	7980	26.8 (24.7–28.9)
Two	6480	21.9 (19.8–24.2)
Three or more	6340	21.4 (19.2–23.7)
SEIFA[d] (quintiles)		
Bottom quintile (less advantaged)	17,500	58.6 (54.4–62.7)
Second	7310	24.5 (21.1–28.0)

Table 1 (*Continued*)

	Number	Percentage (95% CI)
Third	3600	12.1 (9.3–15.2)
Fourth	1270	4.3 (2.4–7.0)
Top quintile (more advantaged)	170	0.6 (0.1–1.6)
IRISEO[e] (quintiles)		
Bottom quintile (less advantaged)	6350	21.3 (17.8–25.0)
Second	8760	29.4 (26.1–33.0)
Third	9490	31.8 (28.8–35.0)
Fourth	4830	16.2 (13.7–18.9)
Top quintile (more advantaged)	300	1.0 (0.4–2.4)
Demographics		
Age (years)		
0–3	6910	23.2 (21.7–24.7)
4–11	13,800	46.5 (44.8–48.2)
12–17	9100	30.3 (28.5–32.1)
Sex		
Male	15,370	51.6 (49.9–53.1)
Female	14,430	48.4 (46.9–50.1)
Level of relative isolation		
None	10,200	34.1 (31.5–36.8)
Low	7270	24.4 (21.8–27.0)
Moderate	6390	21.4 (18.1–25.1)
High	3170	10.6 (7.9–14.0)
Extreme	2830	9.5 (6.8–12.7)

[a] Numbers are weighted estimates of the population of Aboriginal children in each category, and have been rounded. Proportions for sensory function problems, injuries/accidents and oral health problems are based on all Aboriginal children aged 4–17 years ($n = 22{,}900$); all other proportions are based on all Aboriginal children aged 0–17 years ($n = 29{,}800$). The frequencies of missing responses have not been reported.

[b] For 4–17-year-olds only.

[c] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. ‘Managers and professionals’ include occupational skill levels 1 and 2. ‘Tradespersons, clerical workers and labourers’ include occupational skill levels 3–5.

[d] Customised version of the index of relative socio-economic disadvantage that forms part of the Australian Bureau of Statistics’ Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs.

[e] Biddle’s Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Indigenous persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

SES–health disparities

Tables 2 and 3 show the odds ratios from logistic regression analyses, and highlight that the direction and magnitude of the association between SES and health varied greatly by both SES indicator and health outcome. Overall, of the 48 associations examined, 17 were statistically significant on the basis of a chi-square test for trend, and another 7 had at least one significant difference (at a 95% level of confidence) in health status between categories of SES. For ear infections, recurring chest infections and sensory function problems, the patterns were generally consistent with a positive

Table 2. Socioeconomic disparities in selected physical health outcomes among Indigenous children aged 0–17 years, Western Australia, 2000–2002.[a]

	Asthma			Ear infections			Recurring chest infections		
Socioeconomic measure	OR	95% CI	p Value[b]	OR	95% CI	p Value[b]	OR	95% CI	p Value[b]
Carer characteristics									
Education: primary carer									
Did not attend	0.60	0.33–1.36	0.089	1.90	1.21–2.98	0.007	2.35	0.98–5.67	0.362
Year 9 or less	0.75	0.64–1.04		1.34	1.05–1.71		0.94	0.71–1.25	
Year 10	1.00	..		1.00	..		1.00	..	
Years 11–12	1.08	0.84–1.36		1.26	0.98–1.63		1.05	0.80–1.38	
13 or more years	1.33	0.89–1.86		1.63	1.09–2.45		1.19	0.76–1.85	
Education: secondary carer									
Did not attend	0.89	0.48–1.57	0.343	2.10	1.04–4.24	0.002	0.97	0.45–2.08	0.305
Year 9 or less	0.90	0.67–1.19		1.36	1.00–1.85		1.03	0.70–1.51	
Year 10	1.00	..		1.00	..		1.00	..	
Years 11–12	1.31	0.88–1.69		0.98	0.68–1.42		0.78	0.50–1.21	
13 or more years	0.85	0.44–1.88		0.42	0.20–0.88		0.76	0.39–1.45	
No secondary carer	1.22	0.90–1.45		1.42	1.09–1.85		1.13	0.81–1.57	
Occupation[c]									
Managers/professionals	1.08	0.70–1.67	0.736	1.28	0.93–1.77	0.125	1.07	0.73–1.58	0.718
Tradespersons, clerical workers and labourers	1.00	..	..	1.00	..	..	1.00	..	..
Not employed	1.01	0.79–1.30	0.907	1.04	0.84–1.29	0.702	1.35	1.05–1.75	0.021
Family/household characteristics									
Family financial strain									
Spending more than we get	0.95	0.49–1.84	0.857	1.11	0.56–2.19	0.366	2.65	1.33–5.27	0.015
Just enough to get by	0.88	0.47–1.62		1.05	0.58–1.90		1.72	0.91–3.24	
Some left over but spend it	0.78	0.41–1.50		1.12	0.60–2.09		1.37	0.69–2.69	
Can save a bit	0.96	0.53–1.76		0.86	0.47–1.60		1.52	0.81–2.84	
Can save a lot	1.00	..		1.00	..		1.00	..	
Housing tenure									
Owned	1.00	..	..	1.00	..	..	1.00	..	..
Being paid off	1.97	1.00–3.88	0.049	0.91	0.54–1.55	0.729	0.57	0.34–0.97	0.037
Renting	1.90	1.02–3.53	0.042	1.14	0.71–1.82	0.594	0.83	0.53–1.30	0.423
Other	0.66	0.23–1.91	0.440	1.42	0.71–2.83	0.324	0.53	0.21–1.33	0.176

Table 2 (*Continued*)

	Asthma			Ear infections			Recurring chest infections		
Socioeconomic measure	OR	95% CI	*p* Value[b]	OR	95% CI	*p* Value[b]	OR	95% CI	*p* Value[b]
Number of indicators of poor housing quality									
None	1.00	..	0.018	1.00	..	<0.001	1.00	..	0.237
One	0.99	0.76–1.30		0.97	0.73–1.29		1.20	0.89–1.62	
Two	0.94	0.68–1.29		1.28	0.96–1.69		1.31	0.97–1.77	
Three or more	0.60	0.43–0.85		1.55	1.21–2.00		1.32	0.97–1.81	
Neighbourhood characteristics									
SEIFA quintiles[d]									
Bottom quintile	1.00	..	0.001	1.00	..	0.790	1.00	..	0.237
Second	1.48	1.10–2.00		1.18	0.90–1.55		0.90	0.69–1.17	
Third	1.80	1.29–2.51		1.10	0.80–1.50		0.85	0.58–1.22	
Fourth	1.41	0.83–2.37		1.14	0.69–1.88		0.84	0.53–1.34	
Top quintile	3.48	1.34–9.04		1.06	0.41–2.74		0.38	0.16–0.93	
IRISEO quintiles[e]									
Bottom quintile	1.00	..	<0.001	1.00	..	0.001	1.00	..	0.407
Second	3.37	2.07–5.49		0.68	0.50–0.90		1.06	0.78–1.46	
Third	3.91	2.42–6.31		0.54	0.40–0.73		0.92	0.66–1.28	
Fourth	4.66	2.80–7.74		0.56	0.38–0.84		1.24	0.86–1.79	
Top quintile	9.24	3.10–27.20		0.47	0.22–1.04		0.69	0.27–1.81	

[a] Results are derived from multivariate logistic regression models using a multi-level framework. All models are adjusted for age and sex. Each SES–health variable pair represents a separate model.

[b] Calculated using chi-square tests adjusted for the complex sample design. Chi-square tests for trend were used for ordinal SES variables; standard chi-square tests were used for nominal SES variables.

[c] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. 'Managers and professionals' include occupational skill levels 1 and 2. 'Tradespersons, clerical workers and labourers' include occupational skill levels 3–5.

[d] Customised version of the index of relative socio-economic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs.

[e] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Indigenous persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

socio-economic gradient – where better health was associated with higher SES. Conversely, asthma, accidents and injuries, and oral health problems tended to exhibit a reverse gradient – where better health was associated with lower SES, although this was primarily observed for area-level SES indicators.

The largest differences in health outcomes were observed for area-level SES indicators, with other SES measures generally showing a weak to moderate association with the health outcomes. For example, Aboriginal children aged 0–17 years in the top quintile of the IRISEO were 9.2 times more likely (95% CI: 3.1–27.2) to have ever had asthma than those in the bottom quintile; whereas there was generally less than a two-fold disparity in the health outcomes within parental, family and household-level SES indicators.

Most health outcomes had a curvilinear pattern of association with SEIFA (Figure 1), although not all of these were statistically significant. There was evidence of a reverse threshold effect for oral health problems and asthma, whereby those in the lowest quintile of SEIFA generally had *better* health outcomes than all others. The relationship with the IRISEO was characterised by a reverse gradient for four of the six health variables. These gradients tended to be linear, reflecting monotonic changes in health status along the continuum of this index.

The pattern of health disparities by family financial strain was generally consistent with a positive socio-economic gradient (Figure 2). This pattern was strongest for recurring chest infections: children in families who described their financial situation as ‘spending more than we get’ were 2.6 times more likely (95% CI: 1.3–5.3) to experience recurring chest infections than children in families who could ‘save a lot’ (Figure 2).

There was no clear pattern in health disparities for housing characteristics, such as tenure and housing quality. This reflects a lack of consistency in the direction of the associations and generally modest effect sizes.

The strength and shape of the associations with primary carer education varied: there was a U-shaped relationship with both ear infections and oral health – with the worst health outcomes found when primary carers had not attended school or had 13 or more years of education; and a pronounced positive gradient with sensory function problems. Few of the results by secondary carer educational attainment reached statistical significance. Most of the odds ratios for carer occupation were close to the null value, with the exceptions reflecting differences in employment status rather than occupational skill. For example, children without an employed carer had a slightly elevated likelihood of experiencing recurring chest infections (OR: 1.4; 95% CI: 1.1–1.8) and an accident/injury (OR: 1.3; 95% CI: 1.0–1.5) than other children.

The pattern of disparities presented here does not differ appreciably when all SES variables are considered simultaneously in the models (data not shown). This is not surprising given only weak to moderation associations among these SES indicators, as shown in Table 4. Further, the majority of the SES–health associations are not significantly attenuated by the inclusion of geographic isolation in the models, with the exception of associations between IRISEO and asthma, ear infections and oral health problems (data not shown). In these instances, the effect sizes were diminished, although the association with oral health remained statistically significant (Figure 3 provides an example, using asthma).

Table 3. Socioeconomic disparities in selected physical health outcomes among Indigenous children aged 4–17 years, Western Australia, 2000–2002^{a}.

	Injury/accident			Sensory function problem			Oral health problem		
Socioeconomic measure	OR	95% CI	*p* Value^{b}	OR	95% CI	*p* Value^{b}	OR	95% CI	*p* Value^{b}
Carer characteristics									
Education: primary carer									
Did not attend	0.83	0.39–1.77	0.192	2.43	1.17–5.01	0.037	1.75	0.93–3.28	0.001
Year 9 or less	1.05	0.84–1.31		1.05	0.80–1.39		0.71	0.54–0.92	
Year 10	1.00	..		1.00	..		1.00	..	
Years 11–12	1.09	0.87–1.36		1.25	0.94–1.67		1.04	0.79–1.36	
13 or more years	1.57	1.07–2.30		0.77	0.44–1.37		1.51	1.00–2.30	
Education: secondary carer									
Did not attend	1.47	0.86–2.52	0.175	1.20	0.47–3.03	0.308	0.41	0.19–0.90	0.066
Year 9 or less	0.99	0.75–1.32		0.83	0.57–1.21		0.73	0.53–1.00	
Year 10	1.00	..		1.00	..		1.00	..	
Years 11–12	0.79	0.55–1.13		1.50	0.94–2.39		0.57	0.36–0.89	
13 or more years	1.57	0.83–3.00		0.73	0.35–1.53		0.49	0.22–1.12	
No secondary carer	1.05	0.84–1.32		1.05	0.79–1.41		0.85	0.65–1.13	
Occupation^{c}									
Managers/professionals	1.26	0.92–1.73	0.52	0.99	0.69–1.42	0.948	0.93	0.66–1.30	0.664
Tradespersons, clerical workers and labourers	1.00	..	..	..	..	..	..	..	..
Not employed	1.25	1.02–1.52	0.028	0.95	0.76–1.19	0.673	0.93	0.75–1.16	0.523
Family/household characteristics									
Family financial strain									
Spending more than we get	1.59	0.91–2.79	0.211	1.31	0.67–2.56	0.692	1.37	0.78–2.42	0.412
Just enough to get by	1.30	0.80–2.11		0.96	0.54–1.72		1.41	0.81–2.47	
Some left over but spend it	1.16	0.69–1.93		1.01	0.54–1.91		1.07	0.62–1.84	
Can save a bit	1.50	0.91–2.49		1.00	0.54–1.83		1.24	0.72–2.15	
Can save a lot	1.00	..		1.00	..		1.00	..	
Housing tenure									
Owned	1.00	..	..	1.00	..	..	1.00	..	..
Being paid off	0.99	0.61–1.60	0.972	1.41	0.77–2.56	0.264	0.91	0.57–1.46	0.700

Table 3 (*Continued*)

	Injury/accident			Sensory function problem			Oral health problem		
Socioeconomic measure	OR	95% CI	p Value[b]	OR	95% CI	p Value[b]	OR	95% CI	p Value[b]
Renting	0.92	0.61–1.40	0.710	1.32	0.76–2.29	0.333	0.66	0.44–0.99	0.043
Other	0.85	0.54–1.34	0.483	0.91	0.38–2.19	0.840	0.49	0.24–1.03	0.060
Number of indicators of poor housing quality									
None	1.00	..	0.093	1.00	..	0.982	1.00	..	<0.001
One	1.19	0.90–1.56		1.05	0.78–1.42		0.89	0.68–1.16	
Two	1.23	0.92–1.64		1.03	0.72–1.46		0.72	0.54–0.96	
Three or more	0.90	0.69–1.16		1.06	0.77–1.46		0.52	0.38–0.70	
Neighbourhood characteristics									
SEIFA quintiles[d]									
Bottom quintile	1.00	..	0.225	1.00	..	0.105	1.00	..	0.001
Second	1.16	0.93–1.45		1.07	0.81–1.41		1.10	0.83–1.47	
Third	1.28	0.97–1.67		1.37	0.86–2.19		1.43	1.05–1.96	
Fourth	1.08	0.69–1.68		0.48	0.25–0.91		0.55	0.37–0.82	
Top quintile	2.72	0.70–10.20		0.82	0.17–3.92		2.53	0.50–13.60	
IRISEO quintiles[e]									
Bottom quintile	1.00	..	<0.001	1.00	..	0.041	1.00	..	<0.0001
Second	1.50	1.14–1.99		1.81	1.17–2.79		2.72	1.85–4.01	
Third	1.79	1.36–2.36		1.61	1.08–2.39		2.98	2.03–4.36	
Fourth	1.70	1.26–2.31		1.61	1.05–2.49		2.98	1.93–4.60	
Top quintile	2.98	1.15–7.73		2.43	1.16–5.10		5.37	1.90–15.30	

[a] Results are derived from multivariate logistic regression models using a multi-level framework. All models are adjusted for age and sex. Each SES–health variable pair represents a separate model.

[b] Calculated using chi-square tests adjusted for the complex sample design. Chi-square tests for trend were used for ordinal SES variables; standard chi-square tests were used for nominal SES variables.

[c] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. 'Managers and professionals' include occupational skill levels 1 and 2. 'Tradespersons, clerical workers and labourers' include occupational skill levels 3–5.

[d] Customised version of the index of relative socio-economic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs.

[e] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Indigenous persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

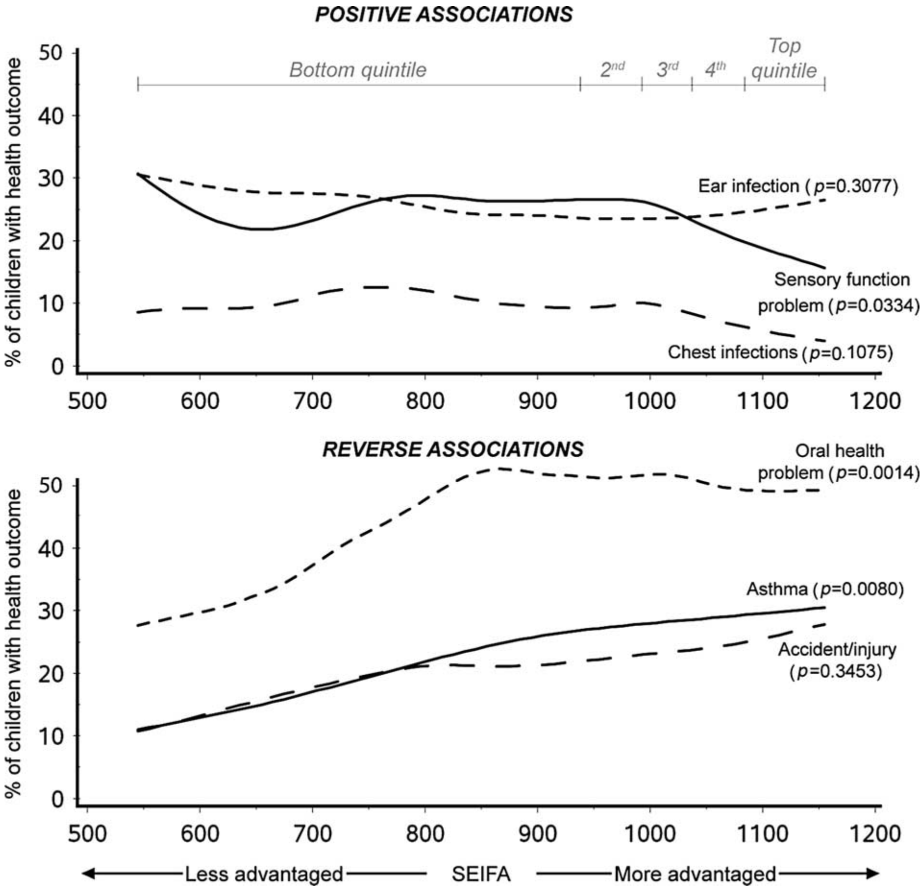

Figure 1. Pattern of association between SEIFA and various physical health outcomes for Western Australian Aboriginal children, 2000–2002.

Note: Data for asthma, and ear and chest infections refer to 0–17-year-olds; all other data refer to 4–17-year-olds. Results are derived using Generalized Additive Models, adjusting for age and sex, and accounting for survey weights.

Discussion

We examined six health outcomes across eight SES variables and found that half of the associations exhibited a statistically significant socio-economic disparity in health, although the direction, shape and magnitude of associations differed. While these findings suggest that socio-economic factors shape the physical health of Aboriginal children to some degree, the diversity of results implies that other factors are likely to play a significant role in the pattern of these health outcomes.

It is not surprising to observe inconsistent patterns across health outcomes, as each outcome has a unique and complex causal pathway and is likely to interact with socio-economic factors in different ways and at different points along the pathway (Marmot and Wilkinson 2006). For example, education is known to influence the aetiology of many health outcomes, partly through pathways involving greater access to material resources and health care (Reynolds and Ross 1998). However, in an

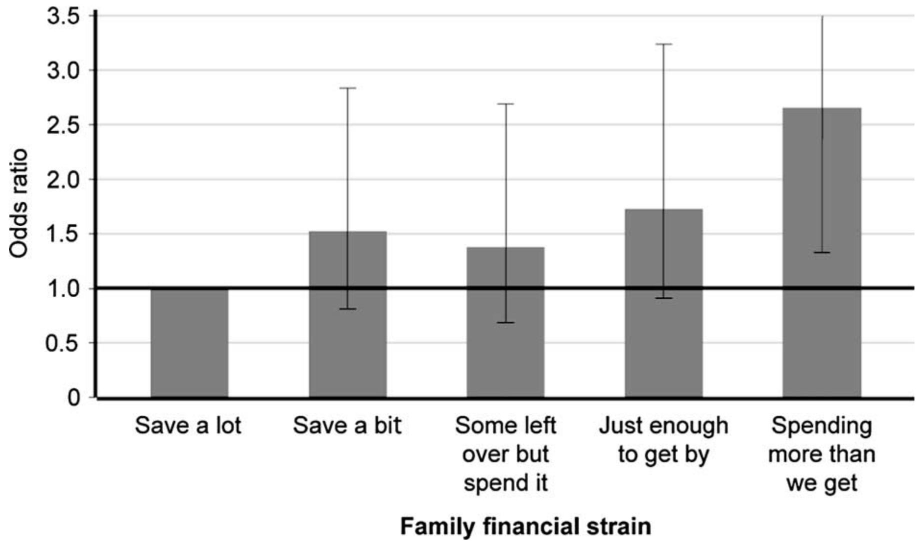

Figure 2. Relative odds of recurring chest infections by categories of family financial strain, Western Australian Aboriginal children aged 0–17 years, 2000–2002.

Note: Odds ratios are derived from logistic regression models, adjusted for age and sex and accounting for survey weights.

Aboriginal context, the pathway from education to wealth creation and health could conceivably be weakened by the direct and indirect effects of discrimination and racism. For example, the persistent marginalisation of Aboriginal peoples can limit developmental opportunities for children. This, in turn, can inhibit the attainment of skills and abilities that can be drawn upon for the benefit of health at each level of SES, and this may alter the SES–health relationship in Indigenous contexts.

Positive gradients

Despite the diversity across outcomes, the results for ear infections, recurring chest infections and sensory function problems were generally consistent with a positive socio-economic gradient. This is the prevailing pattern in the wider literature, where lower parental SES is generally linked to poorer child health outcomes (Adler and Stewart 2010), including conditions related to the physical health outcomes discussed here (Cohen 1999, Chen and Matthews 2002). There are few studies that examine SES–health relationships among Indigenous children, and none are directly comparable with this study. Chi *et al.* reported a positive but statistically insignificant association between helicobacter pylori infection and both parental education and income among Aboriginal children in Taiwan (Chi *et al.* 2009). Studies of adult Aboriginal populations in Australia confirm that there are positive gradients with aspects of physical health, including end-stage renal disease, diabetes and cardiovascular disease (Cass *et al.* 2002, Cunningham *et al.* 2008, Cunningham 2010a, 2010b). The results of these studies may not be generalisable to Aboriginal child populations, given the conflicting evidence on the strength of gradients by age (Bartley *et al.* 1997). While childhood has been characterised as a period of relatively

Table 4. Correlation between SES variables used in the study.[a]

	Education (secondary carer)	Family financial strain	Housing quality	SEIFA[b]	IRISEO[c]
Education (primary carer)	0.47 ($p < 0.001$)	0.30 ($p < 0.001$)	0.38 ($p < 0.001$)	0.17 ($p < 0.001$)	0.17 ($p < 0.001$)
Education (secondary carer)		0.24 ($p = 0.017$)	0.21 ($p = 0.041$)	0.19 ($p < 0.001$)	0.21 ($p < 0.001$)
Family financial strain			0.18 ($p = 0.005$)	0.02 ($p = 0.779$)	0.08 ($p = 0.010$)
Housing quality				0.29 ($p < 0.001$)	0.26 ($p < 0.001$)
SEIFA[b]					0.37 ($p < 0.001$)

[a] Correlation coefficients have been computed for all discrete ordinal and continuous SES variables (nominal variables, such as occupation and housing tenure, have been omitted). Observations with missing values are excluded from all calculations. Coefficients are estimated using linear and logistic regression models, and adjusted to account for the complex survey design and survey weights.

[b] Customised version of the index of relative socio-economic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product.

[c] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Indigenous persons only.

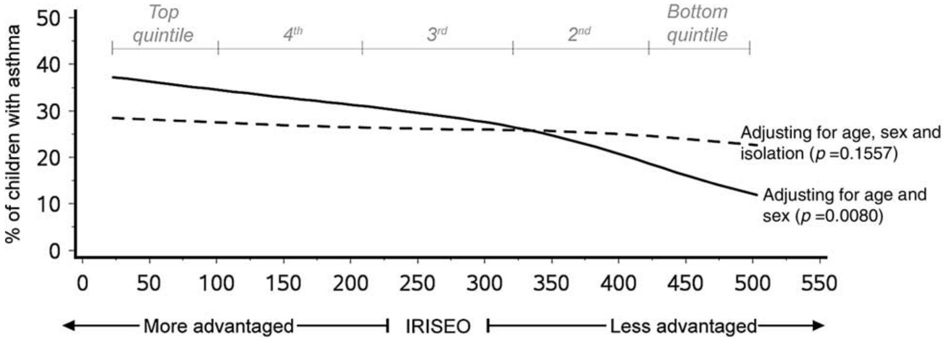

Figure 3. The impact of relative geographic isolation on the pattern of association between area-level socio-economic disadvantage (IRISEO) and asthma for Aboriginal children aged 0–17 years, 2000–2002.
Note: Results are derived using a Generalized Additive Model, adjusting for age and sex, and accounting for survey weights.

shallow gradients, life course patterns are likely to vary depending on the choice of health and SES indicators and population context (Adler and Stewart 2010).

Reverse gradients

However, better health was not always associated with higher SES, particularly for asthma, accidents/injuries and oral health. The reverse associations found here, while curious, are not necessarily surprising results. This pattern has been observed in mainstream populations for each of these three outcomes (Scheidt *et al.* 1995, Goh *et al.* 1996, Dugmore and Rock 2005). Reverse associations between SES and health in mainstream populations have been variously attributed to measurement anomalies (e.g., labelling and reporting bias) or methodological concerns (e.g., no consideration of pertinent mediators such as access to health services, quality of health care and environmental conditions or the impact of SES mobility), and these issues may have relevance to our findings. While our findings for asthma contrast those found for Aboriginal adults (Cunningham 2010c), they are plausibly explained by the hygiene hypothesis, on the assumption that lower SES is linked to greater infectious challenge in early life (Shankardass *et al.* 2007). The associations with accidents and injuries may reflect greater availability of recreational activities and facilities for children living in more affluent areas or in families with greater material resources (Scheidt *et al.* 1995). Further, our measure of childhood accidents/injuries includes hospitalisation events which are influenced by better access to hospitals and more responsive care-seeking behaviours, all of which are typically associated with higher SES (Agency for Healthcare Research and Quality 2003). While the significance of these issues cannot be adequately empirically tested using these data, they remain pertinent theories for further exploration.

Our findings for oral health in Western Australian Aboriginal children are counter to the marked positive socioeconomic gradients found among Aboriginal and Torres Strait Islander children in the Northern Territory (Jamieson *et al.* 2006). This discrepancy may be attributable to differences in sample characteristics, data collection methods or the measurement of oral health between the two studies. In our study, a composite binary indicator was created from carer responses to four questions (ever had holes in teeth, teeth removed, fillings, or sore/bleeding gums), whereas Jamieson *et al*. (2006) analysed the number of decayed, missing and filled teeth in the deciduous dentition (dmft) and in the permanent dentition (DMFT) of children based on dental examinations by a government-funded school dental service. Our carer-reported measure of dental problems may be a greater reflection of dental services access and utilisation than dental problems per se. If so, then our findings would suggest that dental services are more accessible (and possibly affordable) to Aboriginal children living in areas of higher relative advantage.

Conventional and alternative measures of SES

The findings highlighted that a number of SES constructs are associated with child physical health, including those that measure the SES characteristics of carers, families, households and neighbourhoods. The largest disparities in health were observed for area-level SES indicators, which may relate to the greater importance that Aboriginal peoples place on social connections with family and community than to individuals.

The study confirms that the physical health of Indigenous children can differ by conventional measures of SES, although outcomes were more sensitive to primary than secondary carer education and to employment status than occupation. This is in accordance with a substantial body of literature that demonstrates that the education of the mother is a more proximate determinant of child health and development than that of the father (Cochrane *et al.* 1982). More broadly, the diversity of our results could imply that conventional SES measures alone are inadequate for explaining variations in health outcomes in Indigenous contexts. Standard indicators of educational attainment typically ignore knowledge that is valued in Indigenous society (that has an impact on status) but acquired outside of Western education systems, while most income measures do not properly account for the nature of sharing of economic resources that can occur between extended members of Indigenous families (Hunter *et al.* 2003).

Effects of geographic isolation

We demonstrated that geographic isolation does not explain the relationship between SES and Aboriginal child physical health outcomes (with the partial exception of the relationship with an area-based IRISEO). This is somewhat surprising because many of the factors that impact on population health are unevenly distributed across areas of geographic isolation. For example, there tends to be fewer health care services in more isolated areas. This is particularly pertinent for Aboriginal peoples who, despite predominantly living in urban settings, are far more likely than non-Aboriginal Australians to live in remote and isolated areas. The finding that geographical isolation partially explains away the association between IRISEO and child health outcomes confirms a common belief that Aboriginal peoples living in isolated areas are more disadvantaged. Notwithstanding, they also suggest that the area-level SES characteristics of both the Aboriginal and total population have an independent effect on the physical outcomes of Aboriginal children.

Limitations of this study

The main strength of this study is that it draws upon a representative data-set that was collected using robust and culturally appropriate methods, and that it employs rigorous analytical methods. The limitations primarily relate to difficulties in measuring SES and health and a reliance on cross-sectional data which limits an assessment of the causal relationships between SES and health. Our findings are based on self-reported, or subjective, measures of health, which are inherently open to issues of bias, particularly among socially disadvantaged people who may underreport or understate poor health outcomes (Sen 2002). This can give rise to a flatter health gradient when compared with results that rely on objective assessments of health (Matthews *et al.* 2010). This may be exacerbated by the reliance on carer perceptions of child health status – as a carer's views may not accord with that of a medical expert or the child. However, we believe that the use of Aboriginal interviewers, including Aboriginal health workers where possible, has minimised misclassification error. Future research will benefit from collecting information on both objective and self-reported health measures and comparing the patterns of their association with SES.

The measurement of accidents and injuries was restricted to the narrow set of available variables from the survey. The exclusion of a wider range of adverse events, including those resulting in hospitalisation, may have influenced the observed relationships. Sensory function problems were assessed using three different, albeit partly overlapping, limitations (vision, hearing and speech problems). While the prevalence of these limitations was too low to enable separate analysis, their aggregation may have obscured a different SES patterning of health for each limitation.

Access and use of health services is likely to affect a number of the study outcomes. Robust objective measures of health service access were not available in this study; carers were asked about satisfaction with access to services but this is not a substitute for access. We have adjusted our regression model results for geographic isolation (using the LORI measure) and this partly, but not adequately, accounts for the fact that services are less accessible in more remote areas.

Socioeconomic status, like health outcomes, may have been incorrectly reported by some survey participants. Some participants may have considered expenditure on wealth creation initiatives (e.g., home loan repayments) as a family financial strain. If this interpretation was consistently applied by participants then financial strain estimates will be overstated and potentially lessen the strength of health gradients for this SES measure. Further, the overrepresentation of Aboriginal children in the lower levels of all SES constructs used in the study has reduced the statistical power for comparing child health outcomes across SES levels, and this may have obscured the nature of the SES–health relationship in some instances.

Future directions

There is a critical need for future research to identify pathways from SES to Aboriginal child health. Our understanding of these pathways is likely to be enhanced by examining a range of factors that relate specifically to Indigenous circumstances and culture in the past and present day, such as the high levels of stress that Indigenous peoples are typically exposed to in daily life, racism and loss of cultural continuity. These should be explored in conjunction with known determinants of specific child health outcomes.

Most of the SES indicators used in this study are only relatively weakly correlated among themselves and, consequently, continue to have an independent effect on physical health when analysed collectively. This suggests that socio-economic characteristics in different domains and at multiple levels have an independent influence on Aboriginal health, and addressing them has the potential to significantly improve the health status of, and reduce the health inequalities within, Aboriginal populations. Strategies that attempt to reduce social inequalities in health within Aboriginal populations need to be multifaceted, and acknowledge that the development of human capital and supporting the household and wider community environment are all important.

Key messages

- There are significant socio-economic disparities in the physical health outcomes of Indigenous children in Australia
- The direction, shape and magnitude of these socio-economic disparities varies considerably, by both socio-economic measure and health outcome
- The socio-economic characteristics of carers, households and neighbourhoods all have an influence on the physical health of Indigenous children, with area-level measures of SES having the strongest impact.

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Socioeconomic disparities in the mental health of Indigenous children in Western Australia

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Abstract

Background: The burden of mental health problems among Aboriginal and Torres Strait Islander children is a major public health problem in Australia. While socioeconomic factors are implicated as important determinants of mental health problems in mainstream populations, their bearing on the mental health of Indigenous Australians remains largely uncharted across all age groups.

Methods: We examined the relationship between the risk of clinically significant emotional or behavioural difficulties (CSEBD) and a range of socioeconomic measures for 3993 Indigenous children aged 4–17 years in Western Australia, using a representative survey conducted in 2000–02. Analysis was conducted using multivariate logistic regression within a multilevel framework.

Results: Almost one quarter (24%) of Indigenous children were classified as being at high risk of CSEBD. Our findings generally indicate that higher socioeconomic status is associated with a reduced risk of mental health problems in Indigenous children. Housing quality and tenure and neighbourhood-level disadvantage all have a strong direct effect on child mental health. Further, the circumstances of families with Indigenous children (parenting quality, stress, family composition, overcrowding, household mobility, racism and family functioning) emerged as an important explanatory mechanism underpinning the relationship between child mental health and measures of material wellbeing such as carer employment status and family financial circumstances.

Conclusions: Our results provide incremental evidence of a social gradient in the mental health of Aboriginal and Torres Strait Islander children. Improving the social, economic and psychological conditions of families with Indigenous children has considerable potential to reduce the mental health inequalities within Indigenous populations and, in turn, to close the substantial racial gap in mental health. Interventions that target housing quality, home ownership and neighbourhood-level disadvantage are likely to be particularly beneficial.

Keywords: Socioeconomic, Social disparities, Social gradient, Aboriginal, Mental health, Indigenous, Inequality, Australia

Background

Mental health conditions and disorders are among the leading causes of disability in many countries, and are estimated to account for 13% of the total burden of disease worldwide [1]. The existing epidemiological evidence-base, while limited, confirms that mental health problems are a universal dilemma among children and adolescents, with a global prevalence of about 10–20%, and up to 40% in some low income countries [2].

Mental health disorders have complex aetiologies, with a broad range of factors shown to variably influence them [3] across time and by place and lifecourse stage [4]. Among these factors socioeconomic status (SES) is consistently implicated as an important determinant in both adult [5-9] and child populations [10,11]. Overwhelmingly, quantitative studies show that better SES outcomes are associated with better mental health [12-15]. While this pattern has been observed from early childhood (0–5 years), the association is less consistent among young children, potentially owing to the difficulty in identifying mental illness in children of this age [10].

The theories regarding the mechanisms underpinning the association between SES and mental health are

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disputed [16,17]. Explanations of SES disparities in mental health tend to support one of two broad hypotheses: that SES factors cause the onset of a mental health condition (social causation), or that poor mental health causes a downward shift in social class or status (health selection). The relative merits of these hypotheses may depend on the outcome of interest [18,19], although both theories support a distal connection between socioeconomic conditions and mental health [20,21].

There are few reliable population-based studies that have specifically aimed to assess the mental health of Indigenous Australians (Aboriginal and Torres Strait Islander peoples; herein referred to as Aboriginal) [22,23]. This partly reflects the difficulties in measuring mental health in culturally distinct populations. The complexities of accurate assessment in these contexts extend to issues of diagnostic validity (e.g. the reliability and validity of mainstream assessment tools, and appropriateness of Western classification systems) [24], misdiagnosis (e.g. as a result of language problems) and under-reporting (e.g. not willing to identify as belonging to a minority group) [25]. These issues are complicated by differences in the definition of mental health concepts and associated terminology between Western and other (including Aboriginal) cultures [23]. The scant quantitative literature, in conjunction with a wider body of qualitative and ethnographic studies, suggests that the mental health outcomes of Aboriginal Australians are particularly poor [25,26], and worse than those of non-Aboriginal Australians [27]. Recent evidence reveals that these disparities are evident in childhood and adolescence [28,29].

The distribution of mental health outcomes across socioeconomic strata within Aboriginal populations of Australia is largely undescribed. A recent review highlighted that the social patterning of physical health in Aboriginal Australia is diverse, and found limited and inconclusive evidence on mental health [30]. While the mental health outcomes of mainstream populations of Australian children typically reflect a social gradient [14,31,32], it is unclear whether this pattern characterises Aboriginal children.

It is plausible that the association between SES and mental health is relatively muted in Aboriginal population groups. It is now well-accepted that the unique post-colonial history of Aboriginal Australia, characterised by widespread dispossession, exclusion, discrimination and marginalisation, has had profoundly negative effects on the wellbeing of Aboriginal peoples. Evidence suggests that these effects include high levels of stress in the lives of a disproportionate number of Aboriginal people in all levels of the social hierarchy [33] and, correspondingly, this may limit the mental health benefits that normally accrue from improved SES. In addition, extended family networks, cultural continuity, and connection to traditional lands may exert a greater influence on Aboriginal health than SES.

Gaining an appreciation of the relationship between SES and the mental health of Aboriginal children is important for a number of reasons. Evidence that details the magnitude and shape of mental health disparities within Aboriginal child populations, and the mechanisms that mediate the impact of SES on mental health, can provide insights into the relative importance of social conditions to child mental health outcomes. This would facilitate a better grasp of the complex underlying mechanisms that lead to poor mental health among Aboriginal children specifically and Aboriginal peoples more generally. It is also likely to broaden the scope of this field of research with the recognition of social factors that may play a critical role in the mental health of Aboriginal children but are not implicated as traditional determinants of mental wellbeing.

Further, there are important policy implications of improving our knowledge in this area. If there are relatively weak socioeconomic gradients in the mental health of Aboriginal child populations then investments aimed at improving socioeconomic conditions (e.g. the employment, income and education of carers) may not translate into the same level of improvement in the mental health of Aboriginal populations as in mainstream populations. Such investments may fail to substantially reduce the disparities in mental health status between Aboriginal and other populations of children. This implies that policy intent, expectations and interventions would need to be modified in order to substantially benefit the mental health of Aboriginal children. Importantly, if interventions can improve the mental health status of Aboriginal children they are likely to have positive consequences for subsequent generations of adults, given that physical and mental wellbeing in childhood builds the foundation for health and development throughout the lifecourse [4,34].

This study aims to examine the nature of the relationship between SES and mental health among Aboriginal children in Western Australia, and the underlying mechanisms, using a rare and large, representative sample that is well-characterised and comprehensively measured. We use a reliable, validated measure of emotional and behavioural difficulties applicable to Aboriginal children and youth in Western Australia [35] to investigate the pattern of associations with conventional and alternative measures of SES at individual, family, household and community levels.

Methods

Data are from the 2000–2002 Western Australian Aboriginal Child Health Survey (WAACHS), a population representative study of the health, development and education of Aboriginal children aged 0–17 years in the state of Western Australia, and their families and communities. While the data source is now over ten years old, they still provide a reliable assessment of the social, economic and health circumstances of Aboriginal children and families as there have been few significant changes in these circumstances across Australia since the WAACHS data were collected [36]. The survey used an area-based clustered multi-stage sample design. Dwellings in selected census collection districts (CDs) were approached and in-scope families were surveyed, where there was an Aboriginal child aged 0–17 years living in the dwelling. All Aboriginal children aged 0–17 years in in-scope families were selected to participate in the survey. Of all eligible families, 84% consented to participate in the survey and useable information was obtained on 96% of participating children (from interviews with their carers, supplemented with self-reported information from 12–17 year old participants). This netted a final sample of 5289 Aboriginal children living in 1999 responding families, equating to almost 18% of all Aboriginal children living in Western Australia. In addition to data on the health of children, interviews were conducted among primary carers and, where possible, secondary carers of children to gather information on the demographic, social and economic circumstances of families, households and the communities in which they lived. Primary and secondary carers were the people who spent the most time with survey children and knew them best. The primary carer was usually the mother of the child (80%). In the majority of cases, the secondary carer was the father of the child (77%) or another related person (19%). Most primary (83%) and secondary (79%) carers identified themselves as Aboriginal. All aspects of the survey were conducted under the direction of a steering committee of senior Aboriginal people from a cross-section of settings and organisations, to ensure the cultural integrity of survey methods and processes. The full details of the design and conduct of the WAACHS have been described elsewhere [33].

Measuring mental health

Information on mental health outcomes was gathered from primary carers of participating children aged 4–17 years. The Strengths and Difficulties Questionnaire (SDQ) was used to assess risk status for clinically significant emotional or behavioural difficulties (CSEBD) [37,38], and was modified, with permission from the author, to be more suitable for use in Australian Aboriginal populations. Consistent with its design parameters, the SDQ was collected only for participants aged 4–17 years. No reliable indicator of infant and toddler mental health was available to the survey – as such, no mental health data were collected for 0–3 year olds. The 20 questions that examined emotional symptoms, conduct problems, hyperactivity and peer problems were combined to produce a SDQ Total Score (range 0–40). Primary carers' responses to the SDQ form the basis of the analysis of Aboriginal children's emotional and behavioural difficulties in this study, with scores of 17–40 indicating that a child was at high risk of CSEBD (Figure 1). The SDQ Total Score demonstrated excellent psychometric properties across a range of geographic areas, from urban to very remote settings (Raykov's Rho = 0.93) [39].

The term 'mental health' is used here to describe the WAACHS measure of risk of CSEBD, in preference to 'social and emotional wellbeing' (SEWB). Mental health is one aspect of the broader concept of SEWB and its scope does not include the aspects of SEWB that pertain to issues of suicide, self-harm, spiritual wellbeing, and the broader issues that impact on the wellbeing of Aboriginal communities.

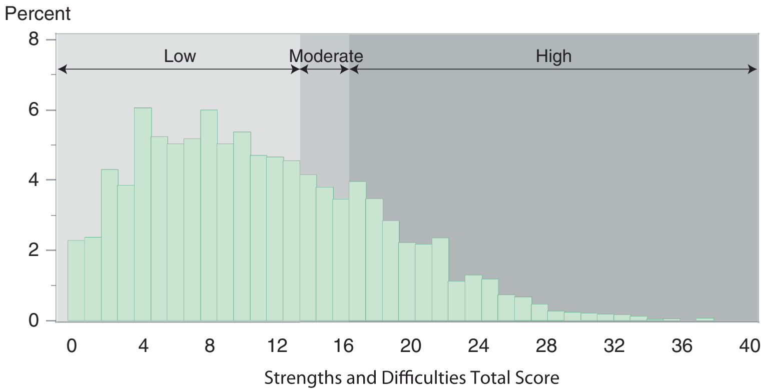

Figure 1 Distribution of SDQ total scores among aboriginal children aged 4–17 years, Western Australia. Note: SDQ = Strengths and Difficulties Questionnaire; 'Low, 'Moderate' and 'High' indicate risk of clinically significant emotional or behavioural difficulties. Figure from Zubrick et al., 2005, used with permission [29].

SES measures

SES was measured using seven variables, including characteristics of parents/carers (educational attainment of primary carer and highest occupational class of carers), families/households (family financial strain, housing tenure, housing quality) and neighbourhoods/communities (two composite indexes of socioeconomic disadvantage; one based on the total population and the other on the Aboriginal population only). This array of measures was chosen for four main reasons. First, reliance on a single measure is unlikely to capture how socioeconomic position shapes health disparities in any population. This is particularly true among Aboriginal populations because they are more likely to be distributed at the lower levels of any SES construct [40]. Second, it is necessary to measure different dimensions of SES at multiple levels in order to capture the complex influences of socioeconomic disadvantage on mental health in Aboriginal populations. Third, use of two different area-level SES measures enables us to distinguish compositional from contextual effects on health disparities. Fourth, it is important to test the saliency of conventional versus alternative SES indicators in shaping health disparities, particularly in Aboriginal and other disadvantaged populations [41-43]. We have included conventional indicators of social class (education and occupation) and used a subjective rating of family financial strain as a proxy measure of material wellbeing. Financial strain is used in preference to a conventional measure of household income, for two main reasons: first, income data were not collected from all household members that contributed to its financial base; and second, income does not capture the nature of sharing of economic resources that can occur between members of extended Aboriginal families [44]. Housing characteristics are afforded prominence in these analyses, given that Aboriginal children often experience sub-standard housing that fails to meet the basic requirements for maintaining physical and mental health and social wellbeing [45,46]. Housing tenure and quality can also be considered as proxy indicators of income and wealth [47] and have been included to complement the measure of financial strain (income) in describing the material wellbeing of Aboriginal families and households.

Information about the characteristics of primary carers, families and households was provided by the primary carers of participating children. Secondary carers provided separate responses on their occupational class. Housing quality was measured using a set of indicators based on a nationally agreed framework for the design, construction and maintenance of Indigenous housing [48]. This includes whether the house had facilities for washing people and clothes, removing waste safely, storing and cooking food, and controlling the temperature. Households were classified into one of four categories: having none, one, two, or three or more indicators of poor housing quality.

The Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product and Biddle's Index of Relative Indigenous Socioeconomic Outcomes (IRISEO) were used to measure area-level socioeconomic disadvantage [49,50]. The SEIFA index ranks the relative level of disadvantage of areas using the attributes of all persons (Aboriginal and non-Aboriginal) in each CD, and includes measures of income, educational attainment, employment status and occupational skill. Quintiles were determined based on the distribution of values for all Australian CDs. Biddle's IRISEO is a rank order variable that measures the socioeconomic outcomes of all 531 Indigenous Areas in Australia in 2001, based on the employment, income, education and housing characteristics of Aboriginal persons only [50]. Quintiles were determined based on the distribution of IRISEO values for all Australian Indigenous Areas.

Geographic isolation

Geographic isolation is defined using the Level of Relative Isolation (LORI) classification, which is based on the Accessibility/Remoteness Index of Australia (a widely used classification of remoteness in Australia). The five categories of isolation reflect differences in access to services, cultures and health outcomes for Aboriginal children in Western Australia, and range from none (Perth metropolitan area), to low, moderate, high and extreme [51].

Non-response and imputation

The survey sample was broadly representative of the population of Aboriginal children living in Western Australia, although comparisons with population benchmarks revealed that age, household size and region were significantly associated with non-response. The sample had a lower proportional representation of older children and children living in small households and the south-west region of Western Australia (including the Perth metropolitan area). Post-stratification weighting was employed to adjust for differences in response rates by age, household size and region and produce unbiased estimates. There was only a small amount of non-response to individual questions. While an imputation procedure was employed to assign values to non-responding items, the percentage of imputed values was less than 1% for each variable. Thus, imputation had no effect on the results of this study. Information was unable to be obtained on the characteristics of 15% of secondary carers, and we have treated all variables from these records as missing in the following analysis. More details about non-response characteristics, weighting and imputation are available elsewhere [51].

Analysis

The analysis in this study was restricted to data from the 3993 children aged 4–17 years for whom the SDQ was collected. Analysis was conducted using logistic regression techniques within a multilevel framework. Models were fitted with the method described by Pfeffermann et al. [52], which takes into account the survey weights and the hierarchical structure of the data, i.e. selection of children within families and communities. A dichotomised total SDQ score was the outcome of interest and modelled separately with each of the following SES variables: carer education, carer occupation, family financial strain, housing tenure, housing quality, SEIFA and IRISEO. Age, sex and LORI are included in the first step (Model 1). Known covariates were entered in blocks at separate steps. The results of successive steps were only reported here if the SES variable achieved marginal statistical significance ($p < 0.10$). Child physical health factors (whether child had runny ears, whether child had normal vision in both eyes, whether child had difficulty saying certain sounds) were added in the second step (Model 2). Factors related to the physical and mental health of the carer (whether primary carer had a medical condition for 6 months or longer, whether the primary carer had used Mental Health Services) were added in the third step (Model 3). Factors related to the circumstances of the family and household (quality of parenting, life stress events, family composition, overcrowding, number of homes the child had lived in, whether bothered by racism in the neighbourhood/community, and family functioning) were added in the fourth step (Model 4). All models report odds ratios, with the highest status category used as the reference category for ordinal SES variables. Standard errors for survey estimates of total numbers of children were produced using the Ultimate Cluster Variance estimation technique [53]. Standard errors for estimates of odds ratios and proportions were calculated using a modified form of the Jack knife variance estimation technique [54]. Standard chi-square tests adjusted for the complex sample design were used to assess the difference between categorical SES indicators and a dichotomised total SDQ score. SAS version 9.2 was used for all analyses (SAS Institute Inc., Cary, NC, USA, 2000–08).

Ethical approvals

The WAACHS was conducted under ethical approvals from the (then) Western Australian Aboriginal Health Information and Ethics Committee (WAAHIEC) and the (then) King Edward Memorial and Princess Margaret Hospital Ethics Committee. In addition to the WAAHIEC, this analytic study was approved by Curtin University's Human Research Ethics Committee and endorsed by the Aboriginal Collaborative Council Advising Research and Evaluation at the Telethon Institute for Child Health Research.

Results

Almost a quarter (24%) of Aboriginal children was at high risk of clinically significant emotional or behavioural difficulties (CSEBD). Aboriginal children were largely distributed in the more disadvantaged categories of most measures of SES, with few represented in the top category: only 6% of Aboriginal children had a primary carer with a post-secondary education, 5% lived in a family that could 'save a lot', and less than 1% lived in areas that fall into the top SEIFA quintile (more advantaged areas). When area-level relative disadvantage based on the characteristics of Aboriginal people only (IRISEO) was analysed, 17% of our study population was in the top two quintiles (Table 1). This signals that, on average, Aboriginal children in Western Australia live in areas with less favourable socioeconomic characteristics than other Aboriginal people across Australia.

Table 2 presents odds ratios from logistic regression analyses, and highlights a generally positive – and significant – association between SES and risk of CSEBD in Aboriginal children, suggesting that those with higher SES have better mental health. The strength and shape of the associations with mental health vary by SES measure, although the most consistent gradients were found for housing quality and tenure. For example, children living in poorer quality housing (three or more indicators of poor quality) were 3.1 times more likely ($p < 0.01$) to be at high risk of CSEBD than those in the top category (no indicators of poor quality), after adjusting for age, sex and geographic isolation. Children living in rented housing were 1.9 times more likely ($p < 0.01$) to be at high risk of CSEBD than those in houses that were owned or being paid off by its occupants. The relationship between CSEBD and SEIFA represents a threshold effect, whereby those in the top (most advantaged) SEIFA quintile were at least four times less likely to be at high risk of CSEBD than other children, although only 0.5% of children were in the top quintile (Table 1). While the carer occupation variable was significantly associated with CSEBD, the disparities in odds ratios reflect differences in CSEBD by employment status rather than occupational skill.

There was a positive, but not continuous, gradient between the primary carer's educational level and the child's mental health, although the effects were not statistically significant. There was no clear pattern in CSEBD outcomes when using IRISEO as the SES indicator.

The relationships between SES and CSEBD are partly attenuated by other known covariates – especially by factors that describe the circumstances of Aboriginal families and households, such as parenting quality, life

Table 1 Mental health, SES and demographic characteristics of Aboriginal children aged 4–17 years in Western Australia[a]

	Number	% (95% CI)
Mental health status		
Risk of clinically significant emotional or behavioural difficulties		
Low risk	14800	64.6 (62.2–66.9)
Moderate risk	2610	11.4 (10.3–12.6)
High risk	5490	24.0 (21.9–26.1)
SES characteristics		
Education: primary carer		
13 or more years	1370	6.0 (4.6–7.6)
Years 11-12	5080	22.2 (20.0–24.4)
Year 10	9920	43.3 (40.7–46.0)
Year 9 or less[b]	5960	26.0 (23.7–28.4)
Occupation[c]		
Managers and professionals	2910	13.0 (11.2–15.0)
Tradespersons, clerical workers and labourers	8480	38.0 (35.4–40.7)
Not employed	10900	49.0 (46.2–51.8)
Family financial strain		
Can save a lot	1080	4.7 (3.5–6.2)
Can save a bit	5780	25.3 (23.0–27.6)
Some left over but spend it	3040	13.3 (11.5–15.3)
Just enough to get by	10400	45.2 (42.6–47.9)
Spending more than we get	2050	9.0 (7.5–10.6)
Housing tenure		
Owned or being paid off	4800	21.0 (18.6–23.6)
Renting	16600	72.3 (69.6–75.0)
Other	960	4.2 (3.0–5.6)
Number of indicators of poor housing quality		
None	6930	30.3 (27.7–32.9)
One	6180	27.0 (24.7–29.3)
Two	4950	21.6 (19.4–24.0)
Three or more	4840	21.1 (18.9–23.6)
SEIFA[d] (quintiles)		
Top (more advantaged)	120	0.5 (0.1–1.9)
Third and fourth	3750	16.4 (13.1–20.0)
First and second (less advantaged)	19000	83.1 (79.4–86.5)
IRISEO[e] (quintiles)		
Top (more advantaged)	260	1.1 (0.4–2.3)
Fourth	3660	16.0 (13.5–18.8)
Third	7310	32.0 (28.9–35.2)
Second	6580	28.8 (25.4–32.4)
First (less advantaged)	5020	22.0 (18.5–25.7)
Demographics		
Age (years)		
4-11	13900	60.6 (58.6–62.5)
12-17	9040	39.4 (37.5–41.4)
Sex		
Male	11700	51.2 (49.3–53.1)
Female	11200	48.8 (46.9–50.7)
Level of relative isolation		
None	7830	34.2 (31.6–36.9)
Low	5590	24.4 (21.8–27.1)
Moderate	4680	20.4 (17.1–24.0)
High	2550	11.2 (8.4–14.4)
Extreme	2260	9.8 (7.1–13.0)

[a] Numbers are weighted estimates of the population of Aboriginal children in each category, and have been rounded. Proportions are based on all Aboriginal children aged 4–17 years (N = 22900). The frequencies of missing responses have not been reported.

[b] Includes those who had not attended an educational institution.

[c] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. 'Managers and professionals' include occupational skill levels 1 & 2. 'Tradespersons, clerical workers and labourers' include occupational skill levels 3–5.

[d] Customised version of the index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics' Socioeconomic Index for Areas (SEIFA) product. Quintiles were determined based on the distribution of values for all Australian CDs.

[e] Biddle's Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Aboriginal persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

stress events, family composition, overcrowding, household mobility, perceptions of racism in the neighbourhood, and family functioning. This is most evident for occupation and family financial strain, where adjusted effect sizes are reduced to close to null (Table 2). In contrast, the inclusion of covariates describing aspects of the physical health of the child had little impact on the strength of the social gradients in mental health, whereas the physical and mental health of the carer had a modest influence on the relationships between mental health and occupation, family financial strain and housing quality (Table 2). Housing quality, housing tenure and SEIFA continue to be strongly associated with Aboriginal child mental health after adjusting for the full range of relevant covariates available from the dataset, although there is some attenuation of the odds ratios in the case of the latter two variables (Table 2 and Figure 2).

Additional file 1, Additional file 2 and Additional file 3 provide separate odds ratios for all variables (SES and other known covariates) in logistic regression models where carer occupation, family financial strain and housing tenure are the primary independent variable of interest, respectively. They highlight independent significant associations between CSEBD and all of the included covariates. The results affirm that children have an elevated

Table 2 Relative odds of a mental health problem[a], by socioeconomic measure[b]

Socioeconomic measure	Odds ratio: Model 1[c]	Adjusted odds ratio: Model 2[c]	Adjusted odds ratio: Model 3[c]	Adjusted odds ratio: Model 4[c]
Education: primary carer				
13 or more years	1.00	—	—	—
Years 11–12	1.37			
Year 10	1.16			
Year 9 or less[d]	1.81			
Occupation[e]				
Managers/professionals	1.10	1.08	1.07	0.96
Tradespersons, clerical				
workers and labourers	1.00	1.00	1.00	1.00
Not employed	1.94***	1.91***	1.64**	1.17
Family financial strain				
Can save a lot	1.00	1.00	1.00	1.00
Can save a bit	1.75*	1.86**	1.95**	1.56
Some left over but spend it	1.61	1.72*	1.80*	1.25
Just enough to get by	1.79**	1.89**	1.90**	1.23
Spending more than we get	2.70***	2.72***	2.54***	1.34
Housing tenure				
Owned or being paid off	1.00	1.00	1.00	1.00
Renting	1.93***	1.90***	1.83***	1.54***
Other	2.60***	2.55***	2.48***	1.78*
Number of indicators of poor housing quality				
None	1.00	1.00	1.00	1.00
One	1.82**	1.78**	1.52	1.36
Two	2.24***	2.18***	2.02**	1.88**
Three or more	3.13***	2.93***	2.66***	2.80***
SEIFA (quintiles)[f]				
Top (more advantaged)	1.00	1.00	1.00	1.00
Third and fourth	4.81**	4.89**	5.83**	4.43*
First and second (less advantaged)	5.69**	5.91**	6.71**	4.68**
IRISEO (quintiles)[g]				
Top (more advantaged)	1.00	—	—	—
Fourth	1.82			
Third	1.04			
Second	1.58			
First (less advantaged)	0.91			

Notes: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$; p values are calculated using chi-square tests adjusted for the complex sample design.

[a] High risk of clinically significant emotional or behavioural difficulties (CSEBD).

[b] Results are derived from multivariate logistic regression models using a multilevel framework. Results for each SES variable represents a separate model.

[c] All models include age, sex, Level of Relative Isolation (LORI) and the socioeconomic variable of interest. Model 2 also includes child physical health factors (whether child had runny ears, whether child had normal vision in both eyes, whether child had difficulty saying certain sounds). Model 3 further adds factors related to the physical and mental health of the carer (whether primary carer had a medical condition for 6 months or longer, whether the primary carer had used Mental Health Services). Model 4 further adds factors related to the circumstances of the family and household (quality of parenting, life stress events, family composition, overcrowding, number of homes the child had lived in, whether bothered by racism in the neighbourhood/community, and family functioning). Successive steps were conducted if the socioeconomic variable achieved marginal statistical significance ($p < 0.1$).

[d] Includes those who had not attended an educational institution.

[e] Highest occupational class of primary and secondary carers. Occupation categories have been dichotomised based on skill levels defined in the Australian Standard Classification of Occupations, second edition. ‘Managers and professionals’ include occupational skill levels 1 & 2. ‘Tradespersons, clerical workers and labourers’ include occupational skill levels 3–5.

[f] Customised version of the index of relative socioeconomic disadvantage that forms part of the Australian Bureau of Statistics’ Socioeconomic Index for Areas (SEIFA) product. Percentiles were determined based on the distribution of values for all Australian CDs.

[g] Biddle’s Index of Relative Indigenous Socioeconomic Outcomes. The index was derived using the characteristics of Aboriginal persons only and quintiles were determined based on the distribution of values for all Australian Indigenous Areas.

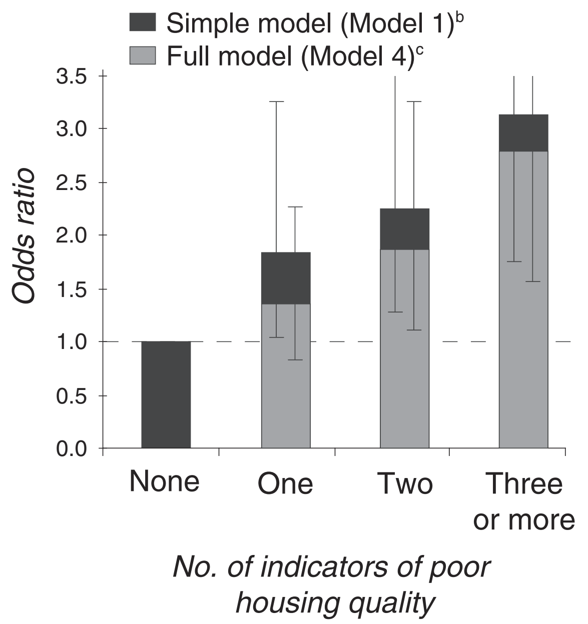

Figure 2 Relative odds of a mental health problem[a], by number of indicators of poor housing quality. [a] High risk of clinically significant emotional or behavioural difficulties. [b] Simple model (Model 1) adjusts for age, sex and geographic isolation. [c] Full model (Model 4) also adjusts for a range of factors related to the physical health of the child, the physical and mental health of the carer, and the circumstances of the family and household.

odds of CSEBD if they had experienced runny ears, vision problems or difficulty saying certain sounds, had a primary carer that had used Mental Health Services or had a chronic medical problem, lived in a sole parent family or without a biological parent, experienced poor parenting quality, poor family functioning, significant life stress or racism, or had moved homes a lot. In contrast, being female, an older child, or living in overcrowded conditions or in the most isolated areas, appeared to be protective of mental health. Among these variables, the strongest associations with CSEBD were found with quality of parenting, life stress events, geographic isolation and whether the child had difficulty saying certain sounds – with odds ratios typically exceeding 3.

Discussion

The pervasive inequalities in health between Aboriginal and non-Aboriginal people in Australia has demanded a better understanding of the aetiology of poor health outcomes in Aboriginal populations – including mental health. While the current scientific literature implicates social factors and processes in the complex pathways to mental health problems, there has been little scrutiny of the saliency of these factors in Aboriginal population groups.

Our findings generally indicate that higher SES is associated with a reduced risk of clinically significant emotional or behavioural difficulties (mental health problems) in Aboriginal children. Housing and neighbourhood SES characteristics feature prominently in this study, with housing tenure, housing quality and neighbourhood-level disadvantage all having a strong direct effect on mental health. These results are consistent with the extant literature that acknowledges the multiple benefits of housing and neighbourhoods to mental wellbeing [46,55-58]. Previous research has shown that housing has indirect effects on mental health via material and psychosocial pathways. For example, inadequate housing can lead to social disruption and stress and can limit access to services, while home ownership generally provides greater control over the living environment and choice of neighbourhood [47]. The relatively high prevalence of inadequate housing among Aboriginal peoples, the unique geographic dispersion of Aboriginal populations, and the added difficulties in providing and maintaining quality housing in remote communities, may add to the significance of housing as a critical determinant of the mental health of Aboriginal children.

The circumstances of Aboriginal families and households emerged as an important explanatory mechanism, particularly in the relationship between child mental health and both carer employment status and family financial circumstances. This suggests that factors such as parenting quality, stress, family composition, overcrowding, residential mobility, racism and family functioning have a substantial mediating role in the pathway from material wellbeing to poor mental health. Stress is of particular importance here as it has been shown to be a feature of the lives of many Aboriginal families [57,59,60], and to have deleterious effects on the developing brain, including emotional functioning [61]. Racism and overcrowded living conditions are two of the key sources of stress faced by Aboriginal people and families and have been shown to exacerbate mental health problems [56,62]. Overcrowding has been cited as a common problem in households with Aboriginal people [63] – particularly in remote communities [64]– and can magnify stress in a number of ways. More household residents can lead to less privacy, increased noise, lack of sleep, and a general loss of control. It can also increase contact between residents, which has been shown to promote the spread of infection and disease [57,65,66] and, accordingly, increase the strain and anxiety in a person's life. Racism occurs at both interpersonal and systemic levels in Australian society and it impacts a disturbingly high proportion of Aboriginal people [67]. While the effects of racism on Aboriginal wellbeing is an emerging area of research in Australia, the international literature suggests that discrimination and racism may be a direct cause of psychological distress and/or have an indirect effect on wellbeing via pathways involving smoking and alcohol and substance misuse [68].

While stress is consistently implicated as a primary link between SES and mental health [7,8,10,11], most of the hypothesised pathways have not been fully or adequately investigated in child populations [10]. It is also plausible that stress, racism and overcrowding (and the other potential mediators discussed above) lead to lower SES which, in turn, has a detrimental impact on mental wellbeing. For example, interpersonal and systemic racism can limit the labour market opportunities of parents, leading to a range of stresses that stem from financial insecurity.

The lack of clear evidence of a relationship between primary carer education and child mental health is notable, considering the substantial body of literature that highlights the positive impact of parental education – particularly that of the mother – on child development and wellbeing [4,69,70]. This finding however is consistent with results on aspects of the physical health (scabies, respiratory and ear infections, and diarrhoea and vomiting) of Aboriginal children in remote settings in the Northern Territory of Australia,[57] and may reflect Aboriginal peoples' often adverse interactions with mainstream Australia since colonisation and the associated legacies. For instance, Western education systems have been heavily implicated in the policies and practices of forced separation from family and kinship networks that were a widespread phenomenon in Australia until the 1970s [71]. The removal of children into missions and other institutions may have provided more formal education for some but had profound detrimental effects on the psychosocial functioning of these "stolen generation" children and their onward ability to adequately undertake the tasks of parenthood [72,73]. Discrimination and racism is a common thread to past practices of dispossession and removal and the persistent marginalisation of Aboriginal peoples' in present day Australian society. Racism has been shown to limit the ability of parents to promote optimal child development, by increasing psychological distress and disrupting community cohesion and the supports for raising children [74]. These stresses are likely to impair the ability of all parents to cope and could plausibly overwhelm the protective effects of parental education on child mental wellbeing.

Strengths and limitations

The main strengths of this study are that it: (1) draws upon a large and representative dataset that was collected using robust and culturally appropriate methods and processes; (2) utilises a validated and reliable tool for assessing mental health problems; (3) employs rigorous analytical methods; and (4) uses a wide range of SES indicators that measure different aspects of socioeconomic disadvantage in the Western Australian Aboriginal population.

The main limitation is our reliance on cross-sectional data which limits our ability to assess the causal relationships between SES and mental health. Further, a range of generic and context-specific difficulties in measuring SES may have influenced our results. First, SES may have been incorrectly reported by some survey participants. Some participants may have considered expenditure on wealth creation initiatives (e.g., home loan repayments) as a family financial strain. If this interpretation was consistently applied by participants then financial strain will be overstated and potentially lessen the strength of mental health disparities for this SES measure. Second, there are difficulties in creating robust and meaningful SES measures in Aboriginal contexts. For instance, standard indicators of educational attainment typically ignore knowledge that is valued in Indigenous society (that may have an impact on wellbeing) but acquired outside of Western education systems. Third, our measure of education attainment does not capture the quality of the educational experiences of carers. The relatively poor performance of Aboriginal people in education is well-documented [36,75], and suggests that, at every level of education, Aboriginal people may acquire less health-benefitting knowledge and skills than non-Aboriginal people. If this is applicable to our study sample then we are likely to have understated the strength of the association between carer education and mental health. Fourth, our IRISEO measure is constructed using relatively broad geographic areas where the Aboriginal population often constitute a small minority; consequently, the index may mask the SES characteristics of the total population of an area, and variations in SES within areas. In addition, IRISEO does not capture all community-level SES variables or the full spectrum of factors that have been identified by Aboriginal Australians as important to community wellbeing, such as the resources gained from traditional subsistence activities, access to traditional lands and cultural maintenance [50]. Accordingly, the lack of a clear association between child mental health and the area-level SES characteristics of the Aboriginal population may be an artefact of the composition of the IRISEO measure.

Conclusions

Our findings are consistent with the prevailing pattern in the mainstream literature – in Australia and elsewhere – where higher parental and household SES is generally associated with better child mental health outcomes [31,32,70,76-80]. This study, in conjunction with a small set of studies of Aboriginal child, youth and adult populations in Australia [27,81-83], provides incremental evidence of a social gradient in the mental health of Aboriginal populations. This has important policy implications, particularly in light of the considerably higher prevalence of mental health problems among Aboriginal children than non-Aboriginal children in Western Australia [29]. The larger burden of mental health among Aboriginal children represents a major public health problem affecting Australian society as a whole. Our findings suggest that improving the social, economic and psychological conditions of Aboriginal families has considerable potential to reduce the mental health inequalities within Aboriginal populations and, in turn, to close the substantial racial gap in mental health. Interventions that target housing quality, home ownership and neighbourhood-level disadvantage are likely to be particularly beneficial. Part of the goal should be to reduce the number of life stresses faced by Aboriginal families, which is likely to have significant payoffs for Aboriginal child wellbeing and development.

Additional files

Additional file 1: Relative odds of a mental health problem, by carer occupation and factors related to the child's physical health, the physical and mental health of the carer, and the circumstances of the family and household. Odds ratios from logistic regression analyses are provided for the primary explanatory variable (carer occupation) and separately for a range of known covariates with mental health.

Additional file 2: Relative odds of a mental health problem, by family financial strain and factors related to the child's physical health, the physical and mental health of the carer, and the circumstances of the family and household. Odds ratios from logistic regression analyses are provided for the primary explanatory variable (family financial strain) and separately for a range of known covariates with mental health.

Additional file 3: Relative odds of a mental health problem, by housing tenure and factors related to the child's physical health, the physical and mental health of the carer, and the circumstances of the family and household. Odds ratios from logistic regression analyses are provided for the primary explanatory variable (housing tenure) and separately for a range of known covariates with mental health.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

CCJS was the primary author of the manuscript, completed the analysis of data and interpretation of results. JL conceived of the study and assisted with writing the manuscript. FM assisted with data analysis and edited the manuscript. SRZ conceived of the study and edited the manuscript. All authors read and approved the final manuscript.

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APPENDIX C: STATEMENT OF CONTRIBUTION BY CO-AUTHORS

To whom it may concern,

Carrington C.J. Shepherd was the primary author of the papers listed below, completed the analysis of data and interpretation of results for papers 2–4 and the review and synthesis for paper 1. Jianghong Li assisted in the conceptual development and writing of papers 1, 2 and 4. Stephen R. Zubrick assisted in the conceptual development of all papers and the writing of papers 1, 2 and 3. Francis Mitrou assisted with the analysis of data for paper 4. All co-authors have edited multiple drafts of the papers, and approved the final versions of papers for submission to peer reviewed journals and research monographs.

1. Shepherd CCJ, Li J, Zubrick SR. Social Gradients in the Health of Indigenous Australians. Am. J. Public Health. 2012; 102(1):107-117.
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3. Shepherd CCJ, Li J, Zubrick SR. Socioeconomic disparities in physical health among Aboriginal and Torres Strait Islander children in Western Australia. Ethn. Health. 2012; 17(5):439-461.
4. Shepherd CCJ, Li J, Mitrou F, Zubrick SR. Socioeconomic disparities in the mental health of Indigenous children in Western Australia. BMC Public Health. 2012; 12:756.

Carrington C.J. Shepherd (candidate)	Stephen R. Zubrick (supervisor and co-author)

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