



# Health and wellbeing of Indigenous adolescents in Australia: a systematic synthesis of population data

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## Summary

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**Background** Indigenous populations have high rates of disease and premature mortality. Most Indigenous communities are young, and adolescence (age 10–24 years) provides great opportunities for population health gain. However, the absence of a comprehensive account of Indigenous adolescents' health has been a barrier to effective policy. We aimed to report a national health profile for Indigenous adolescents in Australia.

**Methods** We undertook a systematic synthesis of population data to report the health and wellbeing of Indigenous adolescents in Australia. A reporting framework for Indigenous adolescent health in Australia was defined to measure health outcomes, health risks, and sociocultural determinants. Available data (primary data from national surveys and administrative datasets, and available published data) were mapped against the defined reporting framework, and the quality graded, with the highest quality data selected to report a health profile for Indigenous adolescents. Comparison with non-Indigenous adolescents was made where possible, and estimates (disaggregated by age, sex, and remoteness) were reported as relative risks. A national advisory group (six Indigenous young people, three Indigenous adult community members, three researchers, three policy makers, and two service providers, all aged  $\geq 16$  years) provided input about the reporting framework, interpretation of findings, and policy recommendations.

**Findings** Data were available for 184 (79%) of 234 elements of the reporting framework. All-cause mortality for Indigenous adolescents (70 per 100 000) was more than twice that of non-Indigenous adolescents, with about 60% of deaths due to intentional self-harm and road traffic injury. 80% of all deaths among Indigenous adolescents were considered as potentially avoidable in the current health system. Communicable diseases (particularly sexually transmitted infections) were leading contributors to morbidity. Almost a third of Indigenous adolescents aged 18–24 years reported high levels of psychological distress (twice the non-Indigenous rate). There was an excess burden of mental disorders and substance use, alongside emerging type 2 diabetes and ischaemic heart disease. Additionally, there were excess intentional and unintentional injuries. Many aspects of this health profile differed markedly from that of non-Indigenous adolescents: rates of acute rheumatic fever, pneumococcal infection, gonorrhoea, and type 2 diabetes resulting in admission to hospital were ten times higher; rates of assault and childbirth in those aged 15–19 years were five times higher; whereas rates of eating disorders, melanoma and other skin cancers, and anaphylaxis were significantly lower. Risks for future ill-health were common; 43% of 15–24 year olds were current tobacco smokers and about 45% had high body mass (overweight or obese). Disadvantage across sociocultural health determinants also emerged, particularly around education.

**Interpretation** Despite Australia's adolescents having one of the best health profiles globally, Indigenous adolescents have largely been left behind. Adequate responses will require intersectoral actions, including a health system responsive to the needs of Indigenous adolescents. Without a specific focus on adolescents, Australia will not redress Indigenous health inequalities.

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## Introduction

Health inequities arise from the social and material circumstances in which people grow, live, work, and age, and the systems put in place to deal with ill health.<sup>1</sup> Nowhere is this concept more powerfully illustrated than for Indigenous peoples. Gaps in life expectancy between Indigenous and non-Indigenous populations range from a decade to more than two decades.<sup>2</sup> The underlying determinants are complex: colonisation; forced separation from land, community, family, and culture; racism; and intergenerational poverty have

played a role in many settings.<sup>3,4</sup> Economic development and urbanisation are typically drivers of improved population health, but they can also accentuate inequities and social marginalisation experienced by Indigenous people.<sup>5</sup>

Responses to Indigenous health have largely mirrored global health policies in that they have predominantly focused on maternal and child health and communicable diseases, with a more recent focus on chronic illness. There have been some notable successes. In Australia, for example, under-five mortality among Indigenous

## Research in context

### Evidence before this study

Adolescence is now understood as a developmental stage in which investments in health bring a triple dividend of reduced death and disability during these years, healthier trajectories across the life-course, and the best possible start for the next generation. Many Indigenous communities have a large burden of disease, high rates of premature mortality, and poor health in early childhood. Yet there has been no comprehensive account of the health of Indigenous adolescents in Australia or in other countries. We had previously systematically reviewed health-related literature including all studies of individual health outcomes and risks for Indigenous adolescents in Australia over a 15-year period. The methodological quality of each study was graded and the focus mapped against the burden of disease reporting framework. We identified 360 publications that focused predominantly on sexually transmitted infections, oral health, and substance use, a mismatch with modelled burden of disease where mental health and injury were prominent. A simple synthesis of the published literature would therefore be unlikely to provide an adequate profile of health. We did an updated search in English on July 1, 2017, with PubMed using the broad search terms “(Aborigin\* OR Indigenous)” AND “(youth OR young OR adol\*)”. We did not identify a published health profile of Indigenous adolescents in any setting.

### Added value of this study

This study provides the first comprehensive profile of Indigenous adolescent health in Australia. Priority areas of health need (spanning health outcomes, health risks, and sociocultural determinants) were identified to inform policy. The reported indicators provide a baseline for monitoring of progress and a framework for setting policy and service delivery priorities. Identified data gaps inform a research agenda. Although the focus of the study is Indigenous adolescents in Australia, the findings and approach used might inform the development of relevant Indigenous adolescent health policies in other countries that share similar health profiles.

### Implications of all the available evidence

The health profile of Indigenous adolescents differs markedly from that of non-Indigenous Australian adolescents, with high rates of communicable, nutritional, and reproductive diseases; non-communicable diseases; and injuries. Policies and programmes designed for the broader Australian population might be inadequate to address the health needs of Indigenous adolescents. The early onset of health risks, high adolescent birth rates, and heavy disease burden suggest that without a priority focus on adolescents, Australia will not redress Indigenous health inequalities.

Australians has declined by 33% between 1998 and 2014.<sup>6</sup> However, overall life expectancy for Indigenous Australians (69·1 years for men and 73·7 years for women, which are about 10 years less than for non-Indigenous Australians) has improved little.<sup>6,7</sup> A focus on adolescents has remained largely at the margins of Indigenous health policy.<sup>8</sup> Yet adolescence is increasingly recognised as a life phase in which the foundations for later life health and that of the next generation are established.<sup>8,9</sup>

A sound understanding of the health problems, risks, and their determinants is a prerequisite for effective policy. In this paper, we report the first such national health profile for Aboriginal and Torres Strait Islander (Indigenous) adolescents in Australia (10–24 years old), an age range that encompasses many of the biological, neurocognitive, and social role transitions that define adolescence.<sup>9</sup>

## Methods

### Overview of the study

We undertook a systematic synthesis of population data to report the health and wellbeing of Indigenous adolescents in Australia. In the absence of available indicators for Indigenous adolescent health, we first defined a reporting framework. Elements of the reporting framework were defined by considering public health, policy, and stakeholder relevance. Against each element of the reporting framework, we then systematically identified, graded, and selected the best

available data to report a health profile. The appendix (p 3) provides a conceptual framework for the study.

See Online for appendix

### Definition of the reporting framework

The reporting framework was defined around three key domains: health outcomes (mortality and morbidity relating to disease and injury); risk factors for adverse outcomes in adolescence, adulthood, or the next generation; and sociocultural determinants of adolescent health and wellbeing.<sup>8</sup> Panel 1 and the appendix (pp 4–29) detail how specific elements were defined within these domains.

Health outcomes were categorised as either mortality or morbidity (diseases and injuries). Morbidity was further organised into three major groups representing different stages of the epidemiological transition:<sup>20</sup> communicable, maternal, and nutritional diseases; non-communicable diseases; and injuries. These three broad groups were further organised into subgroups consistent with the burden of disease reporting framework. The reporting framework for health risks was similarly organised into groups consistent with the burden of disease framework. Sociocultural determinants were organised as nine categories, which reflected the subdomains of the Australian Bureau of Statistics' wellbeing framework.

Potentially avoidable mortality, as defined by the Australian Institute of Health and Welfare, was included as a policy-relevant proxy measure of health-care access

**Panel 1: Methods to define the reporting framework of health for Indigenous adolescents****Health outcomes***Causes of mortality*

We identified leading causes of mortality in Indigenous adolescents by ranking mortality data using the standard International Classification of Diseases-10.<sup>10</sup> We identified additional relevant causes by reviewing relevant policy documents, modelled Indigenous burden of disease data, and stakeholder consultations.

*Potentially avoidable mortality*

Potentially preventable and treatable mortality within the current Australian health system as defined by the Australian Institute of Health and Welfare was used as a policy-relevant proxy measure of healthcare access and quality (appendix p 7).<sup>11,12</sup>

*Diseases and injuries*

The 291 health outcomes defined in the 2010 Global Burden of Disease Study (GBD 2010) were used as a starting point.<sup>13,14</sup> We included causes likely to make a contribution to the burden of disease in Indigenous adolescents (>0.1% of total age-specific disability-adjusted life-years) using modelled data from the Australian Aboriginal and Torres Strait Islander Burden of Disease Study 2003 (AATSIBD2003) and the GBD 2010 study for all Australians.<sup>15–17</sup> We identified additional potentially relevant health outcomes not included in the GBD 2010 study by reviewing available health data, relevant national policy frameworks, health concerns as reported by young Indigenous people in qualitative studies, and indicator sets for adolescent health in comparable populations.

**Health risks***Health behaviours and states (intermediate health outcomes)*

We used the 69 health risks defined in the GBD 2010 study as a starting point.<sup>14</sup> We considered their relevance to Indigenous adolescents (prevalent during adolescence, contributes to health of Indigenous Australians across the life-course, and potentially modifiable) using data from the AATSIBD2003, GBD 2010 study, and published literature. Subsequently, we augmented the GBD 2010 list of risk factors using available health data, policy frameworks, health concerns of Indigenous young people in qualitative studies, and comparable indicators.

**Sociocultural determinants**

Subdomains were culture, family, physical wellbeing (overall health), education, employment, income (economic resources), housing, justice, and citizenship (participation). We derived these subdomains from the Australian Bureau of Statistics' wellbeing framework, developed to capture sociocultural determinants of wellbeing for Indigenous Australians across the life-course.<sup>18,19</sup> The nine subdomains included elements relating to individuals and the broader social, cultural, and economic environment. We restricted the analysis to 69 elements relating to individual wellbeing. We additionally explored trends in education, employment, and child rearing given these are defining adolescent transitions.<sup>9</sup>

The appendix (pp 4–29) provides further details.

and quality.<sup>11</sup> This measure included deaths considered either preventable or treatable within the current health system given timely and effective health care, and deaths amenable to legislative measures such as traffic safety (eg, speed limits and use of seat belts and motorcycle helmets).<sup>12</sup>

**Mapping available data to define indicators**

We used a stepwise approach to identify data available for each element of the reporting framework so as to define indicators. National population-based surveys were reviewed first because these surveys were specifically designed to produce representative estimates for Indigenous Australians, including adolescents (table 1).<sup>21</sup> We rated the quality of the identified data using three criteria: type of sample, strength of measure, and overall study method (panel 2). Where survey data were unavailable, poorly representative, or methodologically flawed (grade <A2+), we reviewed administrative data. Where national survey or administrative data were incomplete or of poor quality, we reviewed previously published subnational data, drawing from a previous systematic mapping.<sup>17</sup> Multiple data sources were available for many indicators of the reporting framework. A single data source was selected by considering, in

order, the relevance of the data as a measure of population burden, representativeness of the data for Indigenous Australians aged 10–24 years, methodological quality of studies collecting the data, date of data collection, and whether non-Indigenous comparator data were available.

Indicators measured either the incidence or prevalence depending on data availability and nature of the outcome. We restricted the age definition (eg, self-reported substance use was only available for those aged 15–24 years in the national surveys) for some indicators to accommodate data availability. For some indicators drawn from administrative data, the denominators were restricted to subnational estimates to improve identification of Indigenous status (table 1). To optimise indicator coverage, we included proxy indicators where data availability was poor. For example, given the paucity of mental health data available from population surveys, hospital separations (completed episode of admitted patient care) due to key mental health diagnoses were included. Similarly, hospital separations due to childbirth and coded complications were used to estimate the burden of obstetric conditions.

**Data analysis and reporting**

Table 1 describes data access. We adjusted survey estimates for survey design using the replicate weights

	Scope of data	Coverage of Indigenous adolescents	Measure of Indigenous status	Is non-Indigenous comparator data available?	Data access	Application to the study
<b>National survey</b>						
Australian Aboriginal and Torres Strait Islander Health Survey 2012–13	Physical health outcome, health risks, and health actions; some measures of sociocultural wellbeing	Representative sample of 2477 Indigenous adolescents (aged 10–24 years); those aged >18 years self-reported, some >15 years self-reported, otherwise parent reported	Self-reported, good quality	Yes; 3438 aged 10–24 years (Australian Health Survey 2011–12)	TableBuilder*	Health outcomes (morbidity), health risks, and sociocultural determinants
National Aboriginal and Torres Strait Islander Health Measure Survey 2012–13†	Physical measurement and biological samples relating to health outcomes and risks	Volunteer subsample of the Australian Aboriginal and Torres Strait Islander health survey; only those aged >18 years; 40% participation rate	Self-reported, good quality	Yes; similar volunteer subsample from the Australian Health Survey 2011–12	TableBuilder*	Health risks
National Aboriginal and Torres Strait Islander Social Survey 2008	Broader wellbeing including culture, education, and employment	Representative sample of 3804 Indigenous adolescents (aged 10–24 years); those aged >15 years self-reported	Self-reported, good quality	No	CURF data*	Sociocultural wellbeing
National Aboriginal and Torres Strait Islander Health Survey 2004–05	Physical health outcome, health risks, and health actions; some measures of wellbeing	Representative sample of 2862 Indigenous adolescents (aged 10–24 years); those aged >18 years self-reported, some >15 years self-reported	Self-reported, good quality	Yes; 4746 aged 10–24 years (National Health Survey 2004)	CURF data*	Health outcomes (morbidity), health risks, and sociocultural wellbeing
<b>Administrative data</b>						
National Mortality Database	Mortality	Complete register of all deaths occurring in Australia	As registered, most complete and reliable for NSW, QLD, WA, SA, and NT	Yes	Customised data extraction (2008–12)‡	Health outcomes (mortality)
National Hospital Morbidity Database	Principal and associated diagnosis of all hospital separations (public and private)	Complete register of public and private hospital separations	As registered, complete and considered reliable for all jurisdictions	Yes	Unit record data	Health outcomes (morbidity)
National Notifiable Diseases Surveillance System dataset	Notifiable communicable diseases	Register of notified diseases (dependent on healthcare access, testing, and notification)	As registered, some notifications do not identify Indigenous status, varies by disease	Yes	Customised data extraction	Health outcomes (morbidity; notifiable communicable diseases)
Australian Cancer Database	Registered cases of malignant cancer	Register of cancers (dependent on healthcare access, diagnosis, and notification)	As registered, most complete and reliable for NSW, QLD, WA, and NT	Yes	Customised data extraction	Health outcomes (morbidity; notifiable cancers)

Scope and coverage of national data with respect to Indigenous adolescent health in Australia, and availability and source of comparator data are shown. Additionally, the method of accessing data and the application of these data to the study are shown. CURF=Confidentialised Unit Record File. \*TableBuilder is an online portal that allows for custom tables to be built. CURF data are unit record data that are accessed through an online data laboratory. Both TableBuilder and CURF data are products of the Australian Bureau of Statistics. †This survey is a subset of the Australian Aboriginal and Torres Strait Islander health survey. ‡The years refer to year of registration of death. Deaths registered in 2010 and earlier are based on the final version of cause of death data, whereas deaths registered in 2011 are based on revised versions and deaths registered in 2012 are based on preliminary versions and are subject to further revision by the Australian Bureau of Statistics. Data for 2010 have been adjusted for the additional deaths arising from outstanding registrations of deaths in QLD in 2010.

**Table 1: National data sources for Indigenous adolescent health in Australia**

method<sup>25</sup> and weighted them to be nationally representative. For administrative data, we estimated rates using population count data from the Australian Bureau of Statistics.<sup>26</sup> Estimates were disaggregated by age, sex, and remoteness. Remoteness was defined with the Australian Standard Geographic Classification; remote was defined as a statistical local area with a dwelling density of less than 0.057 dwellings per km<sup>2</sup> (remote or very remote in the Australian Standard Geographic Classification).<sup>27–29</sup> These disaggregated estimates were compared and reported as incidence rate ratios (IRRs) or as risk ratios for prevalence measures (collectively termed relative risks [RRs]). For some estimates (particularly administrative data), standard errors were not provided in the original

source. In these instances, standard errors (and thus confidence intervals) for RRs were obtained using the delta method.<sup>30</sup>

Indigenous status was either as self-reported in the surveys or as registered in the administrative datasets (table 1).<sup>21</sup> Where possible, the corresponding population estimate for non-Indigenous adolescents and the RRs comparing Indigenous to non-Indigenous adolescents were calculated. Of note, although the Australian health survey 2011–12 (comparator for the Australian Aboriginal and Torres Strait Islander health survey 2012–13) included a small (<1% total) incidental sample of Indigenous Australians, an Indigenous identifier was not included in the released dataset. We explored the measurement error resulting from

**Panel 2: Method used to grade the quality of available data****Grading of population samples**

- National sample from all jurisdictions in Australia was graded A
- Multiple (but not all) states or territories of Australia was graded B
- Single state or territory was graded C
- Multiple communities of sites (either within or across states and territories) was graded D
- Single community or site was graded E

**Grading of measures**

- Direct assessment of health condition was graded 1
- Self-reported measure of health condition was graded 2
- Proxy measure of health condition by parent or guardian was graded 3

**Grading of quality of method\***

- Sound study method was graded positive (+)
- Flaws or limitations to method relating to either the sample (small sample size, poor response rate, incomplete identification of Indigenous status [ $<80\%$ ], or potentially biased sampling that is likely to result in a non-representative sample for Indigenous adolescents) or the measure (poorly validated for adolescents and likely to yield poor quality estimates) were graded negative (–)

Method of grading modified from Azzopardi and colleagues,<sup>22</sup> Nelson and colleagues,<sup>23</sup> and Atkins and colleagues.<sup>24</sup> \*The methodological quality for population sample (graded in letters) and measure (graded in numbers) were assessed and reported separately—eg, A+1–.

this sample of Indigenous Australians being included in the comparator population using the example of tobacco smoking, and found it to be minimal (appendix pp 30, 31).

We analysed data using Stata MP (version 12) and visualised it using Tableau Desktop (version 9).

**Consultation and ethical approval**

We formed and sought advice from a national advisory group of six Indigenous young people, three Indigenous adult community members, three researchers, three policy makers, and two service providers. All were aged at least 16 years and formally consented to participate. Consultation was on an individual basis given the geography of Australia and diversity of the group. We used a modified linear Delphi approach<sup>31</sup> (each consultation began with a de-identified summary of previous consultations) to reach saturation or consensus. The advisory group provided input around the reporting framework, interpretation of findings, and policy recommendations based on the study findings.

Approval for data access and publication of findings was provided by the Australian Bureau of Statistics (national health and social surveys), Australian Institute of Health and Welfare (registries relating to hospital

separation, mortality, and cancer), and the Australian Department of Health (notifiable diseases registry). The Royal Children's Hospital Human Research Ethics Committee, VIC, Australia, approved the project (HREC 32026B).

**Role of the funding source**

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

**Results**

The reporting framework consisted of 234 specific outcomes, risks, or determinants across three domains: 145 related to health outcomes, 22 to health risks, and 67 to sociocultural determinants (table 2). Except for some of the non-communicable diseases, data for health outcomes were largely drawn from administrative datasets. Health risk data were sourced from national surveys and were limited in coverage for young adolescents. Data coverage was poorest for the sociocultural determinants. Data were available for 184 (79%) of 234 elements of the reporting framework (127 health outcomes, 18 health risks, and 39 sociocultural determinants). The appendix (pp 4–29) details the definition of each indicator and the corresponding data source.

Indigenous adolescents had a mortality rate of 70 per 100 000 per year on average across the age range of 10–24 years, more than twice that of non-Indigenous adolescents. Risks for death increased with age (figure 1A), and were most pronounced among boys and young men in their mid-to-late adolescence (appendix p 33).

Intentional self-harm and road traffic injuries were leading causes of death, accounting for about 60% of mortality among Indigenous adolescents aged 10–24 years. For these causes, men and boys aged 15–24 years were at greater risk than women and girls of the same age. These injuries were also important causes of death for Indigenous adolescents aged 10–14 years (accounting for about 40% of deaths in this age group) despite being relatively uncommon for non-Indigenous counterparts. Non-communicable diseases were relatively uncommon causes of mortality, but Indigenous adolescents were at excess risk compared with non-Indigenous adolescents. For example, Indigenous adolescents were about 40 times as likely to experience mortality related to rheumatic heart disease as non-Indigenous adolescents (appendix p 33). Communicable diseases were an uncommon cause of mortality for Indigenous adolescents, but those aged 10–14 years were at greatest risk of death (figure 1A).

About 80% of Indigenous adolescents' mortality was classified as potentially avoidable within the current health system (figure 1B). Almost all potentially avoidable

	Data coverage	Type of data source	Best overall data source	Data quality		Non-Indigenous comparator data	Method to optimise data quality
				Sample	Measure		
<b>Health outcomes</b>							
Mortality	100%	Administrative	NMD	~ (Indigenous status)	✓	✓	Restricted to NSW, WA, QLD, SA, and NT (best ascertainment of Indigenous status)
<b>Morbidity</b>							
Communicable, nutritional, and maternal diseases							
Common diseases	100%	Administrative	NHMD	✓	~	✓	Indicator defined as hospital separations, not incidence (to prevent overcounting)
Endemic diseases to certain communities	33%	Survey	Targeted screening surveys	~ (non-representative)	✓	✗	..
Sexually transmitted infections and blood-borne viruses	100%	Administrative	NNDSS	~ (Indigenous status)	~ (some clinically probable cases)	✓	Included jurisdictions where Indigenous identification >50%; redistributed those aged 0–14 years as 10–14 years*
Vaccine preventable diseases	100%	Administrative	NNDSS	~ (Indigenous status)	~ (some clinically probable cases)	✓	Included jurisdictions where Indigenous identification >50%
Nutritional diseases	100%	Survey	NATSIHMS	~ (>18 years, non-representative)	✓	✓	..
Maternal diseases	100%†	Administrative	NHMD	✓	✓	✓	..
<b>Non-communicable diseases</b>							
Cancer	100%	Administrative	ACD	~ (Indigenous status)	✓	✓	Restricted to NSW, QLD, WA, and NT (jurisdictions with the most reliable ascertainment of Indigenous status <sup>37</sup> )
Cardiovascular diseases	100%	Administrative	NHMD	✓	✓	✓	Included survey data for burden of rheumatic heart disease
Respiratory diseases	100%	Survey	AATSIHS	✓	✓	✓	Included parent proxy
Gastrointestinal diseases	100%	Administrative	NHMD	✓	✓	✓	..
Neurological diseases	66%	Survey	AATSIHS	✓	✓	✓	..
Mental disorders and substance use	92%‡	Administrative	NHMD	✓	✓	✓	Where survey data were used, parent proxy report was excluded
Endocrine and haematological diseases	66%	Survey	NATSIHMS	~ (>18 years, non-representative)	✓	✓	Hospital separation included to measure diabetes complications
Urogenital diseases	71%	Administrative	NHMD	✓	✓	✓	..
Musculoskeletal and skin diseases	50%	Survey	AATSIHS	✓	✓	✓	Included parent proxy report
Allergies	100%	Survey	AATSIHS	✓	✓	✓	Included parent proxy report
Sense organ diseases	100%	Survey	AATSIHS	✓	✓	✓	Included parent proxy report
Congenital diseases	0	Survey	..	..	..	..	..
<b>Injuries</b>							
Unintentional	86%	Administrative	NHMD	✓	✓	✓	..
Intentional	100%	Administrative	NHMD	✓	✓	✓	..
<b>Health risks</b>							
Nutritional risk	100%	Survey	NATSIHMS	~ (>18 years, non-representative)	✓	✓	..
Substance use	100%	Survey	AATSIHS	~ (>15 years only)	~ (ever used in the past 12 months)	✗	..
Physiological risk	80%	Survey	AATSIHS	✓	✓	✓	..
Dietary risk	40%	Survey	AATSIHS	✓	✓	✓	..
Body image	100%	Survey	AATSIHS	~ (>15 years only)	✓	✗	..
Physical activity	100%	Survey	AATSIHS	✓	✓	✓	..
Sexual risk	100%	Survey	Goanna	~ (>16 years)	✓	✗	..

(Table 2 continues on next page)

	Data coverage	Type of data source	Best overall data source	Data quality		Non-Indigenous comparator data	Method to optimise data quality
				Sample	Measure		
(Continued from previous page)							
<b>Sociocultural determinants</b>							
Culture	77%	Survey	NATSISS	~ (>15 years)	✓	✗	..
Family	67%	Survey	NATSISS	~ (>15 years)	✓	✗	..
Overall health	50%	Survey	AATSIHS	✓	✓	✓	..
Education	50%	Survey	AATSIHS	~ (>15 years)	✓	✓	..
Employment	63%	Survey	AATSIHS	~ (>15 years)	✓	✓	..
Economic resources	63%	Survey	AATSIHS	~ (>15 years)	✓	✓	..
Housing	50%	Survey	AATSIHS	✓	✓	✗	Included household level data
Justice	83%	Survey	NATSISS	~ (>15 years)	✓	✗	..
Participation	14%	Survey	NATSISS	~ (>15 years)	✓	✗	..

This table summarises data availability and quality (the appendix [pp 4–29] shows further details). Within each group, data coverage is reported as percentage of desired elements of the reporting framework for which at least some data could be identified. Key issues relating to data quality are reported with respect to the sample (representativeness of Indigenous adolescents in Australia) and measure (reliable unbiased measure of the outcome of interest). NMD=National Mortality Database. NHMD=National Hospital Morbidity Database. NNDSS=National Notifiable Diseases Surveillance System. NATSIHMS=National Aboriginal and Torres Strait Islander Health Measures Survey. ACD=Australian Cancer Database. AATSIHS=Australian Aboriginal and Torres Strait Islander Health Survey. NATSISS=National Aboriginal and Torres Strait Islander Social Survey. ✓=no concern. ~=some concern. ✗=substantial concern. \*Indicators and data for sexually transmitted infections and blood-borne viruses were drawn from annual notification reports published by the Kirby Institute.<sup>33</sup> These data provided counts for those aged 0–14 years, 15–19 years, and 20–29 years. As reported, the majority of cases of sexually transmitted infections in those <16 years old were aged 13–15 years (95% of chlamydia and 94% of gonorrhoea). Cases of sexually transmitted infections among those aged 0–14 years were redistributed to estimate the rate for those aged 10–14 years. The rate in those aged 20–29 years was reported, because it is likely to closely approximate the rate among those aged 20–24 years. †Perinatal data were not available, hospital data were used as a proxy. ‡Mental disorders were poorly measured, hospital data were used as proxy.

**Table 2: Availability and quality of data, and methods used to optimise data quality**

mortality was potentially preventable rather than potentially treatable.

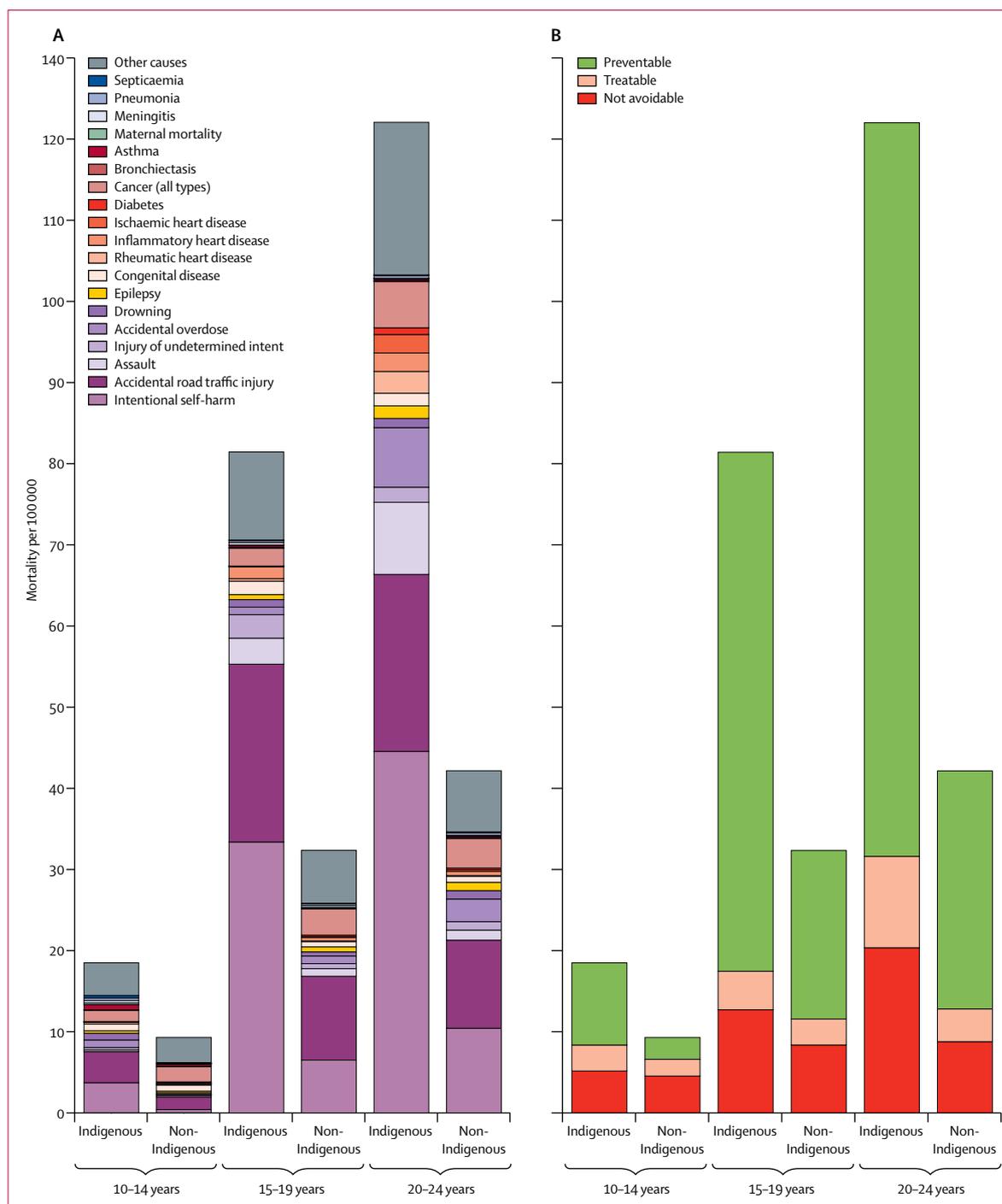
Non-fatal health outcomes of Indigenous adolescents included communicable diseases, nutritional diseases, maternal disorders, non-communicable diseases, and injuries (figures 2 and 3A). Rates of rheumatic heart disease, pneumococcal infection, gonorrhoea, and hospital separations due to type 2 diabetes among Indigenous adolescents were more than ten times those of non-Indigenous adolescents. Additionally, Indigenous 15–19 year olds had rates of hospital separation due to assault and rates of childbirth that were about five times those of their non-Indigenous counterparts. By contrast, eating disorders, melanoma and other skin cancers, and anaphylaxis were each significantly less likely to affect Indigenous adolescents than non-Indigenous adolescents. There was also a substantial gradient in health by remoteness (figure 3B). Indigenous adolescents living in remote areas were at excess risk of communicable diseases (including sexually transmitted infections), assault, obstetric complications, rheumatic heart disease, and emerging non-communicable diseases, such as type 2 diabetes requiring admission to hospital. Those in urban areas were at excess risk of asthma, migraine, epilepsy, allergies, and eating disorders than those in remote areas.

Communicable diseases were common in Indigenous adolescents (figure 2). For example, there were more than three notifications of chlamydia per 100 Indigenous adolescents per year, an IRR about three times that of non-Indigenous adolescents (figure 3A, appendix p 39).

Notifications in women and girls were twice as common as in men and boys. Of note, notification rates of sexually transmitted infections among Indigenous 10–14 year olds were more than ten times those of their non-Indigenous peers. The rate of hospital separations due to pneumonia in Indigenous adolescents (300·6 per 100 000) was almost four times that of non-Indigenous adolescents, and notifications of vaccine preventable diseases such as influenza (329·4 per 100 000) occurred at almost twice the rate. Indigenous adolescents were also burdened with diseases that are otherwise rare in Australia including acute rheumatic fever, trachoma, and scabies.

Nutritional diseases were common (appendix p 41). About a quarter of Indigenous adolescents aged 18–24 years were vitamin D deficient, and around a tenth were iodine deficient. Almost 6% of Indigenous adolescents aged 18–24 years were anaemic (about three times the rate in their non-Indigenous counterparts). The burden of anaemia was almost entirely among women and girls, with a female-specific prevalence of 15·3%.

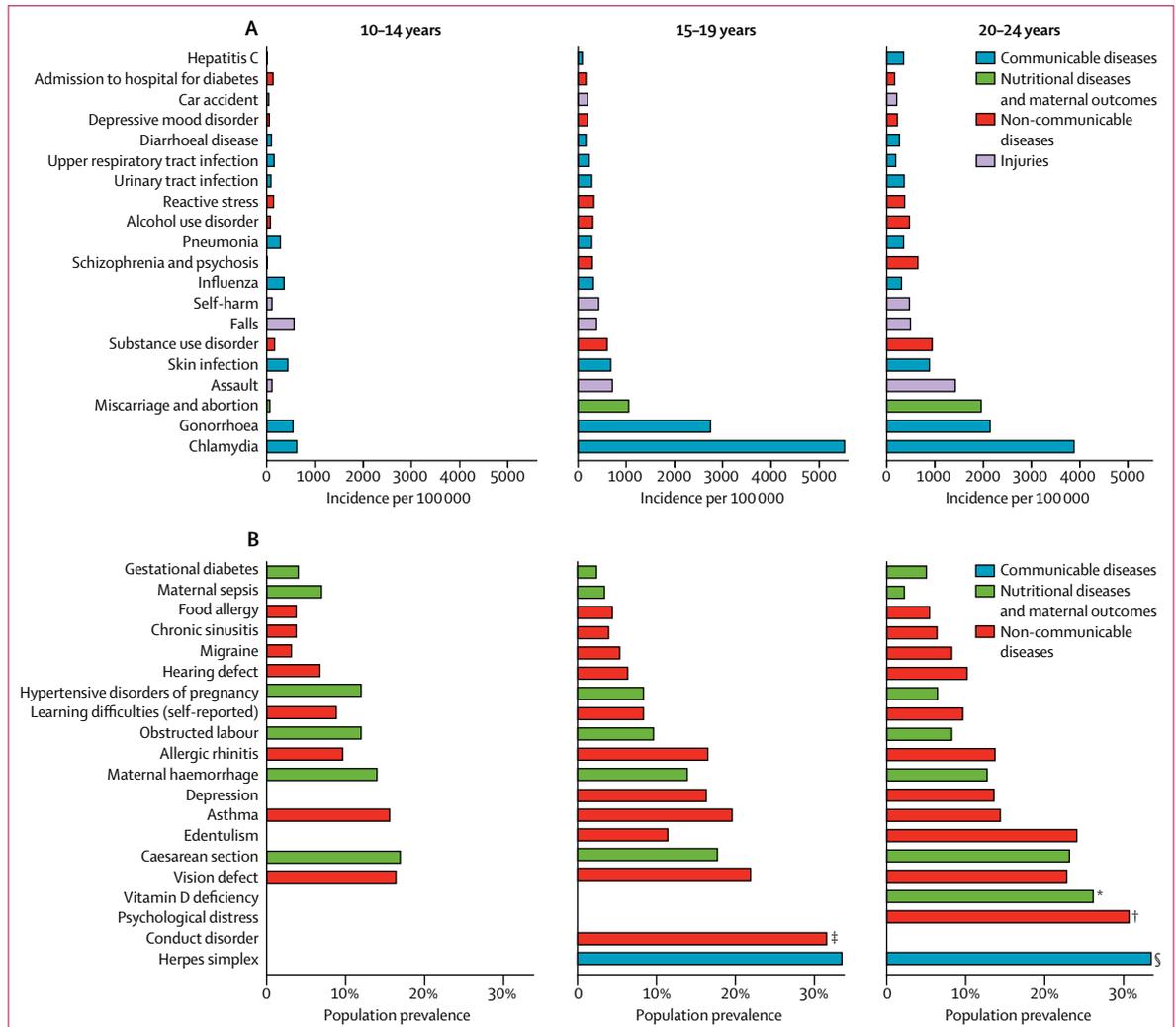
Female Indigenous adolescents had a pregnancy rate (68·4 per 1000) twice that of non-Indigenous adolescents; those aged 10–14 years were almost 20 times as likely (95% CI 14·7–26·1) to have a child than their non-Indigenous counterparts (appendix p 42). Indigenous adolescent mothers had fertility-adjusted rates of obstructed labour and hypertensive disorders of pregnancy comparable to those of non-Indigenous adolescents. However, deliveries to Indigenous adolescent mothers were almost twice as likely to be



**Figure 1: Cause-specific (A) and potentially avoidable (B) mortality for Indigenous and non-Indigenous adolescents**  
 (A) Estimates and 95% CIs for cause-specific mortality are shown in the appendix (pp 33–34). Causes are grouped by epidemiological grouping: communicable disease (dark-to-light blue shading), maternal conditions (green shading), non-communicable diseases (red-to-yellow shading), and injuries (purple-to-burgundy shading). Mortality that was not attributed to a specific cause is categorised as other (dark-grey shading). (B) Potentially avoidable mortality is shown as a proportion of all deaths; the remaining deaths that were not avoidable also included those from causes that could not be determined. Data are from the National Mortality Dataset of NSW, WA, QLD, SA, and NT, Australia, 2008–12 (as detailed in table 1).

complicated by maternal sepsis compared with non-Indigenous adolescents. Childbirths among Indigenous adolescents aged 20–24 years were more likely to be

complicated by gestational diabetes. There were no differences in caesarean section. Hospital separations due to miscarriage and post-abortion care were less



**Figure 2: Incidence and prevalence of common health outcomes for Indigenous adolescents**

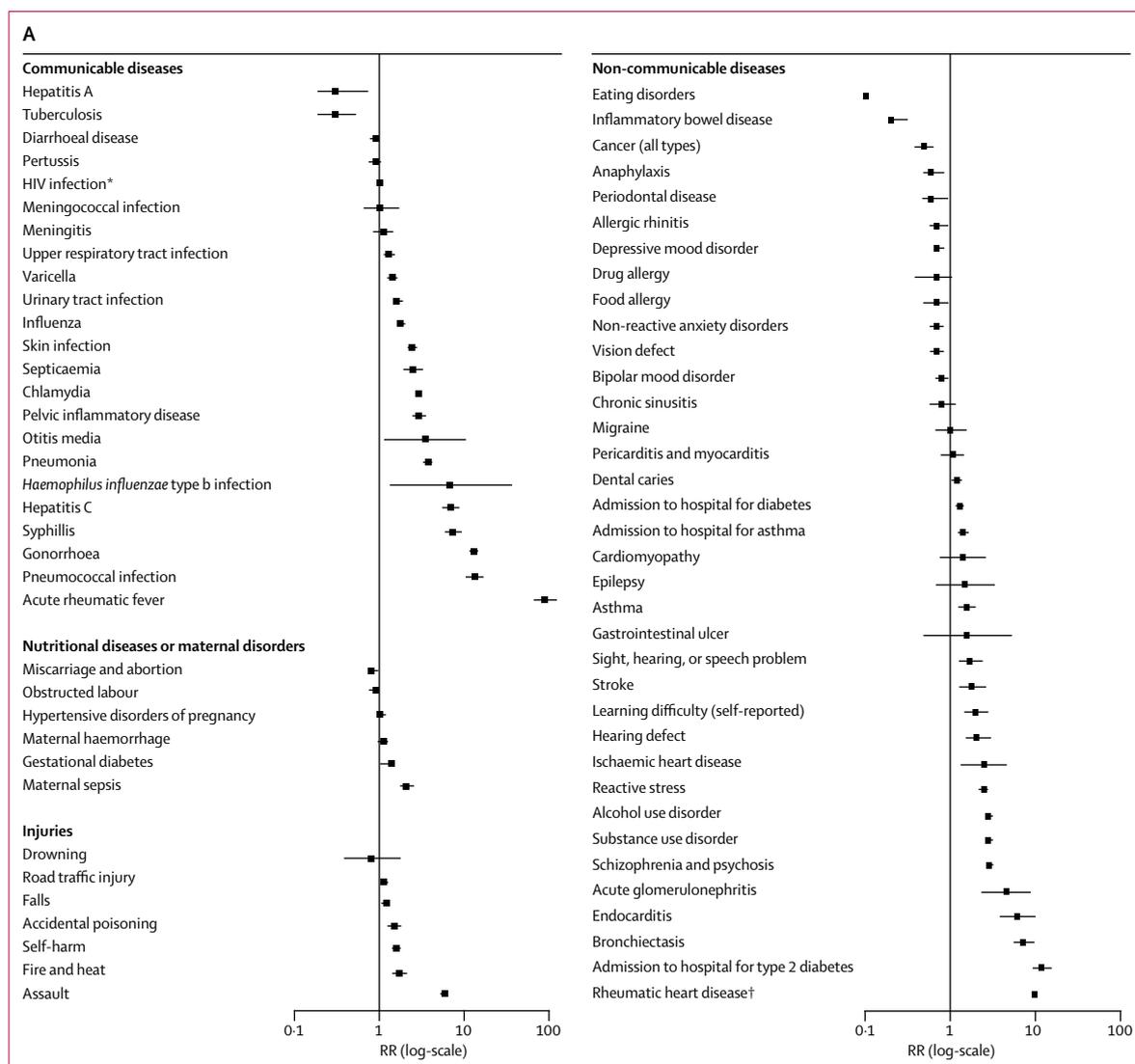
Data are disaggregated by age and ranked by burden. (A) 20 leading incident conditions. (B) 20 leading prevalent conditions, with the exception of maternal conditions, which are the proportion of all births. Blank spaces indicate absence of data. The appendix (pp 37–58) shows the estimates and 95% CIs. \*Data for vitamin D were of 18–24 year olds. †Data for psychological distress were of 18–24 year olds. ‡Data for conduct disorder were of 12–17 year olds. §Data for herpes simplex were of 16–24 year olds.

common in Indigenous adolescents than in non-Indigenous counterparts.

Mental disorders and substance use disorders were the most common non-communicable diseases among Indigenous adolescents (figure 2). Almost a third of Indigenous adolescents aged 18–24 years reported significant psychological distress, about twice the rate in non-Indigenous adolescents. Indigenous women and girls were significantly more likely to report psychological distress than men and boys. Additionally, Indigenous adolescents were more likely to report depression compared with non-Indigenous adolescents. However, they were less likely to be admitted to hospital with depressive mood disorder (IRR 0.7, 95% CI 0.7–0.8) or anxiety (0.7, 0.6–0.8) compared with non-Indigenous adolescents. Hospital separations due

to reactive stress were significantly more common (IRR 2.5, 95% CI 2.3–2.6) for Indigenous adolescents. Hospital separations relating to psychoses, alcohol use, and other substance use among Indigenous adolescents occurred at about three times the rate compared with non-Indigenous counterparts.

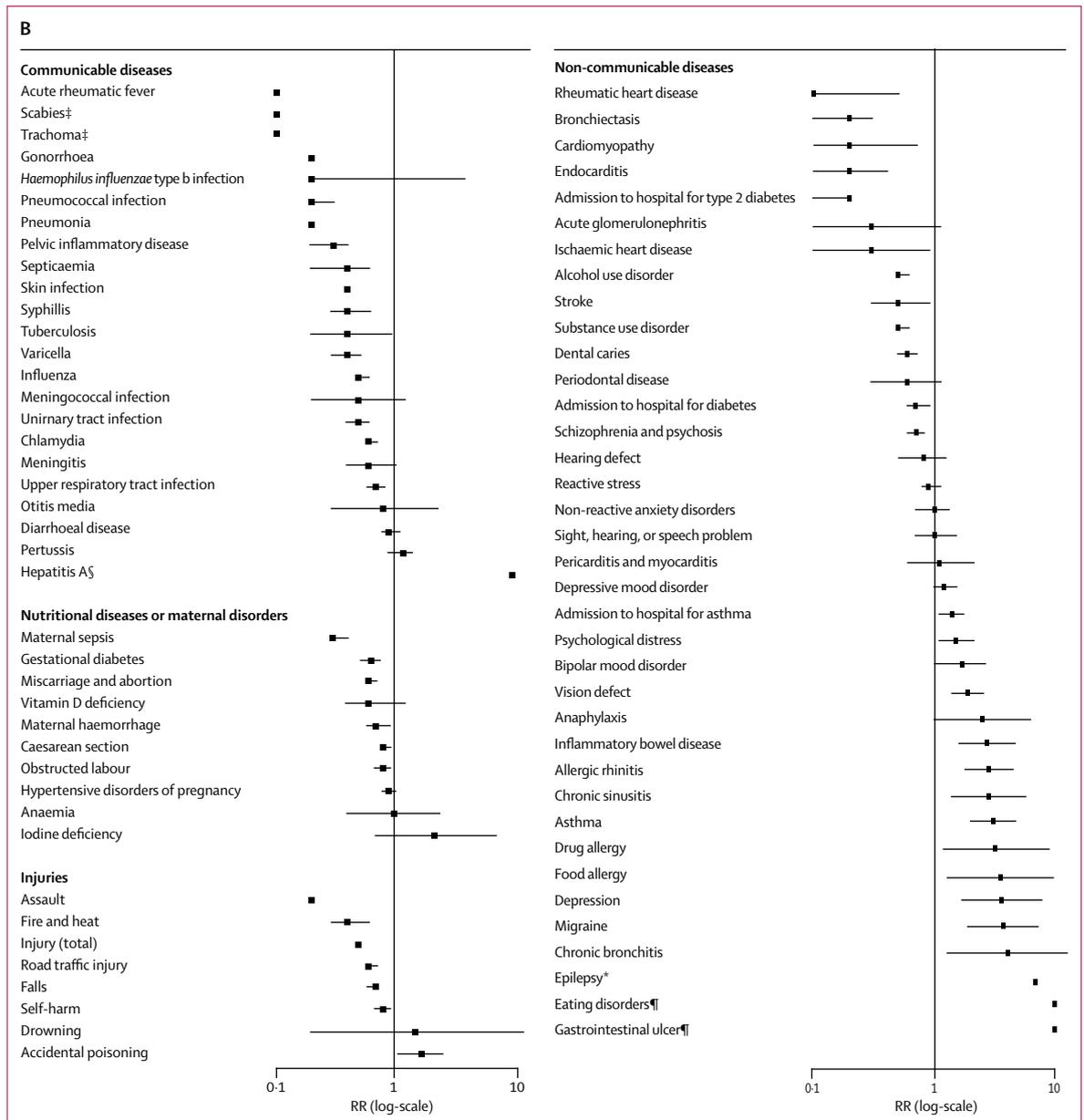
Asthma, allergies, learning difficulties, sensory conditions, migraine, and back pain emerged as other common non-communicable diseases for Indigenous adolescents. Some important patterns also emerged in less common non-communicable diseases. Indigenous adolescents were less likely to have cancer than non-Indigenous adolescents (IRR 0.5, 95% CI 0.4–0.6), as recorded in the Australian Cancer Database; melanoma (a leading cause of cancer among non-Indigenous adolescents) was uncommon among



(Figure 3 continues on next page)

Indigenous adolescents. However, Indigenous women aged 20–24 years had twice the risk of cervical cancer. Almost 1% of Indigenous adolescents self-reported rheumatic heart disease (more girls than boys), whereas non-Indigenous adolescents reported no cases. Hospital separations due to bronchiectasis occurred at about seven times the rate of non-Indigenous adolescents, whereas hospital separations due to endocarditis were almost six times more common. Furthermore, ischaemic heart disease and stroke (typically diseases of adulthood) resulted in about twice as many hospital separations among Indigenous adolescents compared with non-Indigenous adolescents. Almost 1% of Indigenous adolescents aged 18–24 years had a glycated haemoglobin concentration suggestive of diabetes. They were also about 12 times as likely to be admitted to hospital for type 2 diabetes.

There were almost three hospital separations related to injury for every 100 Indigenous adolescents annually, with the excess in Indigenous men and boys (appendix p 56). About a third of these injuries were intentional, with the majority related to assault. The incidence of assault-related hospital separations in Indigenous adolescents was about six times that of non-Indigenous Australians, with the highest incidence among older adolescents and those living in remote areas. Most assault-related injuries were from blunt trauma. Intentional self-harm accounted for 10% of all injury-related hospital separations, with the incidence in Indigenous adolescents almost twice that of the non-Indigenous adolescents. Of the unintentional injuries, falls and road traffic injuries (particularly cars and motorcycles) were the leading causes, with rates similar to non-Indigenous adolescents.

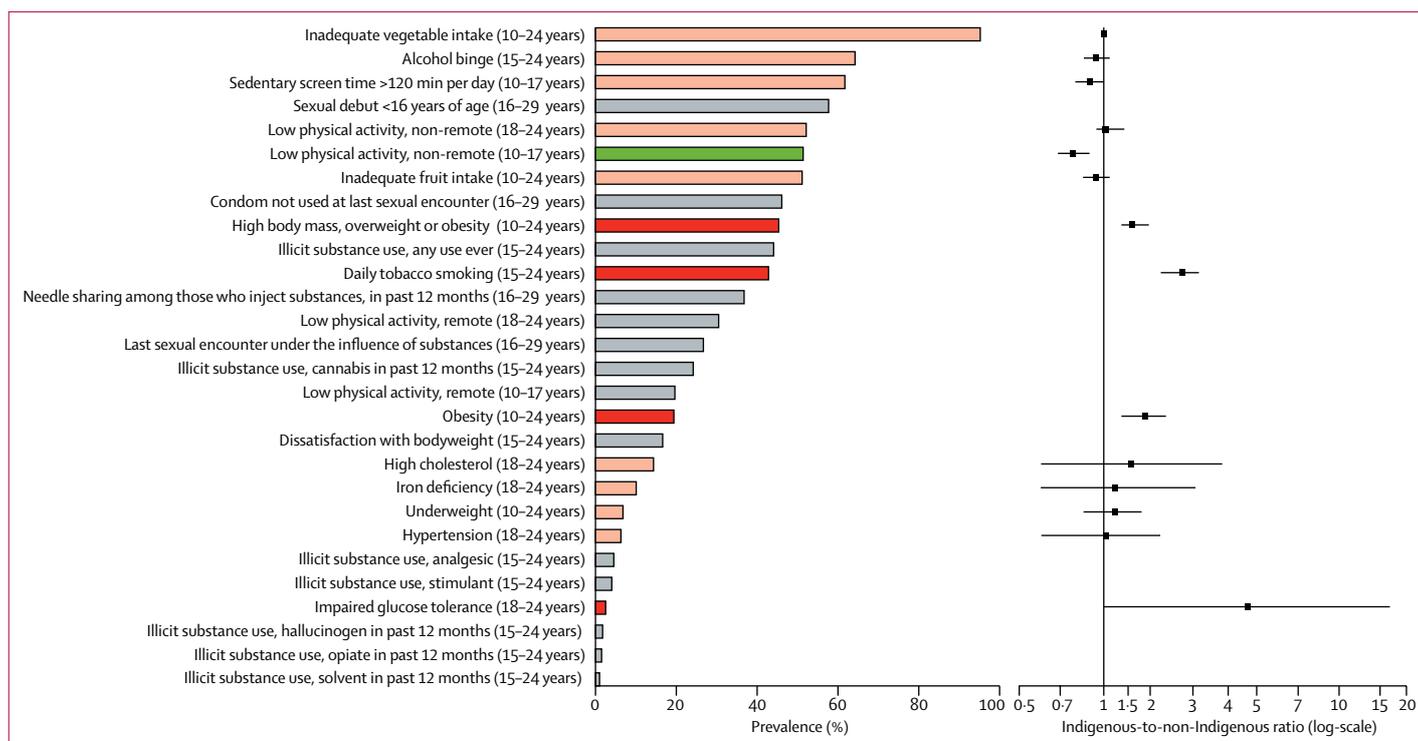


**Figure 3: Inequity of health outcomes between Indigenous and non-Indigenous adolescents and within the Indigenous adolescent population** (A) Data are RRs (Indigenous:non-Indigenous) plotted on a log-scale with corresponding 95% CIs for selected health outcomes, with outcomes ordered by RRs. (B) Data are RRs (non-remote:remote) for Indigenous adolescents plotted on a log-scale with corresponding 95% CIs for selected health outcomes, with outcomes ordered by RRs. The appendix (pp 37–58) details the estimates and 95% CIs. RR=relative risk. \*Standard errors and thus confidence intervals were not available. †No cases among non-Indigenous adolescents were reported, a rate ratio of 10 is assigned to indicate its excess burden among Indigenous adolescents. ‡Data for these diseases were only available for Indigenous adolescents in remote areas. Expert opinion suggests that these diseases are uncommon in urban settings, indicated as a rate ratio of 0.1. §Available data show this disease to be almost exclusive to adolescents living in non-remote areas, indicated with a rate ratio of 10. ¶No cases of these diseases were reported in non-urban settings and have been assigned a rate ratio of 10.

Health risks were common for Indigenous adolescents (figure 4, appendix pp 59–65). Of those risks with comparable data, Indigenous adolescents were found to have an excess risk of daily tobacco smoking, overweight, obesity, and impaired glucose tolerance compared with non-Indigenous adolescents. By contrast, Indigenous adolescents aged 10–17 years living in non-remote

areas were substantially less likely to report low levels of physical activity compared with non-Indigenous adolescents.

In addition to high body mass (overweight or obesity), Indigenous adolescents were at substantial risk of undernutrition. About one in five Indigenous women aged 18–24 years was iron deficient. Almost 7% of



**Figure 4: Prevalence of health risks for Indigenous and non-Indigenous adolescents in Australia**

Prevalence estimates for health risks are shown on the left, ranked from highest to lowest prevalence. Where available, relative risks are shown on the right on a log-scale with 95% CIs. Red shading shows that risks in Indigenous adolescents are greater than in non-Indigenous adolescents. Amber shading shows that risks have no difference. Grey shading shows that risks are unknown. Green shading shows that risks in Indigenous adolescents are lower than in non-Indigenous adolescents. The appendix (pp 59–65) details the estimates and 95% CIs.

Indigenous adolescents were underweight, with those living in remote areas at excess risk. By contrast with non-Indigenous adolescents, Indigenous 10–14 year olds were more likely to be underweight, a difference that dissipated in mid-to-late adolescence (appendix p 59).

About half of Indigenous adolescents aged 15–24 years reported ever using an illicit substance. Cannabis was the most commonly used, with almost a quarter of Indigenous 15–24 year olds reporting recent use in the past 12 months (men and boys more so than women and girls, with no difference by geography). Although the prevalence of injectable substance use was low overall, among those who injected substances, about 37% reported sharing injecting equipment. Licit substance use was common; almost 43% reported daily smoking and 64% reported binge alcohol use. Men and boys were more likely to report binge drinking than women, whereas no appreciable differences were reported for tobacco smoking. More than half of daily tobacco smokers had attempted to quit in the past 12 months.

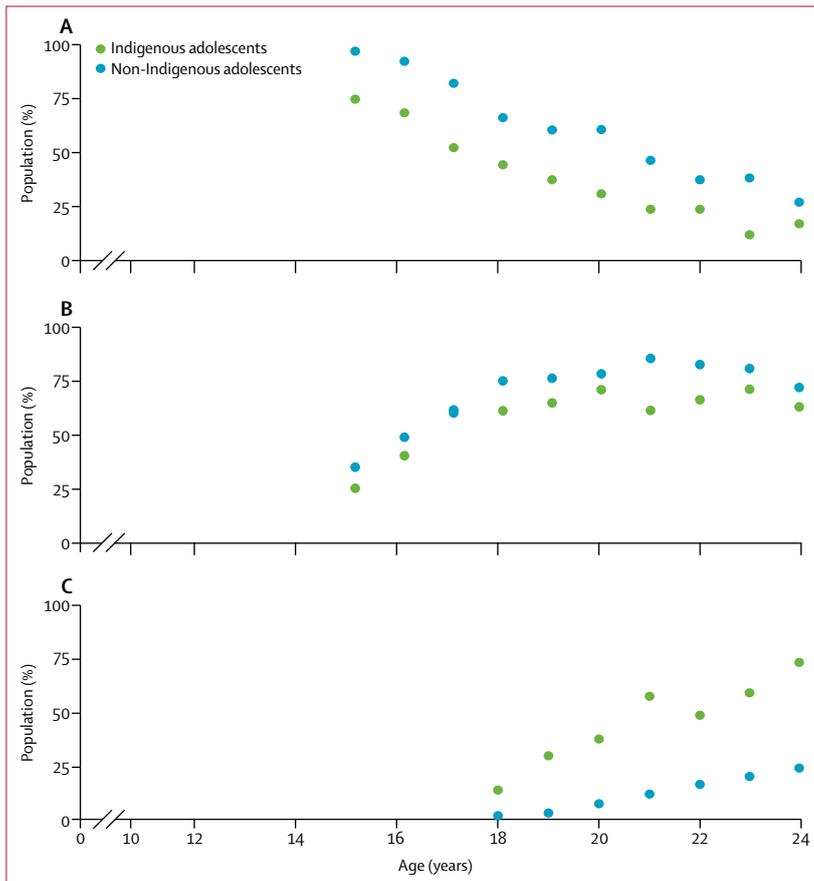
More than half of Indigenous adolescents aged 16–29 years reported sexual debut before 16 years of age. Early sexual debut was more likely to occur in male adolescents and those living in non-remote areas. Just over half of Indigenous adolescents aged 16–29 years reported using a condom at their last sexual encounter; however, the risk of this sexual encounter was unclear.

About a quarter reported that their last sexual encounter was under the influence of substances, more so in male adolescents and those living in remote areas.

Many Indigenous young people lived in socio-economically disadvantaged and overcrowded homes of insecure tenure. Life stressors were common, including experiences of discrimination and contact with the justice system. About 20% of Indigenous adolescents reported having been arrested in the preceding 5 years, with one in ten Indigenous men aged 20–24 years reporting ever having been incarcerated (10.6%, 95% CI 6.5–14.7). Physical health and function also emerged as an important determinant of broader health and wellbeing. For example, about one in ten Indigenous adolescents reported a disability (condition >6 months duration with functional limitation) that affected their participation in education or employment.

Almost all Indigenous adolescents reported being proud of their culture (appendix p 66). Participation in cultural events was high and typically greater for Indigenous adolescents living in rural than in urban areas. Yet only about a third spoke even a few words of an Indigenous language, and only around half were satisfied with their level of cultural knowledge.

Almost two-thirds of Indigenous adolescents reported having a say in important issues with friends or family, with no significant differences between male and female



**Figure 5: Trends in education, employment, and childbearing across adolescence**  
Data are age-specific population prevalence for (A) education, (B) labour force participation, and (C) parenthood or childbearing in female adolescents between Indigenous and non-Indigenous adolescents in Australia. Note that these data are not longitudinal but cross-sectional.

adolescents. Less than 20% of Indigenous adolescents, however, reported having a say in important issues in the community.

Sociocultural determinants changed across the adolescent years for both Indigenous and non-Indigenous adolescents. Figure 5 shows some key social role transitions. Adolescence typically coincides with transition out of education and into employment. Indigenous adolescents were more likely to leave education earlier than non-Indigenous adolescents, but they were not more likely to transition into the labour market. At age 15 years, one in five Indigenous adolescents was not engaged in either education or employment. Childbirth during adolescence and young adulthood was earlier and more common for Indigenous Australians than for non-Indigenous Australians.

## Discussion

Despite Australia's adolescents having one of the best health profiles globally, Indigenous adolescents have largely been left behind.<sup>8</sup> Their high rates of

communicable diseases, combined with poor sexual and reproductive health, and nutritional disorders are more typical of adolescents in low-income countries.<sup>8</sup> Yet non-communicable diseases also contribute a disproportionate burden of morbidity and mortality in Indigenous adolescents, as do intentional and unintentional injuries. As such, Indigenous adolescents have a multi-burden health profile within a country where adolescents have otherwise transitioned to a pattern in which non-communicable diseases are predominant.<sup>8</sup> Further complicating this profile of Indigenous adolescent health is the variability by remoteness. Current national adolescent health policies and programmes will not be sufficient to improve the specific health needs of Indigenous adolescents (table 3).

Many health needs of Indigenous adolescents have not previously captured attention.<sup>34,35</sup> Pneumonia, for example, is an important contributor to morbidity for Indigenous adolescents and might in part arise from their high incidence of influenza. Australia's vaccine schedule does not currently identify Indigenous people aged 5–15 years as a high-risk group.<sup>36</sup> Sexually transmitted infections are the focus of a national strategy, but the burden in Indigenous adolescents aged 10–14 years has not previously been reported because of its sensitivity.<sup>37</sup> These important findings should be interpreted in the context of early sexual debut and endemic infection in the broader community.<sup>38</sup> The excess burden of pelvic inflammatory disease might reflect barriers to accessing testing, treatments, and preventive interventions for sexually transmitted infections. Of the non-communicable diseases, the burden of psychosis (measured by hospital separations) is among the highest reported globally.<sup>39,40</sup> It might in part reflect high cannabis use, which can trigger psychoses in those already vulnerable.<sup>41</sup> Poorer access to primary health care and maintenance therapy, or misdiagnosis might be additional explanations.<sup>42</sup> There was a disproportionate burden of hospital separations due to reactive stress in Indigenous adolescents, possibly related to the substantial life-stressors reported (which might also be a factor in psychosis). There was also an excess in hospital separations related to type 2 diabetes, which might reflect increased incidence, poorly controlled disease, or premature onset of complications.<sup>22</sup> Rates of overweight and obesity in Indigenous adolescents are among the highest globally, as are rates of daily tobacco smoking.<sup>8</sup> This risk profile might, in part, explain the excess burden of ischaemic heart disease in Indigenous adolescents, which warrants further research.<sup>22</sup> Of the injuries, Indigenous adolescents were at similar risk of hospital separation due to road traffic injury, but at excess risk of mortality compared with non-Indigenous adolescents. This observation might signify differences in the severity of injury or in access to timely care. Given that fatal self-harm increases from early adolescence, high rates of non-fatal intentional injury

seem an important focus for preventive and early intervention.

The health inequalities of Indigenous adolescents reflect those of Indigenous Australians across the life-course. Adolescence, however, seems likely to be an important period for reducing these inequalities. For Indigenous Australians, communicable diseases typical of childhood too often extend into adolescence; conversely, non-communicable diseases more typical of later adulthood have too often already emerged in adolescence. So too, Indigenous adolescents have high rates of injuries, mental disorders, and poor sexual and reproductive health, all of which have implications for later-life health and are largely preventable. Adolescence also coincides with increasing inequity across the social determinants of health.<sup>1</sup> Early school leaving affects later employment prospects, but also reduces the other health and social benefits of being in school. For Indigenous girls, high pregnancy rates might compound socio-economic disadvantage, with major implications for the next generation, particularly in the context of poor adolescent health.<sup>43</sup> Adolescence is also a time of identity formation, including cultural identity, a process that is susceptible to racial discrimination. For these reasons, investing in adolescent health and wellbeing is likely to yield substantial returns across the life-course.<sup>8</sup>

This study had a high level of engagement with stakeholders to inform the method and interpretation.<sup>44,45</sup> The findings and research strategy might be relevant in the study of adolescent health in other Indigenous adolescent populations, who are also likely to have substantial health needs. For example, Indigenous adolescents across the USA, Canada, and New Zealand are at excess risk of suicide compared with their non-Indigenous counterparts.<sup>46</sup> However, differences in indicator availability, definition, and data quality for Indigenous adolescents preclude more detailed comparisons at this time.<sup>2</sup>

This study has limitations. The quality of the health profile was dependent on the reporting framework. To ensure the framework was complete, we used multiple inputs and consulted the study's national advisory group; however, there might be additional relevant indicators. Estimates were also dependent on the availability and quality of primary data. The health profile emphasises health outcomes, because this domain was where data were most available. Morbidity and mortality are the focus of national Indigenous health policy in Australia.<sup>18,47,48</sup> This emphasis, however, should not overshadow the emergent health risks and sociocultural determinants during this developmental stage. Indicators were reported at the national level, and we might have missed health needs of relevance to smaller communities. We also did not report trends over time and therefore did not highlight where gains have been made. Nonetheless, our study identifies current needs for Indigenous adolescents and provides a baseline from which progress can be measured.

	Rationale for this outcome, risk, or determinant being a key health need for Indigenous adolescents as supported by this study
<b>Health outcomes (including mortality)</b>	
Sexual reproductive health: sexually transmitted infections and obstetric complications	Sexually transmitted infections had high incidence (about 5500 chlamydia notifications per 100 000 Indigenous adolescents aged 15–19 years), and excess risk of pelvic inflammatory disease (IRR 2.9, 95% CI 2.6–3.3); excess burden of maternal sepsis among 10–14 year olds and gestational diabetes among 20–24 year olds
Mental health: self-harm, stress, and psychosis	Intentional self-harm (suicide) was about four times more common and non-fatal self-harm about twice more common compared with non-Indigenous adolescents; excess burden from reactive stress (IRR 2.5, 95% CI 2.3–2.6) and schizophrenia and psychosis (2.9, 2.8–3.1)
Assault	Assault related to mortality is about four times more likely and assault related to hospital separation around six times more likely to occur in Indigenous adolescents
Unintentional injury: road traffic accidents	Road traffic hospital separations showed no difference but deaths were about twice more likely to occur for Indigenous adolescents aged 10–24 years; excess risk of hospital separation due to falls, fire and heat, and accidental poisoning were reported
Respiratory diseases: pneumonia and asthma	Almost twice the risk of pneumonia mortality and about four times the risk of pneumonia hospital separations; excess burden of chronic lung disease
Vaccine preventable diseases	High rates of pertussis, influenza, and varicella; excess burden of pneumococcal and <i>Haemophilus influenzae</i> type b infections
Sight, hearing, or speech problem	Excess burden (includes otitis media and trachoma in remote areas); effects on education and employment
Oral health	About 15% of Indigenous adolescents aged 15–24 years have had their teeth extracted; excess burden of dental caries
Diabetes and impaired glucose tolerance	Excess burden of impaired glucose tolerance and type 2 diabetes, about 12 times risk of hospital separation for type 2 diabetes
Rheumatic heart disease	Rheumatic heart disease and related mortality almost exclusive to Indigenous adolescents in Australia
Cardiovascular diseases: ischaemic heart diseases, stroke, and endocarditis	Indigenous adolescents aged 20–24 years have about five times the mortality risk of ischaemic heart disease; excess burden of endocarditis
Skin diseases, including scabies	Excess burden of skin infections requiring admission to hospital; scabies prevalent in some communities
Cervical cancer	Although overall cancer was low, excess risk of cervical cancer cases in Indigenous women aged 20–24 years was reported, but this finding was not significant (IRR 2.0, 95% CI 0.9–4.3)
Renal diseases	Excess burden of acute glomerulonephritis (remote areas) and urinary tract infections (especially in women)
Musculoskeletal diseases	Almost 10% of Indigenous adolescents aged 20–24 years reported chronic back pain

(Table 3 continues on next page)

Addressing Indigenous adolescent health will require a greater prominence of adolescents in policy. The National Indigenous Health Equality Council's roundtable has previously recommended coordinated action across sectors, including health, education, employment, family, housing, and community services.<sup>49</sup> This recommendation is yet to be enacted, and Indigenous adolescents continue to face disadvantage across each of these areas.

Reform of social services and policy for Indigenous adolescents is needed. Incarceration of young people at this key developmental stage will have devastating

**Rationale for this outcome, risk, or determinant being a key health need for Indigenous adolescents as supported by this study**

(Continued from previous page)

**Health risks**

Early pregnancy	Indigenous girls aged 10–14 years were almost 20 times more likely to have a child than non-Indigenous counterparts; about 60 per 1000 births for those aged 15–19 years
Tobacco smoking	About 40% of Indigenous youths were current smokers, but >50% of current smokers attempted to quit in the past 12 months
Risky alcohol use	Around 65% of Indigenous adolescents aged 15–24 years had heavy episodic drinking in the past 12 months
Illicit substance use, particularly cannabis and intravenous drug use	About 25% of Indigenous adolescents aged 15–24 years had ever used cannabis; around 40% of people who injected drugs shared needles; hepatitis C notification rate was almost seven times that of non-Indigenous adolescents
Physical inactivity	About 50% of Indigenous adolescents have low rates of physical activity
Obesity and metabolic syndrome	Around 20% of Indigenous youths aged 10–24 years were obese (relative risk 1.6, 95% CI 1.3–1.9) compared with non-Indigenous youths; metabolic syndrome was prevalent
Sexual risks: early sexual debut and condom use	About 60% reported sexual debut aged <16 years; 31% of those aged 16–19 years did not use a condom at last sexual encounter
Iron deficiency	About 20% of Indigenous women aged 18–24 years were iron deficient and almost 15% were anaemic (particularly important given high fertility rate)

**Sociocultural determinants**

Education	Early transition out of education; almost 60% of those not studying intended to study in future
Employment	Common life stressor, Indigenous youths were about twice more likely to be unemployed and seeking work
Financial security	Financial stress was common (about 40% of households of Indigenous adolescents aged 10–24 years)
Food security	Almost 30% of households of Indigenous youths aged 10–24 years ran out of food in the past 12 months; diet quality was poor
Housing, including quality and stability	About 10% of households did not have cleaning facilities, and almost 25% were overcrowded; no data on homelessness were reported
Community safety	Almost 20% of Indigenous youths were victims of violence, and assault was a leading cause of morbidity and mortality
Racism	Around 25% of Indigenous adolescents aged 15–24 years are discriminated against (in the past 12 months)
Justice	24% of Indigenous adolescents aged 20–24 years were arrested in the past 5 years, and almost 6% were ever incarcerated
Participation	
Voice (having a say in important issues)	<20% of Indigenous people aged 15–24 years felt they had a voice within their community
Cultural engagement and participation	Cultural pride was near universal, yet only about a half were satisfied with their cultural knowledge
Connection with family	Almost 75% reported strong connection with family; about half of Indigenous adolescents aged 20–24 years were themselves parents

Key needs to emerge from the analysis, on the basis of burden, inequity, and advice from the study's national advisory group. These key areas of need might help inform priority areas for action and monitoring. Relative risks were of Indigenous to non-Indigenous adolescents of the same age groups. IRR=incidence rate ratio.

**Table 3: Summary of key health needs for Indigenous adolescents in Australia**

immediate, lifelong, and intergenerational consequences: there is a need to invest in alternatives.<sup>50,51</sup> Community-driven approaches to injury and violence

remain a priority.<sup>52</sup> Ensuring accessible education that is responsive to the cultural and developmental context of Indigenous adolescents is also essential. Australia's national Indigenous policy includes targets around education access and attainment.<sup>18</sup> Within this supportive policy context, there is a particular need to focus on the educational engagement of young Indigenous adolescents and young parents.

There remains an essential role for the health system. High rates of vaccine-preventable disease and the large burden of potentially preventable mortality suggest that the current health system is poorly responsive to the needs of Indigenous adolescents. Responsive health services will need to consider the accessibility and their developmental and cultural appropriateness.<sup>53,54</sup> In-reach (maximising opportunities for those engaged in the health system) and outreach services, existing delivery platforms (such as immunisation), and other platforms (including schools) should be explored as part of efforts to address barriers to access.<sup>55,56</sup> Given the high rates of adolescent fertility, adolescent-responsive antenatal care remains essential in many settings. There is also scope for the reorientation of health services to focus more on prevention. The funded well person's check, delivered through primary health care for Indigenous Australians, is more typically used for Indigenous children and older adults and could be extended to include the early identification and modification of adolescent health risks.<sup>57</sup> Among tobacco smokers, for example, many adolescents appear well advanced in the motivational stages towards cessation, and might benefit from therapies to support cessation.<sup>58,59</sup> A well person's check might also provide a mechanism for detection and early management of inconspicuous health needs (eg, screening for mental health, sexually transmitted infection, or impaired glucose tolerance).<sup>57</sup>

Health data and indicators specific to Indigenous adolescents are required to monitor actions and progress. The indicators used in this analysis might provide a useful baseline.<sup>8,60</sup> In the future, it will be important to realign national health and social surveys with the health needs of Indigenous adolescents. The quality of Indigenous identification in administrative datasets also needs to be further strengthened. Additionally, there is a clear need for a high-quality evaluation of policies and programmes to address these complex needs.<sup>17</sup>

Indigenous adolescents should be involved in responding to their health needs. This response will require provision of resources and skills required for young people to participate, and ensuring that policy and decision makers have the skills to listen.<sup>8</sup> The respectful engagement of Indigenous communities and families, who are integral for enabling and supporting adolescent health and wellbeing, is similarly essential. Without a specific focus on adolescents, Australia will not address health inequalities in its Indigenous peoples.

## Contributors

This study is drawn from a doctoral thesis completed by PSA who led all stages of the work under the academic supervision of GCP, ADB, SMS, JBC, and LD. NB and the project's national advisory group provided critical advice around the framing of the study, interpretation, and policy recommendations. All authors contributed to the drafting of the manuscript.

## Declaration of interests

NB is a member of the Prime Minister's Indigenous Advisory Council. All other authors declare no competing interests.

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