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Effects of the Child Dental Benefits Schedule on dental hospitalisation rates in Australian children

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ABSTRACT

Objective. The Child Dental Benefits Schedule (CDBS) was introduced in 2014, and its aim was to support access to dental care for eligible children in Australia. Dental caries, and pulp and periapical diseases were the major dental reasons for children's hospitalisations. This study investigated if the availability of the CDBS had any effects on hospitalisation rates in Australian children. **Methods.** This study was a retrospective analysis of Medicare data from the Australian Government and the hospitalisation data from The Australian Institute of Health and Welfare (AIHW) from 2008 (6 years before the commencement of the CDBS) to 2020 (6 years after the commencement of the CDBS). **Results.** Although the hospitalisation rate trend was reducing before the CDBS started (2008–14), this reduction was not statistically significant. The reduction of hospitalisation rates was higher after the commencement of the CDBS (2014–20) and was statistically significant, but the regression model analysis showed a positive correlation between the CDBS and hospitalisation rate. The analysis without 'abnormal' year data (2019–20, COVID-19 pandemic year) supported no statistically significant decrease in hospitalisation rate after the commencement of the CDBS in 2014 until 2019. **Conclusion.** Although the CDBS is improving access to dental care for eligible children, any possible effects the CDBS might have on hospitalisations are not yet evident.

Keywords: Australia, Child Dental Benefits Schedule, children, dental, health, hospitalisation, Medicare, preventive.

Introduction

Dental caries have been a significant oral health issue in children and its occurrence rate has been predicted to increase over time.[1] Most oral conditions, especially dental caries, are preventable, while delayed diagnosis and treatment can lead to pain, discomfort, unnecessary hospitalisations and more expensive and invasive treatments. Preventative care can be most effective at young ages.[2] One of the most significant barriers to providing early dental care is the cost of dental services,[3] and evidence shows an association between poor dental health and socioeconomic disadvantage.[4–6]

The Child Dental Benefits Schedule (CDBS) is a scheme aimed to support children's dental health, and through this scheme, the Australian Government pays dental benefits to eligible children with greater financial needs. Eligibility for the CDBS includes being between ages 2 and 17 years, being covered by Medicare and receiving a relevant Australian Government payment, such as Family Tax Benefit Part A.[7] The program started in 2014, providing up to AUD1000 in benefits for basic dental services over two consecutive calendar years, in both private and public sectors.[2] Recently, it changed to AUD1070 for children aged 0–17 years. The CDBS services can be provided by a dental practitioner registered by the Dental Board of Australia, who has a Medicare provider number.[8]

Basic dental services covered by the CDBS, include diagnostic, preventive, periodontic, oral surgery, endodontic, restorative, prosthodontic, and general services including emergencies and sedation. The CDBS does not cover orthodontic, cosmetic dental work or services provided in a hospital.[9]

Dental treatments in hospitals are provided at a significant cost to patients, as well as to the health system (directly and indirectly). The expectation is that by providing more accessible dental services to children in the primary care sector, more expensive and invasive treatment through hospitalisations (which usually indicate treatment under general anaesthetics) could be prevented.

As dental caries and pulp and periapical diseases were the major reasons for children's dental hospitalisations,[10–13] this study will investigate if the introduction and availability of the CDBS had any effects on hospitalisation rates (for dental caries, pulp and periapical conditions) in Australian children.

Methods

Study method

This study was a retrospective analysis. This study was conducted following the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[14]

Child Dental Benefits Schedule data

The CDBS data were derived from Medicare Statistics, obtained from the Australian Government Department of Human Services. The services provided in hospitals are not included in the CDBS data. The data for the CDBS were available from 2014 to 2021 (financial year or mid-year).[9] The number of CDBS examinations represents the initial use of the Scheme. There is a rare possibility that a child might have required services that used more than one dental examination code, carried out by two different dental practitioners within the same year, resulting in them being counted twice in the data. This analysis was specifically about all claims made under the CDBS – if a claim was made under the CDBS, it would be reflected in this dataset. Although the dataset does not include all services provided to all children, the focus was on CDBS claims.

Hospitalisation data

The hospitalisation data were obtained from The Australian Institute of Health and Welfare (AIHW) National Hospital Morbidity Database website. This includes hospitalisation data for all of Australia, and included age groups 0–1, 1–4, 5–9, 10–14 and 15–19 years. Because the CDBS covers children aged 2–17 years, the best age match for assessment of both hospitalisation and the CDBS data was 1–19 years. The number of hospitalisations (based on the number of separations) was collected for all children aged 1–19 years in Australia, who were admitted to hospital with a principal diagnosis of dental caries, and pulp and periapical diseases. The International Classification of Diseases Tenth Revision Australian Modification (ICD-10-AM) system was used to identify cases to be included in the study. The hospitalisation data for 6 years before the start of the CDBS have been collected to assess hospitalisation trends over time and to determine the possible effects of the CDBS on hospitalisation trends. The data included admissions to all public and private Australian hospitals between financial years or mid-year from 2008–09 to 2019–20. The hospitalisation data for 2020–21 were not available at the time of analysis. The principal diagnosis ICD-10 codes were K02 for Dental caries and K04 for diseases of pulp and periapical tissues.[10]

The age standardised rates (ASR) of hospitalisations were calculated, based on the number of hospitalisations per 1000 in the relevant age group in the Australian population for each year.

Population data

The data for the Australian population for every age group each year were obtained from the Australian Bureau of Statistics (ABS) government website based on the Australian Census of Population data, using the estimated resident population as at 30 June for respective years.[15,16]

Data analysis

Descriptive data were analysed by Microsoft Excel® for Mac (version 16.60, Microsoft 365, Redmond, WA, USA) and SPSS (IBM SPSS, Chicago, IL, USA). Hospitalisation rates were calculated as the total number of admitted children aged 1–19 years due to all dental caries plus pulp and periapical conditions, divided by the total number of the Australian child population aged 1–19 years, and presented as the rate per 1000 children.

A General Linear Model, which is an advanced statistical modelling technique, was used to analyse the data. Descriptive Statistics and Parameter Estimates with 95% confidence intervals (CI) were estimated to find any possible association between the trends of ASR hospitalisations and the CDBS examination. *P*-values less than 0.05 were considered to be significant.

Ethics

The study involved de-identified data obtained from free open-access websites, and an exemption from ethics approval was obtained from the Human Research Ethics Committee at the University Of Western Australia (RA/4/20/5497).

Results

The first visit when utilising the CDBS includes an initial examination.[7] Since the commencement of the CDBS in 2014, up to 2020–21, a total of 9 239 572 dental examinations were performed for eligible children in Australia.

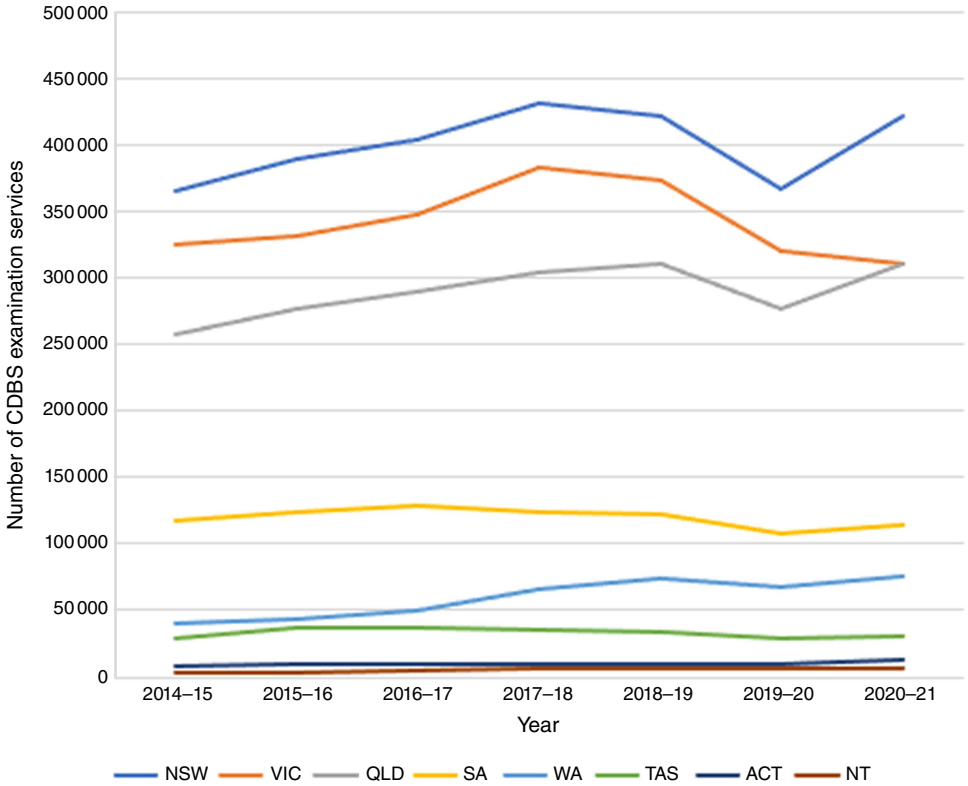


Fig. 1. Examination trends under the CDBS by state and territory from 2014 to 2021. NSW, New South Wales; VIC, Victoria; QLD, Queensland; SA, South Australia; WA, Western Australia; TAS, Tasmania; ACT, Australian Capital Territory; NT, Northern Territory.

Dental examination services trends in states and territories were quite different over time (Fig. 1). The number of dental examination services in the Northern Territory (NT) and Australian Capital Territory (ACT) has remained almost constant over time. In New South Wales (NSW) and Victoria (VIC), examination services increased until 2017–18 and then decreased until 2019–20; after that, in NSW, the number of examinations went up, whereas in VIC, they continued to decrease (Fig. 1).

Although Western Australia (WA) initially had a low utilisation rate of the CDBS, the number of examination services in WA steadily increased over time; however, it did slightly decrease in 2019–20.

In Australia, for age groups 1–4 and 5–14 years, the number of CDBS examinations was increasing every year (except in 2019–20), but for ages 15–19 years, it fluctuated over the study period, and had a sharp decrease in 2019–20 (Table 1).

The results showed the trends in ASR of hospitalisations due to dental caries and pulp and periapical diseases from 2008 to 2020 (6 years before the commencement of the CDBS and also the subsequent 6 years after the CDBS introduction) against the number of CDBS examination services from the beginning of the scheme (2014) until 2020 (Fig. 2).

Overall, regardless of the age group, there was a decrease of 0.012 hospitalisations per 1000 population per year from 2008 to 2014 (during 6 years before the start of the CDBS), but this decrease was not statistically significant (*P*-value < 0.05, 95% CI (−0.267, 0.243), and the annual change was a 1.4% decrease (Table 2).

Table 1. The number of examinations conducted under the CDBS by age group from 2014 to 2020.

Years	0–4 years	5–14 years	15–24 years[A]
2014–15	103 248	797 195	245 568
2015–16	119 389	864 418	232 478
2016–17	132 780	900 949	239 478
2017–18	146 473	968 313	245 601
2018–19	146 704	969 784	235 786
2019–20	125 830	855 554	205 429

[A]This reflects the Medicare statistic website age-group category, but obviously for the CDBS, there are not many cases who were aged 17–24 years included. CDBS covers children aged under 17 years.

From 2014 to 2020 (the 6 years after starting the CDBS), the hospitalisation rate decreased on average by 0.083 per 1000 population per year, indicating an annual 9.7% decrease. This decrease was statistically significant (*P*-value < 0.05, 95% CI −0.147, −0.018). During this period (2014–20), when also accounting for changes in the CDBS, there was a decrease of 0.103 in the hospitalisation rate per year. This decrease was statistically significant (*P*-value < 0.05, 95% CI (−0.139, −0.066), but unexpectedly, there was a positive relationship between the CDBS and hospitalisation rate (Table 2).

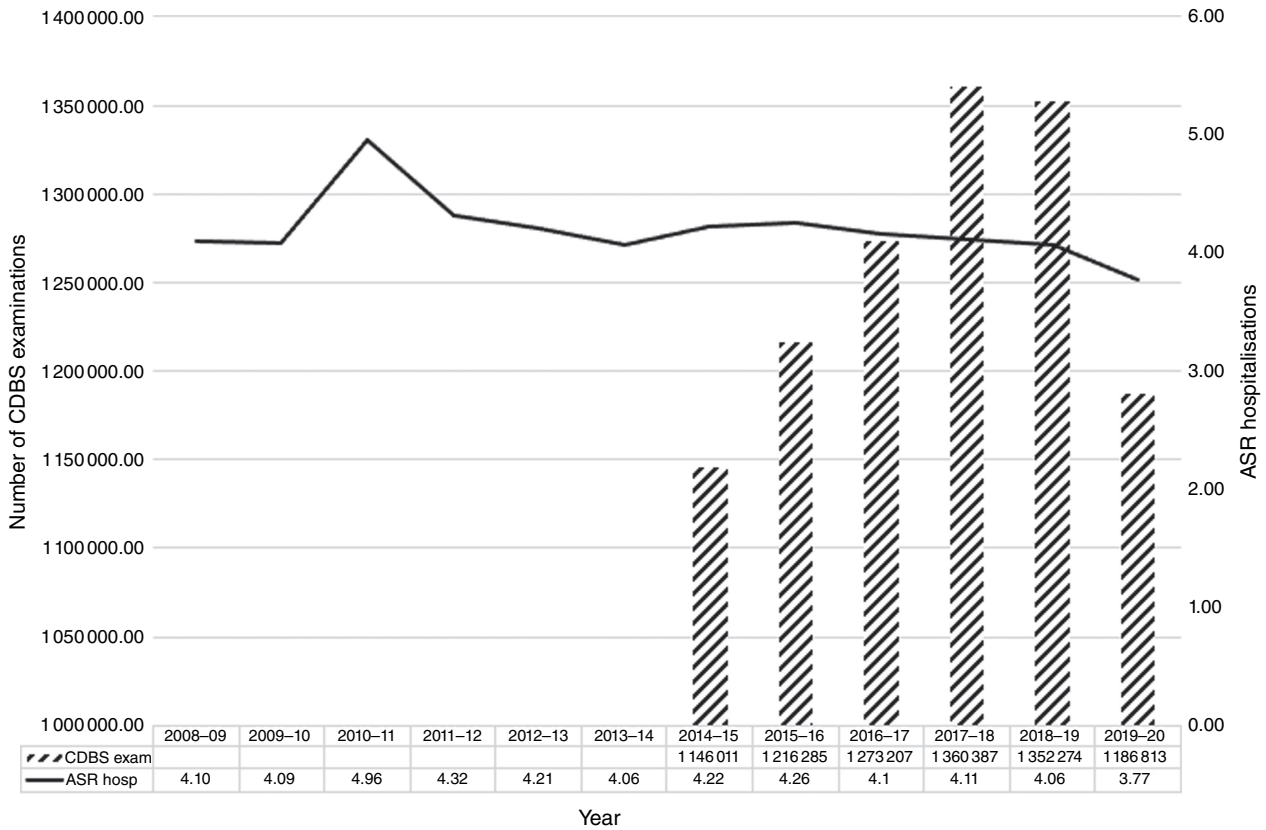


Fig. 2. Trends for Age Standard Rates (ASR) of hospitalisations due to dental caries and pulp periapical diseases versus the number of CDBS examination services in Australian children.

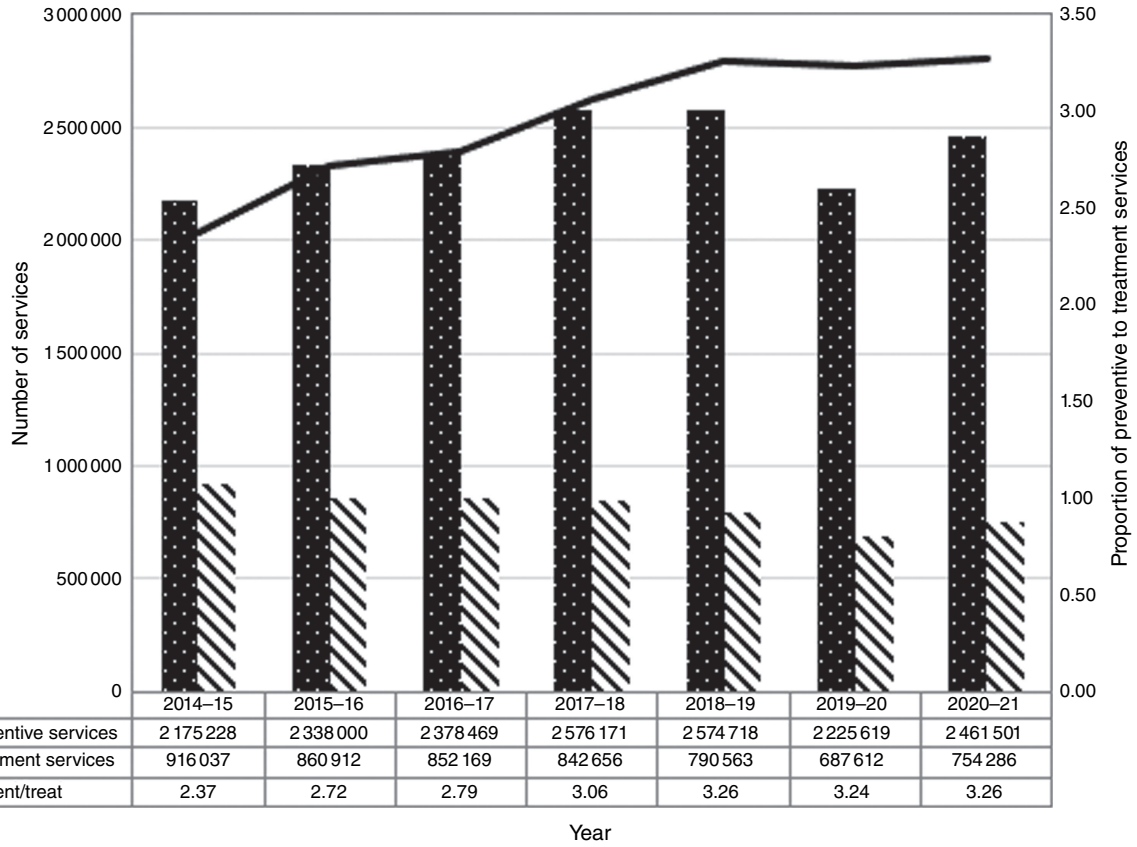
Table 2. Analyses of dental caries and pulp periapical hospitalisation rates over time in Australian children.

Parameter			*B* (coefficient)	*P*-value (Significant)*	95% CI	
					Lower	Upper
2008–14[A]	Years		−0.012	0.905	−0.267	−0.243
2014–20[B]	Covariate (Year)	Years	−0.083	0.024	−0.147	−0.018
	Covariate (Year and CDBS)	Years	−0.103	0.003	−0.139	−0.066
		CDBS	1.001×10^{-6}	0.026	2.219×10^{-7}	1.781×10^{-6}
2014–19[C]	Covariate (Year)	Years	−0.045	0.038	−0.085	−0.005
	Covariate (Year and CDBS)	Years	−0.062	0.399	−0.315	−0.190
		CDBS	3.125×10^{-7}	0.788	-4.070×10^{-7}	4.695×10^{-6}

*P-value < 0.05 is significant.
[A]2008–14 before the start of the CDBS.
[B]2014–20 after the start of the CDBS.
[C]2014–19 after the start of the CDBS without an abnormal year or a COVID-19 year.

As the hospitalisation rate and the CDBS examination services dropped dramatically in 2019–20 (an abnormal year due to the coronavirus disease 2019 (COVID-19) pandemic) (Fig. 2), there was a possibility that this year's data skewed the average 6-year results. Therefore, the data for the years 2019–20 were excluded to obtain a more reliable indication of trends over time.

After removing 2019–20 data, there still was a statistically significant decrease in hospitalisation rates, but only 0.045 per 1000 population per year ($P = 0.038$, CI = $-0.085, -0.005$). During this period (2014–19), when also accounting for changes in the CDBS, there was less reduction over time in hospitalisation rates (not



	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21
Preventive services	2 175 228	2 338 000	2 378 469	2 576 171	2 574 718	2 225 619	2 461 501
Treatment services	916 037	860 912	852 169	842 656	790 563	687 612	754 286
Prevent/treat	2.37	2.72	2.79	3.06	3.26	3.24	3.26

Fig. 3. Proportion of preventive services to treatment services provided by the CDBS in Australia over time.

statistically significant), and there was no significant association between the CDBS and hospitalisation rate (Table 2).

For evaluation purposes, all CDBS services were divided into two major categories: (A) preventive services; and (B) treatment services. Preventive services included all preventive services. Treatment services included periodontic, oral surgery, endodontic, restorative, prosthodontic and general services. The results showed that preventive services were performed more often than treatment services in every individual year. In addition, over time, from the beginning of the scheme until 2020–21, the number of preventive services was rising, except in 2019–20; whereas the number of treatment services reduced slightly until 2019–20 (Fig. 3). Overall, the proportion of preventive services to treatment services provided by the CDBS has been increasing leading up to 2019–20 (Fig. 3).

Discussion

There was an increase in the number of CDBS examinations for children aged 1–14 years over the study period (except for the year 2019–20) and for children aged ≥15 years; a sharp decrease in examinations in the same year is noticeable. This decrease is most likely a consequence of the COVID-19 pandemic.[17] Although the number of prevention services increased over the study period, it declined in 2019–20, which is most likely also due to the COVID-19 pandemic.[17]

Before commencing the CDBS, about 20% of Australian children did not have regular dental examinations yearly, and they visited the dentist only because they had a dental problem rather than for preventive care.[3]

This study showed the ratio of prevention services to treatment services under the CDBS, which covers mostly disadvantaged children, was increasing. It can be assumed that, at least in part, the CDBS has been achieving some of its objectives.

One of the targets of the CDBS is the prevention of dental disease in children. Previous studies indicated that the most common cause of dental hospitalisations in children (which are mostly preventable) were dental caries and pulp and periapical diseases.[10–13] Although the hospitalisation rates in the years prior to the CDBS implementation indicated a downward trend over time, this reduction (1.4% per year) was not statistically significant. The reduction of hospitalisation rates was higher (9.7% per year) after the start of the CDBS, and this was statistically significant, but the regression model analysis showed an overall positive correlation between the CDBS and hospitalisation rate. It means that

when the CDBS examinations increased, the hospitalisation rate increased as well; it might be because they were aware of the dental problem and ended up in hospital for treatment. However, when excluding the abnormal year data (2019–20), no statistically significant decrease in hospitalisation rates after the start of the CDBS was found. It seems the reduction over time in hospitalisation rates was higher after starting the CDBS (compare to the years before the scheme), but no significant correlations were found between hospitalisations and the CDBS use (from 2014 to 2019). At this stage, findings do not indicate that the CDBS affects the rates of child dental hospital admissions for dental caries and pulp and periapical conditions. Reasons for admission to hospitals for dental treatment are varied and complex, and several social determinants, as well as individual-level factors, all play a role. Reasons other than availability and use of the CDBS might be reasons for the decrease in hospitalisations over time. It might also be that the significant unmet need, as assessed by CDBS services, cannot be delivered by the existing health services system capacity, as there are long waiting lists for dental general anaesthesia.

The age groups were slightly different between the two data sets, with the CDBS including children aged 2–17 years, and hospitalisations including children aged 1–19 years. Hospitalisation numbers for those aged <2 years, and those aged >17 years, for dental caries and pulp and periapical conditions, were very low; however, this should not affect the overall outcomes. The other limitation of this study was that the number of eligible children by age group entitled to use the CDBS was not available.

The average number of eligible children in Australia in the first 5 years of the scheme was 2 984 123 each year. It was about 62% of the average population of children aged 2–17 years in that period.[8] In the first year (2014), only 29.5% of eligible children in Australia used the CDBS, but with increasing numbers over time. The proportion of eligible children who used the scheme reached 36.4% in 2017.[8]

The CDBS aims to provide a standardised national dental service for eligible children across states and territories in Australia;[8] however, utilisation rates varied widely across the states and territories. The highest utilisation rates were in South Australia and Tasmania, whereas the eligible children in the Northern Territory and Western Australia had the lowest rates of CDBS utilisation up to 2017.[8] One of the reasons for the low effectiveness of the CDBS could be the lack of uptake of this program. The reports found that just over one-third of the eligible population claim their benefits.[8] There have been different reasons for the lack of scheme use, such as cognitive biases, behavioural barriers and barriers originated from maternal characteristics.[18] Some strategies have been used to eliminate these barriers. As a result, the utilisation rate has been increasing over the life of the program, but some barriers may not be easily overcome.[18]

Moreover, utilisation rates were unequal among states and territories. It has been several years since the introduction of the CDBS, and utilisation has been severely affected by the COVID-19 pandemic since 2020. It is important to not only monitor the utilisation of the CDBS over time, but also to monitor how this scheme might prevent oral disease in children on a population level. One indication of this might be the hospitalisation rate of children for the treatment of preventable dental conditions.

Although in some aspects the CDBS is moving toward improving child dental services, any possible effects the CDBS might have on child hospitalisation rates are not yet evident.

Supplementary material

Supplementary material is available online.

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Data availability. All data are available from free online websites.[9,10,15,16]

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