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# Indigenous children and receipt of hospital dental care in Australia

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**Summary.** *Objective.* The aim of this study was to investigate dental procedures received under hospital general anaesthetic by indigenous and non-indigenous Australian children in 2002–2003.
*Methods.* Separation data from 1297 public and private hospitals were obtained from the Australian Institute of Health and Welfare National Hospital Morbidity Database for 2002–2003. The dependant variable was the admission rate of children receiving four categories of dental care (i.e. extraction, pulpal, restoration or other). The explanatory variables included sex, age group, indigenous status and location (i.e. major city, regional or remote). Rates were calculated using estimated resident population counts.
*Results.* The sample included 24 874 children aged from 2 to 14 years. Some 4·3% were indigenous ($n = 1062$). Admission rates for indigenous and non-indigenous children were similar, with indigenous males having 1·2 times the admission rate of indigenous females ($P < 0·05$). Indigenous children aged < 5 years had 1·4 times the admission rate of similarly aged non-indigenous children ($P < 0·001$) and 5·0 times the admission rate of 10–14-year-old indigenous children ($P < 0·001$). Remote-living indigenous children had 1·5 times the admission rate of their counterparts in major cities or regional areas ($P < 0·001$), and 1·4 times the admission rate of remote-living non-indigenous children ($P < 0·01$). The extraction rate of indigenous males was 1·3 times that of non-indigenous males ($P < 0·01$), and 1·2 times that of indigenous females ($P < 0·05$). Pre-school indigenous children had 2·2 times the extraction rate of similarly aged non-indigenous children ($P < 0·001$), and 5·3 times that of indigenous 10–14-year-olds ($P < 0·001$). The extraction rate of remotely located indigenous children was 1·5 times that of indigenous children in major cities ($P < 0·01$), and 1·8 times that of remote-living non-indigenous children ($P < 0·001$).
*Conclusions.* In certain strata – particularly males, the very young and those in remote locations – indigenous children experienced higher rates of extractions than non-indigenous children when undergoing care in a hospital dental general anaesthetic setting.

## Introduction

Indigenous children in Australia are those who identify as Aboriginal, Torres Strait Islander or both, and they represent some 4·7% of the child population [1]. Although most indigenous Australian children live in metropolitan areas (52%), where they constitute 2% of the metropolitan child population [1], the indigenous proportion of the total child population increases with rising geographical remoteness, with 25% of indigenous children living in 'remote' or 'very remote' areas, compared with 3% of the non-indigenous child population [2]. While dental caries in the general Australian child population has decreased markedly in the past few decades, indigenous children still experience high levels of dental disease, with indigenous children in some areas having up to five times the prevalence of tooth decay of their non-indigenous counterparts [3–6]. Complex treatment needs can impose high demands on such children, making the use of general anaesthesia for dental procedures the preferred approach for some cases [7].

In 2002–2003, the most common reason for children under 15 years of age to receive hospital care under general anaesthesia in Australia was for dental procedures (predominately made up by preschool children) [8]. Children are referred for dental general anaesthetic care because of high dental disease levels, the

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need for complex procedures, medical complications or poor cooperation in the dental chair [7,9]. The advantage of oral rehabilitation under general anaesthesia is that it allows treatment in a single visit, providing immediate relief of pain and requiring little or no cooperation by the child. However, it should be noted that such care is expensive, and carries a small but real mortality risk [10].

Historically, dental general anaesthesia in Australia was available in primary dental care as well as hospital-based services [7]. However, the past two decades have been marked by an increase in public awareness and concern about the safety of dental general anaesthesia administered outside a hospital environment, fuelled by high-profile media coverage of the deaths of apparently healthy children in the UK whilst undergoing dental general anaesthesia [11]. Evidence suggests there are increasing numbers of children waiting to receive dental care under a general anaesthetic in Australia, with waiting lists of up to 2 years existing in some locations [7]. Given the considerable cost of such services to the taxpayer and family (e.g. time off from work, loss of salary, childcare arrangements for other children, travel and accommodation costs if resident in a remote area), and the proven demand for such services, this is an important and significant public health issue. The aim of this study was to investigate dental care received under a hospital general anaesthetic by indigenous and non-indigenous Australian children.

## Materials and methods

Data on dental procedures received by children admitted to public and private hospitals across all Australian states and territories were accessed from the Australian Institute of Health and Welfare National Hospital Morbidity Database for the 12-month period from July 2002 to June 2003 [12]. Data were collected for administrative purposes by hospital-employed dentists and recorded in standardized International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) codes, which are patient record codes used throughout Australian hospitals. There were just over 80 ICD-10-AM dental procedure codes which, for the purposes of this study, were grouped into 'extraction', 'pulpal care', 'restorative care' or 'other'. 'Other' procedures included provision of splints, crowns or bridges. Sociodemographic information was collected and included patients' age, sex, indigenous status and residential location. The Accessibility/Remoteness Index of Australia (ARIA) and the Australian Standard Geographical Classification Remoteness Structure (a classification of the remoteness of a location) were used to determine remoteness. The categories are:
**(0)** Major Cities of Australia: Census Collection Districts (CCDs) with an average ARIA value of 0–0·20.
**(1)** Inner Regional Australia: CCDs with an average ARIA index value of 0·20–2·40.
**(2)** Outer Regional Australia: CCDs with an average ARIA index value of 2·40–5·92.
**(3)** Remote Australia: CCDs with an average ARIA index value of 5·92–10·53.
**(4)** Very Remote Australia: CCDs with an average ARIA index value greater than 10·53.
**(5)** Migratory: composed of offshore, shipping and migratory CCDs.

For the purposes of this study, categories 1 and 2 were combined to make up 'regional', and categories 3 and 4 were combined to make up 'remote'. There were no children in category 5.

Estimated resident population (ERP) counts of all sociodemographic stratifications (i.e. sex, age, indigenous status and location) for 2002–2003 were provided by the Australian Bureau of Statistics. Rates were generated by dividing the number of hospital dental general anaesthetic admissions for a specified strata/procedure by the ERP of the same specified strata and multiplying by 100 000. The standard error formula for rates was used to derive standard errors and consequent 95% confidence intervals (CIs). Findings were considered significant at the $P < 0{\cdot}05$ level when 95% CIs did not overlap. Differences in rates were tested between indigenous and non-indigenous children for each outcome of interest. Findings are presented as rate per 100 000 total child population of the examined strata. Data were analysed using the Intercooled Stata 8·0 (StataCorp LP, College Station, TX, USA) computer program.

## Results

Data were obtained from 1297 hospitals and included 24 874 admissions for dental care. The proportion of female admissions was 49·3%. Some 34·4%, 39·1% and 26·5% of admissions were aged < 5, 5–9 and 10–14 years, respectively. Around 4·3% of admissions were indigenous ($n = 1062$), and 59·7%, 36·0% and 4·3% resided in major cities, regional or remote locations, respectively. Hospital dental admission rates by sociodemographic characteristics are presented in

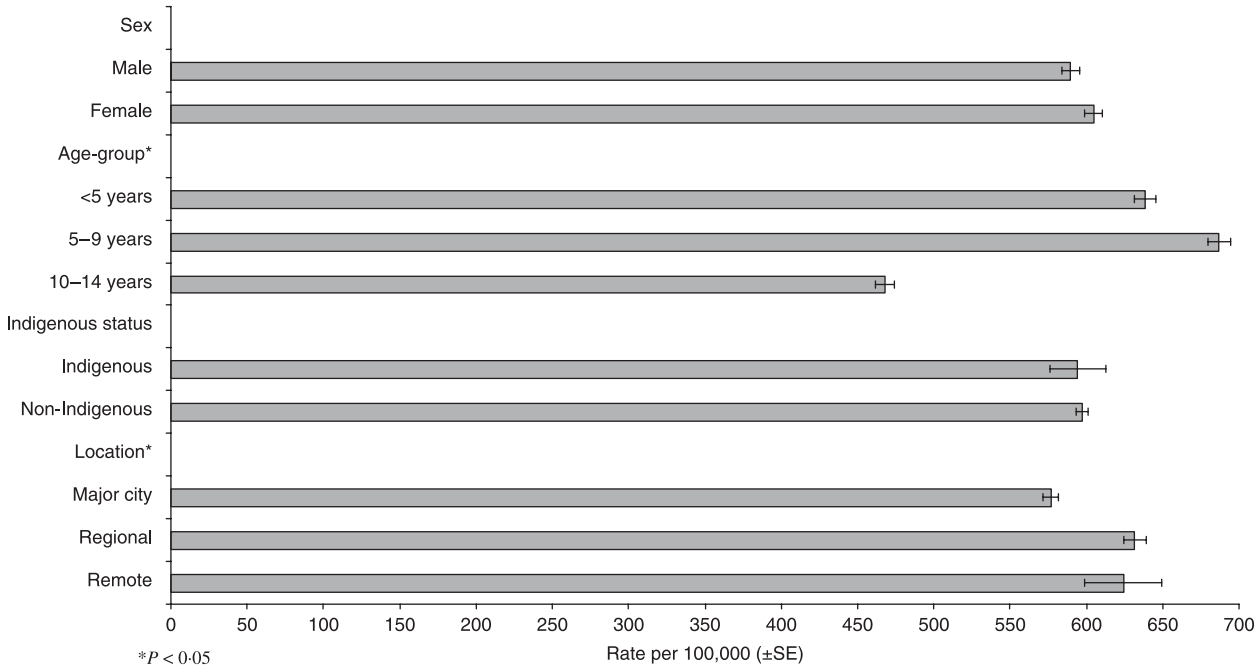


**Fig. 1.** Hospital dental admission rates by sociodemographic characteristics.

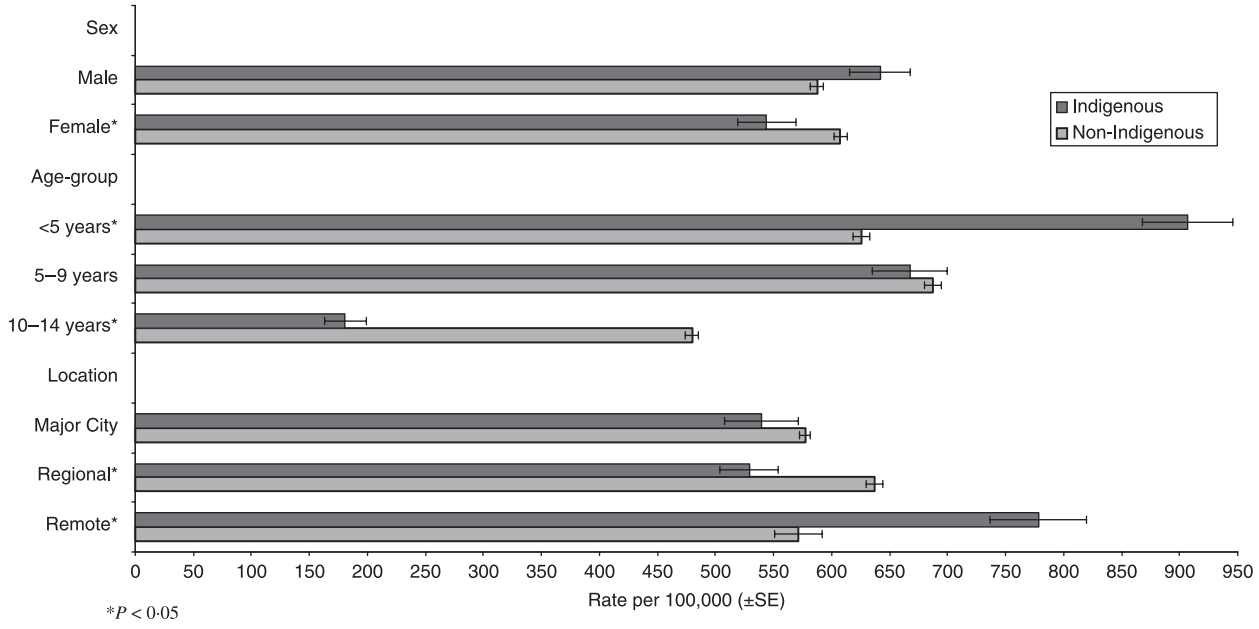


**Fig. 2.** Hospital dental admission rates by sociodemographic characteristics and indigenous status.

Fig. 1. The 5–9-year-old age group had the highest admission rate, and this was 1·4 times the admission rate of 10–14-year-olds ($P < 0·001$). Admission rates in regional and remote locations were similar, and were greater than the admission rate in major cities ($P < 0·05$).

Hospital dental admission rates by sociodemographic characteristics and indigenous status are presented in Fig. 2. Indigenous male admission rates were 1·2 times that of indigenous females ($P < 0·05$). Indigenous children aged < 5 years had 1·4 times the admission rate of similarly aged non-indigenous children ($P <$

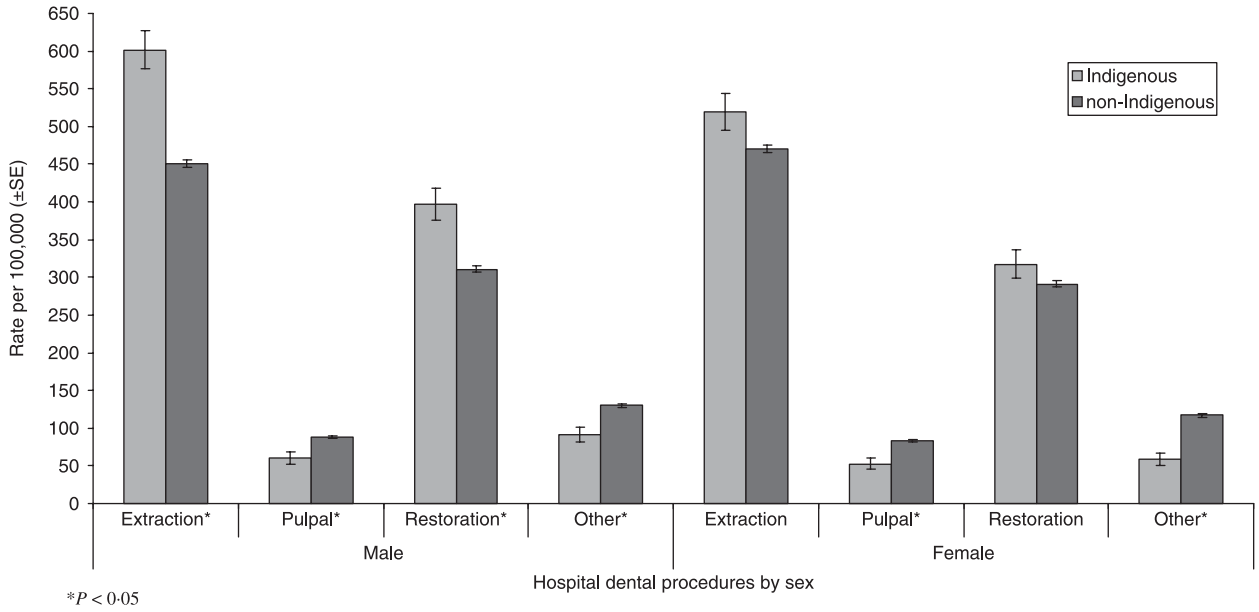


**Fig. 3.** Hospital dental procedure rates by indigenous status and sex.

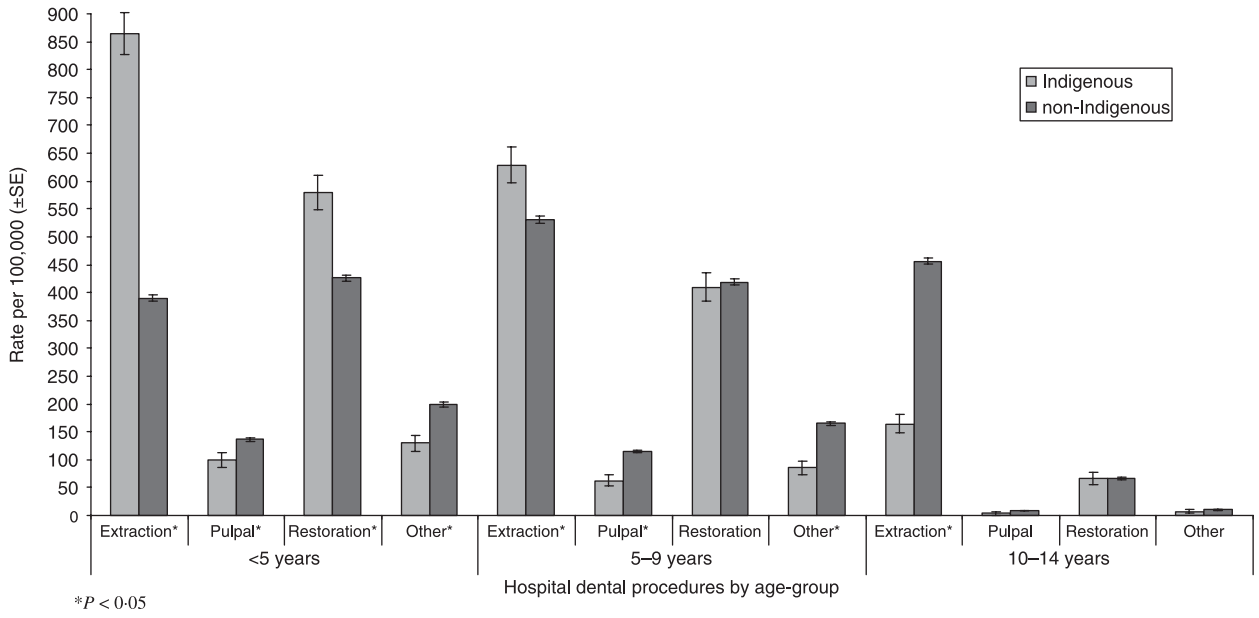


**Fig. 4.** Hospital dental procedure rates by indigenous status and age group.

0·001), and 5·0 times the admission rate of 10–14-year-old indigenous children ($P < 0·001$). Remote-living indigenous children had 1·5 times the admission rate of their counterparts in major cities or regional areas ($P < 0·001$), and 1·4 times the admission rate of non-indigenous children living in remote areas ($P < 0·01$).

Hospital dental procedure rates by indigenous status and sex are presented in Fig. 3. Indigenous males had 1·4 times the extraction rate ($P < 0·01$) and 1·3 times the restoration rate of non-indigenous males ($P < 0·05$). Indigenous males had 0·7 times the rate of pulpal or 'other' care of non-indigenous males ($P < 0·05$), and indigenous females had 0·6 times the rate of pulpal

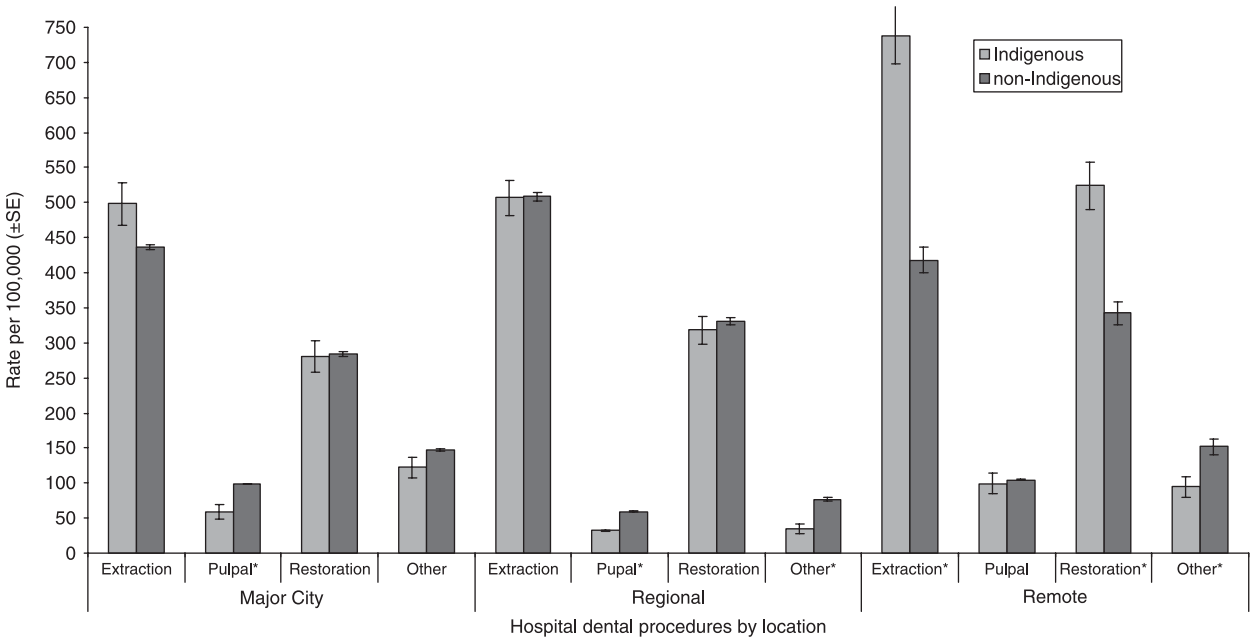


**Fig. 5.** Hospital dental procedure rates by indigenous status and location.

care and 0·5 times the rate of 'other' care of non-indigenous females ($P < 0·05$).

Hospital dental procedure rates by indigenous status and age group are presented in Fig. 4. The extraction rate of < 5-year-old indigenous children was 2·2 times that of < 5-year-old non-indigenous children ($P < 0·001$), and 5·3 times that of indigenous 10–14-year-olds ($P < 0·001$). Restoration rates for indigenous < 5-year-olds were 1·4 times that of non-indigenous < 5-year-old children ($P < 0·01$), while pulpal and 'other' rates for indigenous < 5-year-olds were 0·7 times those of non-indigenous < 5-year-old children ($P < 0·05$). Extraction rates for indigenous 5–9-year-olds were 1·2 times those of similarly aged non-indigenous children ($P < 0·05$), while pulpal and 'other' rates among indigenous 5–9-year-olds were 0·5 times those of their 5–9-year-old non-indigenous counterparts ($P < 0·05$). The extraction rates for indigenous 10–14-year-olds were 0·4 times those of non-indigenous 10–14-year-old children ($P < 0·05$).

Hospital dental procedure rates by indigenous status and location are presented in Fig. 5. The extraction rate of remotely located indigenous children was 1·5 times that of indigenous children living in major cities and regional areas, respectively ($P < 0·01$). Restoration rates for indigenous children were also higher among those in remote locations compared to indigenous children in major cities or regional areas ($P < 0·05$). Indigenous children in major cities had 0·6 and 0·8 times the pulpal and 'other' rates, respectively, of non-indigenous children residing in a city ($P < 0·05$). Regional-dwelling indigenous children had 0·5 times the pulpal and 'other' rates of regional-dwelling non-indigenous children ($P < 0·05$). Remote-dwelling indigenous children experienced 1·8 times the extraction rate ($P < 0·001$) and 1·5 times the restoration rate ($P < 0·01$) of their remote-dwelling non-indigenous counterparts, while 'other' rates for remote-dwelling indigenous children were 0·6 times that of remote-dwelling non-indigenous children ($P < 0·05$).

## Discussion

This analyses of Australian child hospital morbidity data for dental procedures provided under a general anaesthetic between 2002 and 2003 show that, while indigenous and non-indigenous hospital dental admission rates were similar overall, there were marked differences when certain strata or procedures were considered. Indigenous children who were male, aged < 5 years or lived in a remote location had higher rates of admission, and preschool or remotely located indigenous children received a disproportionate number of extractions compared to non-indigenous children in the same strata. Non-indigenous children generally received more conservative care.

According to some sources, female children are often more aware of their health needs and demand more attention from caregivers when in pain [13,14]. This may explain the higher overall admission rates of females in this study, a finding also supported by Vinckier *et al*. [15]. However, when gender was analysed by indigenous status, indigenous males were found to have higher rates of admission. This may reflect greater levels of dental disease among indigenous males, which may be, in part, a result of indigenous culture not supporting males to engage in the predominantly female-run school dental or screening services [16], an involvement that may allow for earlier detection and treatment of dental caries.

The admission rates of preschool indigenous children far surpassed those of their non-indigenous counterparts and indigenous children in older age groups. It may have been that such children were unable to access dental services (school dental or screening services in most Australian states and territories do not include preschool children), meaning that their levels of dental caries went unchecked until such a time that their dental condition warranted treatment under a general anaesthetic. It is well documented that pre-school indigenous Australian children have high levels of dental caries, with the decayed component in one study constituting 95% of the mean dmft (the sum of decayed, missing and filled teeth in the primary dentition) [3]. Pre-school children pose a substantial behavioural challenge to the clinician and may often not receive the treatment they require under local anaesthetic [7]. This is particularly so in the case of indigenous children, when a number of logistical constraints (e.g. multiple children being present in the clinic during treatment) preclude the ability to provide comprehensive and quality care.

Remotely located indigenous children had the highest rate of admissions when location and indigenous status were considered. The role of residential location in indigenous child oral health is recognized, with Endean and colleagues [6] finding that remote indigenous children had markedly higher dental disease levels compared with the general Australian child population, and rural indigenous child populations in Canada and the USA being consistently found to have poorer oral health than their urban-dwelling counterparts [17–19]. The provision of school dental services to remote areas in Australia is dependent upon location, logistical challenges and staff availability, with some indigenous communities having no dental service provision for upwards of one year [20]. Remotely located indigenous families may also have limited access to fresh food produce, although a range of more hardy goods – including cariogenic food and beverage products – are usually available in community stores [8]. The availability of fluoridated toothpaste in remote communities is also inconsistent, and if available, may be three times more expensive than in urban centres [20]. Remote-living indigenous children may not be exposed to the benefits of water fluoridation, although natural levels of fluoride in the water are high in some remote areas (e.g. central Australia) [6]. Cultural factors concerning child autonomy and self-responsibility may additionally play a role in remote indigenous child oral health outcomes [21].

The extent to which indigenous children in this study received extractions, as opposed to less-invasive treatment, compared to non-indigenous children was striking. Children's teeth are extracted during hospital dental procedures when they have excessive decay, when multiple teeth are affected or when time constraints preclude more comprehensive care [15,22]. Although it was not possible to ascertain if indigenous children who received extractions had similar oral health presentations as their non-indigenous counterparts who received more conservative care, research has indicated that – even when dental disease experience is equal – children from socially deprived backgrounds receive more extractions, and less restorations or preventive care under a general anaesthetic than their more affluent counterparts [23–25]. It was not possible to assess levels of social deprivation in this study, but it is widely acknowledged that indigenous children across all age groups and locations in Australia are socially disadvantaged in comparison with their non-indigenous counterparts [2,26].

It is also possible that indigenous children received higher rates of extractions because of provider bias and expectations. Treatment decisions made by dentists who provide care under a general anaesthetic are complex, but it is apparent that clinical considerations are not the only factors which influence the treatment provided. Investigations in the UK have revealed that dental practitioners selectively choose to restore some teeth whilst leaving other carious teeth untreated [25,27,28], and Tickle *et al*. [29] found that dentists were differentially prescribing prophylactic extractions, i.e. extractions other than those for pain and sepsis, for poorer children. The expectations of parents or caregivers also play a role in the type of treatment that a child receives under dental general anaesthetic, with

requests for teeth to be retained or removed being influenced by familial access to dental services, the child's compliance with oral hygiene, the child's behaviour in the dental chair, the oral health experience of other family members, the priority of oral health to family members and familial dental health awareness [30]. Hood *et al*. [24] reported that caregivers of children from more affluent backgrounds were more likely to demand conservative care rather than tooth removal, whereas parents from deprived backgrounds were more likely to accept extractions. In the case of this study, some indigenous families may have preferred extractions to any other treatment for their children so that no further pain or complications resulted. This may have been more likely if the family was from a remote location.

It should be noted that, in the 10–14-year-old age group, non-indigenous children had higher extraction rates than indigenous children. This may be because indigenous children in this age group were less likely to be screened by school dental services as a result of increased mobility or because more non-indigenous children received extractions for potentially impacted wisdom teeth or orthodontic purposes, a speculation made by Tennant *et al*. [5].

It is possible that the number of indigenous children receiving hospital dental care in this study was less than the number supposed to receive such care. The failure rate of indigenous children in presenting for surgery in Australian hospitals is high, and attributed to factors such as cultural alienation of hospital staff and difficulties in complying with operation procedures (which may involve staying up to 4 h after the operation, or in some situations, overnight in the hospital with the child) [12]. Indigenous caregivers may also fail to understand the importance of fasting preoperatively, with food or drink consumption up to 6 h before the operation increasing the risk of postoperative nausea or vomiting [12].

In conclusion, indigenous children in certain strata in this study were found to receive more extractions and less restorative care than non-indigenous children. The reasons for these findings are likely to be complex, but may include barriers in access to care, limited resources, high treatment needs, caregiver preference, treatment bias by service providers, time limitations and behavioural factors. These findings support those of previous investigations, which suggest that there are inequalities in the dental service provision of indigenous and non-indigenous Australian children. More research in this area is required to better understand the relationship between hospital dental service provision and indigenous child oral health.

**What this paper adds**

- Information on dental procedures received under hospital general anaesthetic by indigenous and non-indigenous Australian children, 2002–2003.
- Hospital dental admission rates for indigenous and non-indigenous children were similar.
- Indigenous children in certain strata, for example; males, the very young and those in remote locations, received more extractions and less restorative care than their non-indigenous counterparts.

**Why this paper is important to paediatric dentists**

- The demand for child oral health service provision in hospital general anaesthetic settings is increasing.
- Inequalities exist in the dental service provision of indigenous and non-indigenous Australian children.

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