Australian Government
Australian Institute of Health and Welfare

The dental health of Australia's children by remoteness

Child Dental Health Survey Australia 2009

Diep Ha, Najith Amarasena, Leonard Crocombe

DENTAL STATISTICS AND RESEARCH SERIES NO. 63

Australian Government
Australian Institute of Health and Welfare

Authoritative information and statistics to promote better health and wellbeing

DENTAL STATISTICS AND RESEARCH SERIES
Number 63

The dental health of Australia's children by remoteness

Child Dental Health Survey Australia 2009

Diep Ha

Najith Amarasena

Leonard Crocombe

Australian Research Centre for Population Oral Health
The University of Adelaide

Australian Institute of Health and Welfare
Canberra

Cat. no. DEN 225

The Australian Institute of Health and Welfare is a major national agency which provides reliable, regular and relevant information and statistics on Australia's health and welfare. The Institute's mission is *authoritative information and statistics to promote better health and wellbeing*.

This publication is part of the Australian Institute of Health and Welfare's Dental Statistics and Research series. A complete list of the Institute's publications is available from the Institute's website <www.aihw.gov.au>.

ISSN 1321-0254
ISBN 978-1-74249-427-2

Suggested citation

Ha DH, Amarasena N & Crocombe L 2013. The dental health of Australia's children by remoteness: Child Dental Health Survey Australia 2009. Dental statistics and research series no. 63. Cat. no. DEN 225. Canberra: Australian Institute of Health and Welfare.

Any enquiries about or comments on this publication should be directed to:
Communications, Media and Marketing Unit
Australian Institute of Health and Welfare
GPO Box 570
Canberra ACT 2601
Tel: (02) 6244 1032
Email: info@aihw.gov.au

Published by the Australian Institute of Health and Welfare

Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.

Contents

Acknowledgments

We wish to acknowledge the extensive time and effort that the state and territory health authorities have contributed in the collection and provision of the data used in this publication, along with the continued cooperation of individual dentists and dental therapists.

We would like to thank the staff of the school dental service in each state and territory for their time and extensive assistance with this survey.

We would also like to thank the dental health authority in each state and territory for giving support to their school dental service’s participation in the project.

The Australian Institute of Health and Welfare funded this research.

Abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
ASGC-RA	Australian Standard Geographical Classification-Remoteness Areas
CDHS	Child Dental Health Survey
CI	confidence interval
d	deciduous untreated decayed teeth
D	permanent untreated decayed teeth
dmft	the number of untreated decayed, missing (due to decay) and filled (due to decay) deciduous teeth
DMFT	the number of untreated decayed, missing (due to decay) and filled (due to decay) permanent teeth
DSRU	Dental Statistics and Research Unit
ERP	estimated resident population
f	deciduous filled teeth due to decay
F	permanent filled teeth due to decay
m	deciduous teeth missing due to decay
M	permanent teeth missing due to decay
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
SA	South Australia
SDS	school dental service
SiC	Significant Caries Index. The SiC Index is calculated by taking the mean DMFT of the one-third of individuals having the highest DMFT values in a given population.
SiC^{10}	Significant Caries Index (10%). The SiC^{10} Index is calculated by taking the mean DMFT of the 10% of individuals having the highest DMFT values in a given population.
Tas	Tasmania

WA	Western Australia
WHO	World Health Organization

Symbols

–	nil or rounded to zero

Summary

This publication describes the state of dental health of Australian children examined by school dental service staff in 2009 and provides insights into the dental health of rural children. The findings are drawn from the Child Dental Health Survey 2009, in which the data of 87,269 children aged 5–14 from most states and territories, except New South Wales and Victoria, were collected and analysed. Any comparisons with previous years or international statistics should be made with caution due to missing data from New South Wales and Victoria.

Dental decay is relatively common among Australian children

Just over half (51%) of children aged 6 attending a school dental service had a history of decay in their deciduous ('baby') teeth—that is, 1 or more decayed, missing or filled deciduous teeth (dmft). On average, children aged 6 had 2 or more dmft each (mean dmft = 2.36). Among children aged 12, nearly half (45.0%) had experienced decay in their permanent teeth, with 1 or more decayed, missing or filled permanent teeth (DMFT). On average, children aged 12 had just over 1 affected tooth (mean DMFT = 1.05).

A minority of children experience a greater amount of dental decay

The one-tenth of children aged 6 with the most extensive history of deciduous tooth decay had almost 10 deciduous teeth affected—more than 4 times the average for children of that age. The one-tenth of children aged 12 with the most extensive history of permanent tooth decay had 4.83 permanent teeth affected—about 4 times the average for children of that age.

Dental decay varies across the regions

Children who lived in *Remote/Very remote* areas were at increased risk of dental decay compared with those who lived in *Major cities*. The mean number of dmft at age 6 and the mean DMFT at age 12 were higher among children in *Remote/Very remote* areas than among those in *Major cities*.

Conclusions

Dental decay was relatively common among Australian children who attended a school dental service.

A minority of children still experience a much greater amount of dental decay than average burden of disease.

Children in *Regional* and *Remote* areas were at increased risk of dental decay in their deciduous teeth compared with those in *Major cities*.

1 Introduction

This publication describes the patterns of dental health and dental service provision for children in Australia in 2009. It also provides more detailed insights into rural children's dental health by geographic classifications. It presents data collected by most state and territory school dental services (SDSs) on the dental health of children examined by staff of those services. It provides policy makers and health planners, as well as academics and interested readers, with a summary of the available data on dental decay among children attending SDSs in Australia. The Indigenous status of respondents was not collected by all participating states and territories in 2009.

The dental health of children receiving care in an SDS has been monitored since 1977. Between 1977 and 1988, the monitoring was managed centrally by the (then) Commonwealth Department of Health as an evaluation of the Australian School Dental Scheme. In 1989, responsibility for collecting national data was transferred to the Australian Institute of Health and Welfare's Dental Statistics and Research Unit at the University of Adelaide, where monitoring is undertaken using the Child Dental Health Survey (CDHS).

1.1 What is dental decay?

Dental decay, also known as dental caries or tooth decay, is one of the most common chronic diseases worldwide. In Australia, almost half of the children have decay experience by the age of 6 (Amarasena & Ha 2012) and individuals remain susceptible to tooth decay throughout their life.

Dental decay develops as a result of a complex interaction over time between acid-producing bacteria and fermentable carbohydrates (sugars and other carbohydrates from food and drink that can be fermented by bacteria), as well as many host factors, including teeth condition and saliva. Dental decay is characterised by the loss of mineral ions from the tooth (demineralisation), stimulated largely by the presence of bacteria and their by-products (Mount & Hume 2005). Remineralisation occurs when partly dissolved crystals are induced to grow by the redepositing of minerals via saliva. Normally, a balance occurs between the demineralisation and remineralisation of the tooth surface (enamel). However, this balance is disturbed under some conditions, and the subsequent chronic demineralisation leads to the formation of holes or cavities in the tooth surface. Cavitation beyond the outer enamel covering of the tooth into the tissues can lead to a bacterial infection, which may cause considerable pain and require surgery or the removal of the tooth.

Dental decay is estimated to affect up to five million people in Australia each year. Untreated dental decay afflicts about 25% of all adults in any given year (Roberts-Thomson & Do 2007) and can lead to hospital admission (Jamieson & Roberts-Thomson 2008). Dental extractions and restorations are the most common reasons for hospital separations among children (AIHW 2006). Although dental decay is associated only rarely with mortality, it is a cause of considerable morbidity (Spencer & Lewis 1988). Consequences of dental decay include pain, problems associated with eating or drinking, loss of sleep, social embarrassment and time lost to work (Spencer & Lewis 1988). Dental decay resulting in tooth loss affects both chewing ability and quality of life (Brennan et al. 2008).

An individual's history of tooth decay is represented by teeth that have been filled or are missing due to decay. While these teeth have previously had decay, they no longer have active decay, but can be described as 'affected by decay'. A person with any teeth affected by decay is described as having had 'decay experience'. Knowing about the extent of decay experience is useful because individuals with filled teeth will likely require future dental work on those teeth, such as replacing fillings. Having teeth missing due to decay indicates that timely dental care was not received to fill those teeth before the decay became so extensive that a filling was not feasible. In addition, the accumulation of missing teeth is associated with more dental health related problems and a worse subjective rating of dental health (Gerritsen et al. 2010). A person who has no history of decay in teeth that should be present is described as 'caries free'. A person is described as 'having dental decay or untreated decay' when they have at least 1 tooth that is decayed and needs a filling.

1.2 Risk factors

Dental decay is characterised by chronic demineralisation of the structure of the tooth, a process in which several factors play important roles. The five factors that exert the strongest influence on dental decay are:

1. frequency of carbohydrate intake, which allows bacteria in the plaque to produce concentrations of organic acids that can dissolve the tooth
2. accumulation and retention of plaque, a potential breeding ground for acid-producing bacteria
3. frequency of exposure to dietary acids in addition to the bacterial acids
4. exposure to fluoride and some other trace elements, which help control the development of decay
5. natural protective factors such as saliva, which may help prevent or limit the progress of decay (Mount & Hume 2005).

Plaque, a semitransparent layer that adheres to the tooth surface, forms on all teeth and contains many pathogenic organisms, including bacteria. Tooth brushing and/or the use of chemical solutions capable of killing the acid-causing bacteria can reduce plaque. The frequency of exposure to fermentable carbohydrates such as sugar, which is related to the pattern of consumption of certain foods and beverages, is the most significant risk factor for dental decay.

Behavioural risk factors for dental decay relate to the five risk and protective factors listed above. These include substandard tooth cleaning; poor diet involving high exposure to acidic food stuffs and fermentable carbohydrates such as sugars; and limited exposure to fluoride available in toothpastes, fluoridated public water or other sources (Mount & Hume 2005).

1.3 Prevention

Decline in the prevalence and severity of dental decay over the past three decades points to a substantial improvement in the dental health of Australian children (Armfield & Spencer 2008). The susceptibility of contemporary child populations to infectious diseases affecting the oral cavity has been reduced by systematic exposure to fluorides, along with better nutrition, rising standards of living and better access to dental care. As well as the use of fluoride in public water supplies and products such as mouthwash, toothpaste and fluoride supplements, there are professional caries preventive techniques available that can considerably reduce children's experience of this disease. There is a growing body of research evidence about the effectiveness of preventive methods that can be applied easily in dental practices. For example, systematic reviews have been published for fluoride gel (Marinho et al. 2002a), fluoride varnish (Marinho et al. 2002b), chlorhexidine, pit-and-fissure sealants (Ahovuo-Saloranta et al. 2008) and dental health education (Rozier 2001).

Fissure sealants are materials that are applied to the pit and fissure surfaces of the teeth by dental professionals. They protect teeth from decay by creating a thin barrier that protects the sealed surface from the bacteria that cause decay. The use of fissure sealant has risen across all locations as children age (Amarasena & Ha 2012).

1.4 Measuring dental decay

At about the age of 5 or 6, children start losing their deciduous ('baby') teeth, which are replaced by their permanent teeth. Most children have lost all their deciduous teeth and have gained their permanent teeth (with the exception of wisdom teeth, which may erupt several years, or even decades, later) by the time they are 12. Therefore, analyses of dental decay in teenage children only report the level of disease in permanent teeth. In contrast, younger children generally have a mixture of deciduous and permanent teeth, or mixed dentition, from the age of 5 to 12. The convention is to report on these two sets of teeth separately. However, this report will also look at the decay experience for each age group in the combined deciduous and permanent dentition stage, as this gives a better picture of total decay experience for each age group. The dental health status of children sampled covers the following three areas:

- deciduous decay experience, which is the number of untreated decayed, missing (due to decay) and filled (due to decay) deciduous teeth (dmft), based on the coding scheme of Palmer et al. (1984). Decay refers to cavities, usually detected clinically using visual and/or tactile criteria, although X-rays may be used in some instances. Deciduous dmft was calculated for children aged 5–10. For children aged 11 or older, only permanent decay experience is reported. Loss of deciduous teeth means that at the higher end of this age range dmft scores can be lower than for children in the middle of the age range
- permanent decay experience, which is recorded as the the number of untreated decayed, missing (due to decay) and filled (due to decay) permanent teeth (DMFT), based on the World Health Organization protocol (WHO 1997). In some instances, X-rays may be used. DMFT was calculated for children aged 6–15
- fissure sealants, which are recorded as the number of teeth, otherwise sound, not restored and not decayed, that have a fissure sealant. This data item was introduced in most states and territories in 1989. In Australian SDSs, fissure sealants are mainly applied to the permanent dentition.

A tooth (deciduous or permanent) is recorded as missing due to decay if it was extracted for this reason. Teeth missing due to decay and those due to other causes can be distinguished by taking a detailed history from the patient. The tooth is coded as filled when it has a permanent restoration that, in the clinician's best judgment, was placed because of decay. This excludes fillings placed for reasons other than decay, such as restorations to repair trauma or aesthetic restoration of non-carious lesions.

The average number of decayed, missing and filled teeth can be regarded as a reasonable summary statistic for caries experience of a population. Given that the distribution of dmft/DMFT scores are skewed, mean dmft/DMFT may not reflect the existence of individuals with high levels of caries experience within the same population. The Significant Caries Index (SiC) was developed to target individuals with high caries levels (Bratthall 2000; Nishi et al. 2001). It is computed by obtaining the average decay experience of the one-third of the population with the highest dmft/DMFT scores. The SiC^{10} used here is a slightly modified index that reports the mean dmft/DMFT scores of the 10% of children with the highest caries levels.

1.5 Measuring remoteness

Remoteness areas were defined using the Australian Standard Geographical Classification—Remoteness Areas (ASGC-RA) system. The ASGC-RA essentially divides Australia into five regions—*Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote*—for comparative statistical purposes. It measures remoteness based on the physical road distance to the nearest urban centre and how far one has to travel to access goods and services (ABS 2003).

In this report, the postcode of the child's residence was used to classify their remoteness. If this was not available, the postcode of the attending clinic was used.

1.6 Data in this report

The target population for the CDHS was children attending an SDS operated by one of the states and territories. Data were collected from a random sample of children attending these services for some states. Data from South Australia, the Australian Capital Territory and Tasmania were collected in full enumeration. Results for New South Wales and Victoria were not reported here. Data for children attending services in Victoria for 2009 were not made available at the time of preparing this publication. In New South Wales, the SDSs targeted only schools identified by the state government Department of Education & Communities as being disadvantaged. Children at these schools were screened and entered the SDSs only if they required treatment. Therefore, the children in the SDS population in New South Wales would have greater need for treatment than both New South Wales children generally and children from other jurisdictions, therefore creating bias in the data. Consequently, New South Wales did not collect data for CDHS.

As the child populations of New South Wales and Victoria represent a sizeable proportion of the Australian child population, any comparisons with national estimates from previous years, or with international data, should be made with caution. Caution is also needed in drawing inferences among states and territories, as the differences might be the result of variations in SDS coverage, level of enrolment, services policy focus, or access to services in rural or remote areas.

Due to the low participation of children aged 15 in Queensland, we only report permanent decay experience for children aged 6–14.

A detailed description of the data collection and preparation methods used in this report is in Appendix A. A data quality statement for the Child Dental Health Survey 2009 is in Appendix B.

2 The dental health of Australia's children by age

2.1 Deciduous teeth

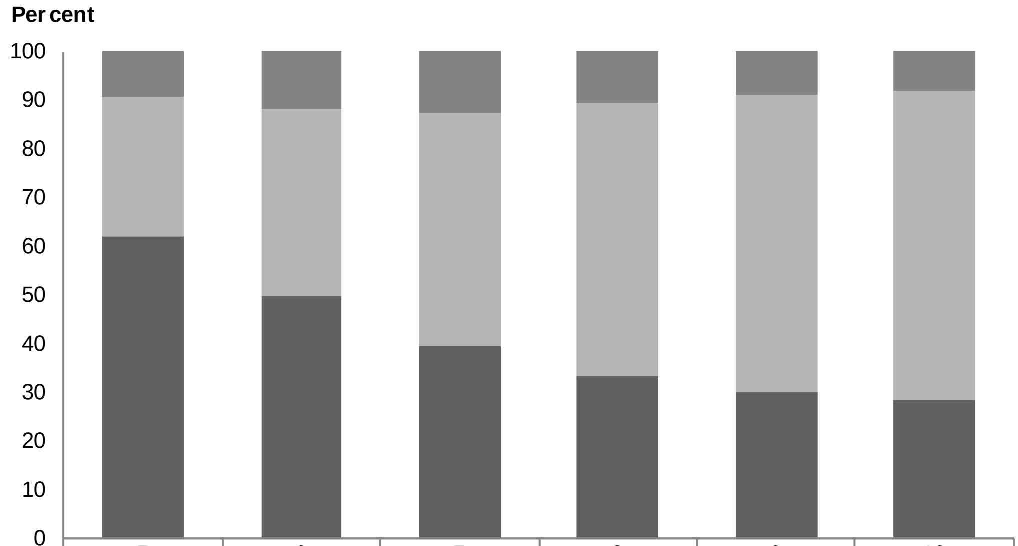
Age-specific decay experience

The average number of untreated decayed, missing and filled deciduous teeth (dmft) denotes the decay experience in the deciduous teeth. Table 2.1 shows the means and 95% confidence intervals (CIs) for each of these components for Australian children aged 5–10 in 2009. Children aged 6 had the highest average number of teeth with untreated decay (1.12), while children aged 10 had the lowest (0.51). The mean number of teeth per child that were missing due to decay was relatively small across all age groups, ranging from 0.15 teeth at age 10 to 0.31 at age 7. The average number of filled teeth was lowest among children aged 5 (0.51) and highest among those aged 9 (1.45). The mean dmft was highest for children aged 8 (2.54) and lowest for children aged 10 (1.79).

Table 2.1: Deciduous teeth—decayed, missing and filled teeth, 2009

Age (years)	Untreated decayed teeth (d)		Missing teeth (m)		Filled teeth (f)		dmft	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
5	1.12	1.07–1.17	0.17	0.15–0.19	0.51	0.48–0.54	1.80	1.74–1.87
6	1.17	1.13–1.22	0.28	0.26–0.30	0.90	0.87–0.94	2.36	2.29–2.42
7	0.98	0.94–1.01	0.31	0.29–0.33	1.19	1.15–1.23	2.47	2.41–2.53
8	0.85	0.82–0.88	0.27	0.25–0.29	1.43	1.39–1.47	2.54	2.49–2.60
9	0.72	0.69–0.74	0.21	0.20–0.23	1.45	1.41–1.49	2.38	2.33–2.43
10	0.51	0.49–0.53	0.15	0.14–0.16	1.13	1.10–1.17	1.79	1.74–1.83

The percentage contribution of decayed, missing and filled deciduous teeth to the dmft index of children aged 5–10 in 2009 is shown in Figure 2.1. Untreated decay was the principal component of the dmft score in the youngest age group, with more than 60% of children aged 5 having untreated decayed teeth. However, the percentage of untreated decay was highest at age 5 and lowest at age 10. Conversely, the percentage of filled teeth was lowest at age 5 and highest at age 10. This could be due to the gradual accumulation of fillings placed over time. The proportion of missing teeth was less than 13% across the groups, ranging from 8.3% at age 10 to 12.5% at age 7.



	5	6	7	8	9	10
Missing	9.4	11.8	12.5	10.6	8.9	8.3
Filled	28.5	38.4	48.0	56.1	61.0	63.4
Decayed	62.2	49.8	39.5	33.3	30.1	28.3

Age (years)

Figure 2.1: Decayed, missing and filled deciduous teeth as a percentage of dmft index by age, 2009

Distribution of deciduous caries experience by age

Figure 2.2 illustrates that the proportion of Australian children with deciduous caries experience in 2009 ranged from 41.5% to 60.7%.

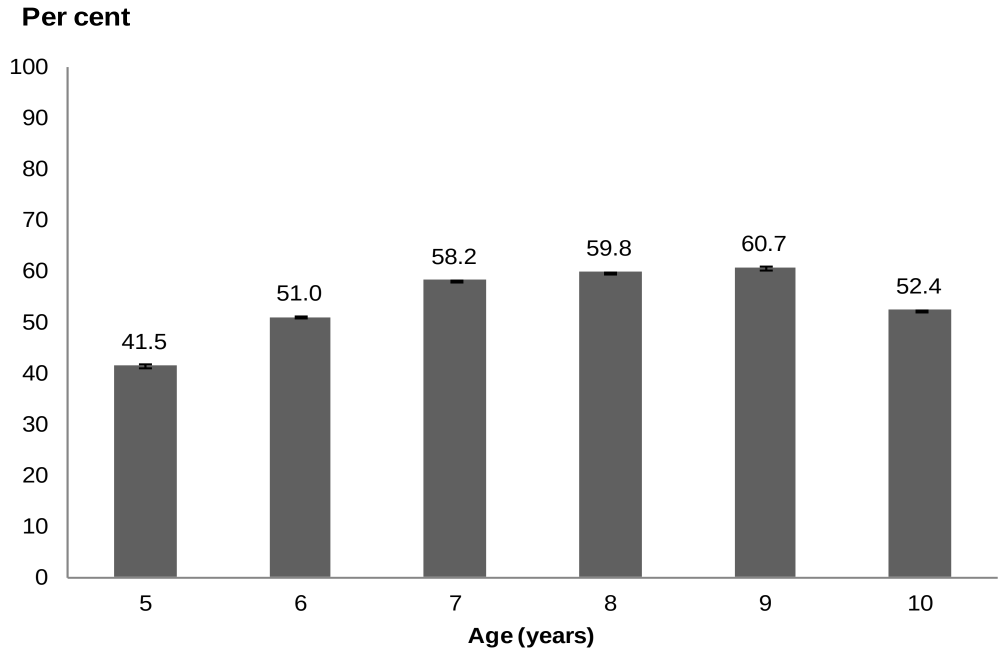


Figure 2.2: Deciduous teeth—proportion of children with dmft > 0 by age, 2009

More than 50% of children aged 6–10 had decay experience in their deciduous teeth (Table 2.2). Nearly 59% children aged 5 were caries free. The proportion of children who had a dmft score of 6 or more ranged from 8.2% to 17.4%, although most children experienced comparatively low levels of deciduous decay, having a dmft score of 1 or 2.

Table 2.2: Distribution of deciduous dmft index by age, 2009

	% dmft (CI)						
Age (years)	**0**	**1**	**2**	**3**	**4**	**5**	**6+**
5	58.5 (58.2–58.8)	8.4 (8.3–8.6)	8.2 (8.0–8.3)	4.0 (3.9–4.1)	4.4 (4.3–4.5)	2.1 (2.0–2.2)	14.4 (14.2–14.6)
6	49.0 (48.7–49.2)	9.9 (9.7–10.1)	8.9 (8.7–9.1)	5.8 (5.7–6.0)	4.4 (4.3–4.5)	4.7 (4.6–4.8)	17.4 (17.2–17.6)
7	41.8 (41.5–42.1)	12.1 (11.9–12.3)	9.5 (9.4–9.7)	8.1 (8.0–8.3)	7.3 (7.1–7.4)	5.9 (5.8–6.1)	15.2 (15.0–15.4)
8	40.3 (40.0–40.5)	9.8 (9.6–9.9)	10.4 (10.2–10.5)	7.7 (7.6–7.9)	8.6 (8.4–8.8)	7.8 (7.6–7.9)	15.5 (15.3–15.7)
9	39.3 (39.0–39.6)	13.7 (13.5–13.9)	11.3 (11.1–11.5)	9.1 (8.9–9.2)	8.1 (8.0–8.3)	5.2 (5.1–5.3)	13.4 (13.2–13.6)
10	47.6 (47.4–47.9)	13.4 (13.2–13.6)	12.1 (12.0–12.3)	7.9 (7.7–8.0)	6.3 (6.2–6.5)	4.5 (4.4–4.6)	8.2 (8.0–8.3)

Significant Caries Index

The SiC[10] reports the mean dmft/DMFT scores of the 10% of children with the highest caries levels. Figure 2.3 shows a comparison between the SiC[10] index and the six-state/territory average dmft index of children aged 6–10 by age for 2009. The SiC[10] values were 3 to 5 times greater than the six-state/territory average values.

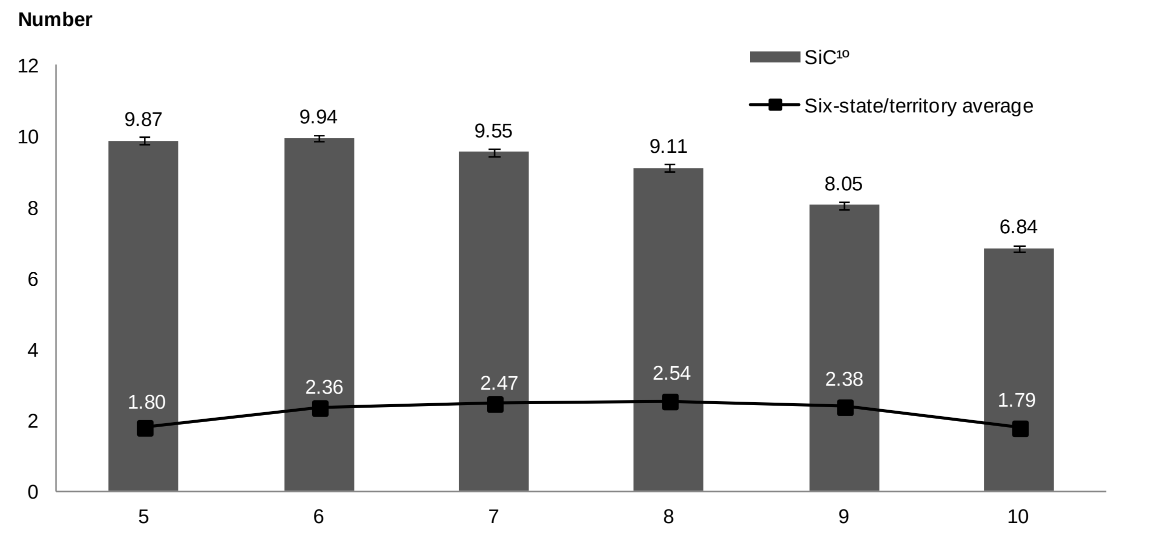


Figure 2.3: SiC[10] and average dmft index among children aged 5–10 by age, 2009

2.2 Permanent teeth

Age-specific caries experience

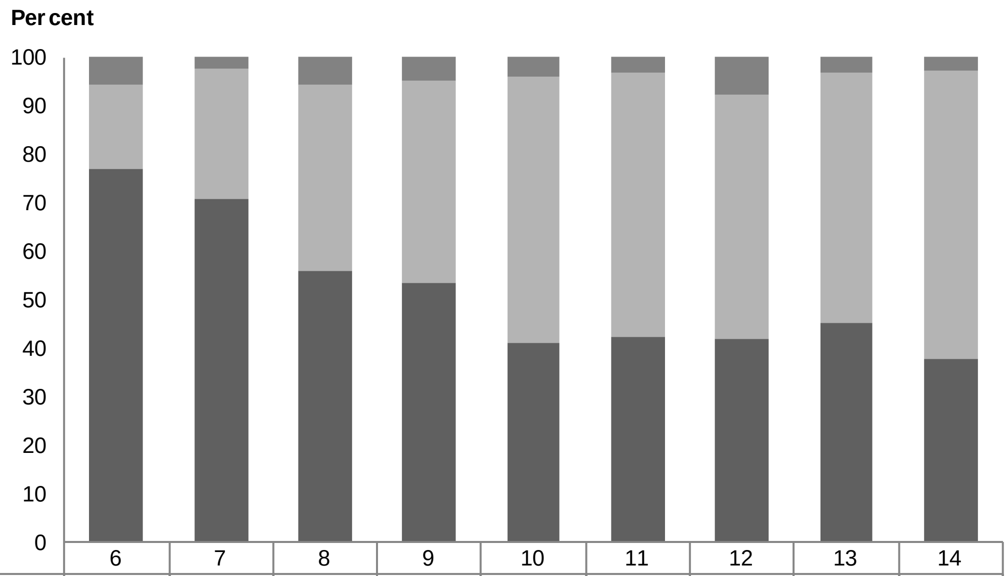
The mean number of untreated decayed teeth per child was lowest at age 6 (0.06) and highest at age 13 (0.77), before reducing to 0.64 at age 14 (Table 2.3). On average, fewer than 0.1 teeth per child were missing due to caries across all ages. Children aged 6 had an average of 0.01 filled teeth, compared with 0.99 in those aged 14. The mean DMFT scores ranged from 0.08 among children aged 6 to 1.7 among those aged 13 and 14.

The mean scores for all DMFT components including untreated decay were lower than the corresponding mean scores for deciduous teeth across the age range 6–10 (Table 2.1). This may suggest that permanent teeth in younger children are less prone to decay than deciduous teeth due to the shorter time since their eruption.

Table 2.3: Permanent teeth—decayed, missing and filled teeth, 2009

Age (years)	Decayed teeth (D)		Missing teeth (M)		Filled teeth (F)		DMFT	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
6	0.06	0.06–0.07	0.00	0.00–0.01	0.01	0.01–0.02	0.08	0.07–0.09
7	0.17	0.15–0.18	0.01	0.00–0.01	0.06	0.05–0.07	0.23	0.22–0.25
8	0.19	0.17–0.20	0.02	0.01–0.02	0.13	0.12–0.14	0.33	0.31–0.35
9	0.28	0.26–0.29	0.02	0.02–0.03	0.22	0.20–0.23	0.52	0.49–0.54
10	0.31	0.30–0.33	0.03	0.02–0.04	0.42	0.40–0.44	0.76	0.73–0.79
11	0.32	0.30–0.34	0.02	0.02–0.03	0.41	0.39–0.43	0.75	0.72–0.78
12	0.44	0.42–0.46	0.08	0.07–0.09	0.53	0.50–0.55	1.05	1.01–1.08
13	0.77	0.73–0.81	0.05	0.04–0.06	0.88	0.84–0.91	1.70	1.64–1.76
14	0.64	0.60–0.67	0.05	0.04–0.06	0.99	0.95–1.03	1.68	1.62–1.73

Figure 2.4 shows the mean number of decayed, missing and filled permanent teeth expressed as a percentage of DMFT index. The proportion of filled teeth (F) was lowest at age 6 (17.3 and highest at age 14 (59.2%). In contrast, the proportion of untreated decay (D) was highest at age 6 (76.9%) and lowest at age 14 (37.9%).



	6	7	8	9	10	11	12	13	14
Missing	5.7	2.4	5.5	4.6	3.9	3.0	7.8	3.1	2.9
Filled	17.3	26.8	38.4	41.8	54.8	54.6	50.2	51.6	59.2
Decayed	76.9	70.8	56.1	53.6	41.2	42.4	42.0	45.4	37.9

Age (years)

Figure 2.4: Decayed, missing and filled teeth as a percentage of DMFT index by age, 2009

The prevalence of dental decay in permanent teeth is shown in Figure 2.5. The proportion of children with a DMFT score greater than zero was lowest at age 6 (4.9%) and highest at 14 (57.7%).

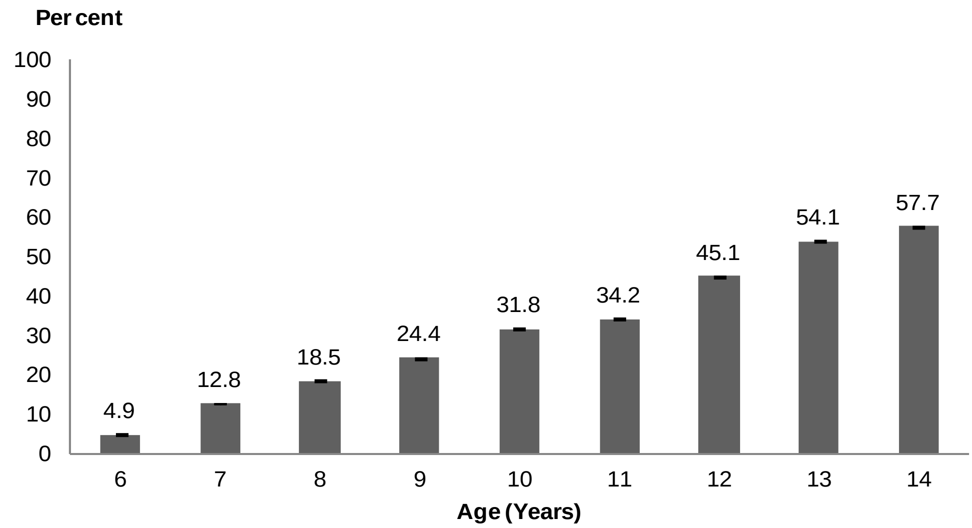


Figure 2.5: Permanent teeth—children with DMFT > 0 by age, 2009

Distribution of permanent caries experience by age

Table 2.4 shows the distribution of DMFT for Australian children aged 6–14 in 2009. The proportion of children with no decay experience in permanent dentition was highest at age 6, with more than 95% of children having a DMFT score of zero. The proportion of children with no caries experience was lowest at age 14 (42.3%). DMFT scores of 1 and 2 were most common than other scores, although 8.6% of children aged 13 had DMFT>6. The proportion of children aged 13 with a DMFT score of 6 or more was up to 9 times higher than those aged 9–12.

Table 2.4: Distribution of DMFT index for children, 2009 (per cent)

	% DMFT (CI)						
Age (years)	**0**	**1**	**2**	**3**	**4**	**5**	**6+**
6	95.1 (95.0–95.3)	2.7 (2.6–2.8)	1.4 (1.3–1.5)	0.6 (0.5–0.6)	0.1 (0.1–0.1)	0.0 (0.0–0.0)	0.0 (0.0–0.1)
7	87.3 (87.1–87.5)	7.3 (7.1–7.4)	3.2 (3.1–3.3)	1.1 (1.1–1.2)	0.6 (0.5–0.6)	0.0 (0.0–0.0)	0.5 (0.5–0.6)
8	81.6 (81.4–81.8)	9.7 (9.5–9.9)	5.4 (5.3–5.5)	1.8 (1.7–1.8)	1.1 (1.0–1.1)	0.1 (0.1–0.2)	0.4 (0.3–0.4)
9	75.6 (75.3–75.8)	11.4 (11.2–11.6)	6.4 (6.3–6.6)	2.9 (2.8–3.0)	2.4 (2.3–2.5)	0.4 (0.4–0.4)	1.0 (0.9–1.0)
10	68.2 (67.9–68.4)	11.6 (11.5–11.8)	8.5 (8.3–8.7)	4.7 (4.5–4.8)	4.2 (4.1–4.4)	1.9 (1.8–1.9)	0.9 (0.9–1.0)
11	65.9 (65.6–66.2)	15.1 (14.9–15.3)	7.7 (7.5–7.8)	5.5 (5.4–5.6)	3.9 (3.8–4.0)	1.0 (0.9–1.0)	0.9 (0.9–1.0)
12	55.0 (54.7–55.3)	16.3 (16.1–16.5)	13.9 (13.7–14.1)	6.5 (6.4–6.6)	4.2 (4.1–4.3)	2.7 (2.6–2.8)	1.5 (1.4–1.5)
13	45.9 (45.6–46.2)	17.0 (16.8–17.2)	10.9 (10.8–11.1)	9.0 (8.8–9.1)	5.1 (5.0–5.3)	3.5 (3.4–3.6)	8.6 (8.4–8.7)
14	42.3 (42.0–42.6)	18.2 (18.0–18.4)	15.5 (15.3–15.7)	7.7 (7.5–7.8)	4.6 (4.5–4.7)	4.9 (4.7–5.0)	6.9 (6.8–7.1)

Significant Caries Index

A comparison between the SiC[10] index and the six-state/territory average DMFT scores of children aged 6–14 in 2009 is in Figure 2.6. The SiC[10] values for permanent teeth were 4 to 10 times higher than the six-state/territory average mean DMFT scores across these age groups.

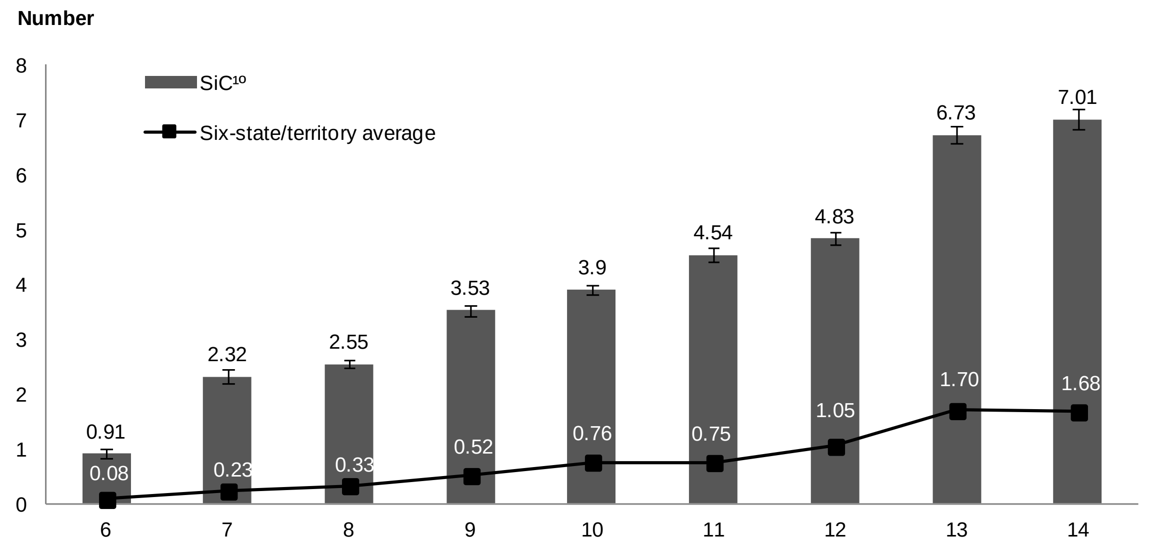


Figure 2.6: Significant Caries Index (SiC[10]) and average DMFT of children aged 6–14 by age, 2009

2.3 All teeth

Age-specific caries experience

Table 2.5 shows the combined components of caries experience for deciduous and permanent teeth in 2009. This gives an indication about the total amount of disease among Australian children receiving care within an SDS.

The prevalence of untreated decayed teeth (d + D = 1 or more) ranged from 30.6% at age 11 to 46.8% at age 7. The extent of untreated decay was highest at age 5 when 11.8% of children had 5 or more teeth with untreated decay and lowest at age 12 (1.4%). The proportion of children with teeth missing due to caries was less than 7% across all age groups. Between 33.4% and 58.3% children across all age groups had no caries experience in both deciduous and permanent teeth.

Table 2.5: All teeth—age-specific caries experience, 2009

Age (years)	No. of children[(a)]	Children with caries experience by total decayed, total missing, total filled and total DMFT/dmft (per cent)								
		d+D[(b)]=0	d+D[(b)]=1	d+D[(b)]=2	d+D[(b)]=3	d+D[(b)]=4	d+D[(b)]=5+	m+M=0[(c)]	f+F=0[(d)]	dmft+ DMFT=0[(e)]
5	116,574	64.2	8.6	8.6	4.4	3.8	10.4	95.8	87.2	58.3
6	115,782	59.3	9.9	9.7	5.7	3.6	11.8	93.6	74.5	47.5
7	117,448	53.2	16.4	11.5	6.8	4.2	7.9	92.4	62.3	39.0
8	120,183	56.3	16.3	10.3	8.4	2.9	5.9	92.1	53.6	36.3
9	120,648	60.1	15.5	10.2	6.1	2.9	5.2	92.6	49.8	33.4
10	121,558	61.6	16.4	10.4	4.6	3.8	3.3	94.4	50.8	36.2
11	121,919	69.4	15.2	7.0	3.4	2.7	2.3	96.8	58.4	44.0
12	122,885	69.0	16.1	8.9	3.0	1.5	1.4	95.6	62.3	45.2

(a) Weighted to estimated resident population — estimates rounded to nearest whole number.

(b) Proportion of children with total number of untreated decayed teeth in both deciduous and permanent dentition.

(c) Proportion of children with no missing teeth due to decay in both deciduous and permanent dentition.

(d) Proportion of children with no filled teeth present in both deciduous and permanent dentition.

(e) Proportion of children with no untreated decay, missing or filled teeth present in both deciduous and permanent dentition.

3 The dental health of Australia's children by remoteness

3.1 Background

The dental health status of Australians aged 15 or older living outside capital cities is poorer than that of those living in capital cities (AIHW DSRU 2009). Non–capital-city residents are more likely to suffer complete tooth loss, have an inadequate dentition (less than 21 teeth), wear dentures, have missing teeth, have untreated coronal dental decay and have a higher mean DMFT than capital-city residents (Roberts-Thomson & Do 2007). They are also more likely to avoid certain foods due to dental problems than people living in capital cities (Harford & Spencer 2007).

There is a complex interplay of many factors that influence the dental health of children (Fisher-Owens et al. 2007). There are four existing theories that try to explain the differences in dental health among rural and urban children.

One suggestion is that rural children have poorer access to dental care (AIHW DSRU 2009), which may include patient perceptions of the impact of travel costs and the effect on family life (Curtis et al. 2007). An imbalance in availability of general health services has been noted between urban and rural locations in Australia, with rural areas characterised by fewer facilities and a shortage of health personnel (Humphreys et al. 2002). Teusner et al. (2007) found that there was an uneven distribution of dentists, favouring larger centres, a trend that persists (Chrisopoulos & Nguyen 2012). Hence, it is not surprising that dentists from non-capital-city areas supply more patient visits per year, and are more likely to be busier than they would like to be, than capital-city dentists (Brennan & Spencer 2001). However, one Australian study found that there was no difference in dental attendance among preschool children from different geographic areas (Slack-Smith 2003).

A second theory is that fluoridation of drinking water is less common in rural areas. Water fluoridation is the most effective and socially equitable means of achieving community-wide exposure to the caries prevention effects of fluoride (NHMRC 2007) and this may be a contributing factor in the differing levels of dental health.

A third theory is that poorer rural dental health could be associated with both lower socioeconomic status and being rurally located. A lower proportion of households outside major urban areas had a high income (defined as more than $1,200 per week) in 2006. At the same time, in regional centres and small towns, a higher proportion of households had a low income (defined as less than $30 per week) (BRS 2008).

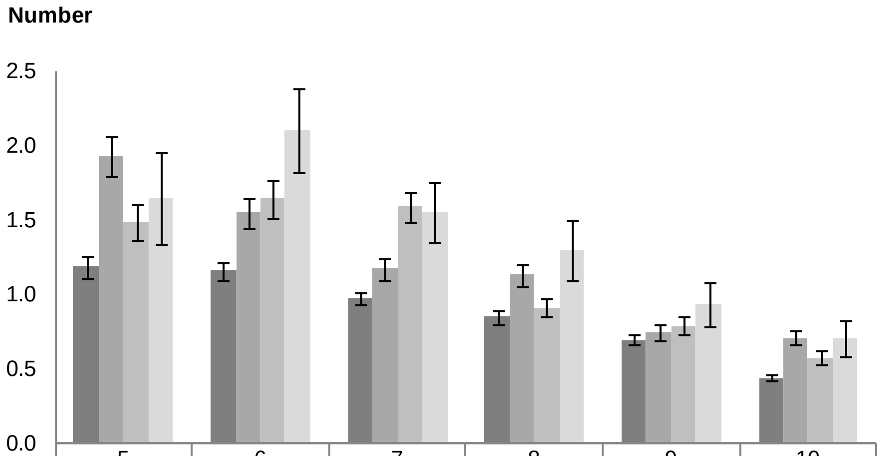
A marked socioeconomic inequality in dental health exists among Australian adults (Sanders & Spencer 2004; Sanders et al. 2006). In the Australian 2006 Census, higher income regions were more common in Australia's capital cities—of the regions analysed that were in capital cities, almost half (45%) were higher income regions, compared with only 9% of the regions outside capital cities (ABS 2009).

Lastly, differences in dental health among rural and urban children may be due to differences in knowledge about health. For example, in rural Victoria the oral-health-related knowledge regarding risk and protective factors among parents of preschool children was found to be variable and sometimes at odds with contemporary knowledge (Gussy et al. 2008). This attitude may be reflected in dental-visiting behaviour. People living in non–capital-city areas were more likely than those living in capital cities to have a problem-orientated pattern of dental attendance; that is, they were less likely to make an annual dental visit, and less likely to have a particular dentist that they usually visited (AIHW DSRU 2009). The notion that rurally based dentists may not be as preventively orientated as city–based dentists could be linked to this health attitude (Brennan & Spencer 2001). Dentists outside Australia's capital cities provide less preventive care, but more restorations and extractions (Brennan & Spencer 2007).

3.2 Children's dental decay by remoteness

Deciduous teeth

The untreated decay experience in deciduous teeth by remoteness of Australian children aged 5–10 in 2009 is in Figure 3.1. Children in *Major cities* had the lowest mean number of decayed teeth across all age groups, ranging from 0.44 at age 10 to 1.19 at age 5. Children in *Remote/Very remote* areas had the highest levels of untreated decay at ages 6, 8 and 9.

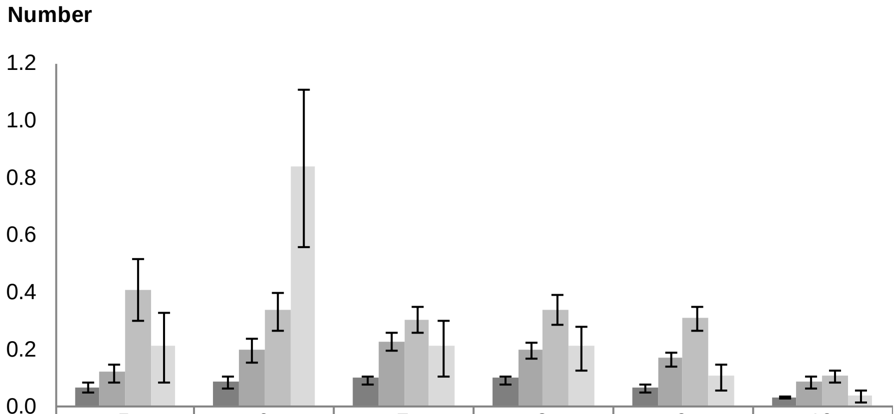


	5	6	7	8	9	10
Major cities	1.19	1.16	0.98	0.85	0.69	0.44
Inner regional	1.93	1.55	1.17	1.13	0.75	0.71
Outer regional	1.49	1.64	1.59	0.91	0.79	0.57
Remote/Very remote	1.65	2.10	1.55	1.30	0.94	0.70

Age (years)

Figure 3.1: Mean number of decayed deciduous teeth by remoteness, 2009

The mean number of missing teeth was generally higher in children from *Outer regional* areas, except for those aged 6 living in *Remote/Very remote* areas, who had the highest number of missing teeth (0.84) (Figure 3.2). Children from *Major cities* had the lowest mean number of missing teeth across all age groups.

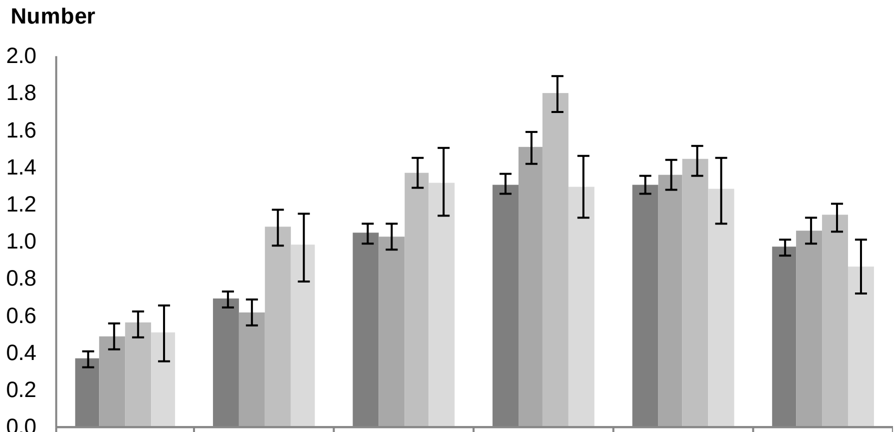


	5	6	7	8	9	10
Major cities	0.07	0.09	0.10	0.10	0.07	0.03
Inner regional	0.12	0.20	0.23	0.20	0.17	0.09
Outer regional	0.41	0.34	0.30	0.34	0.31	0.11
Remote/Very remote	0.21	0.84	0.21	0.21	0.11	0.04

Age (years)

Figure 3.2: Mean number of missing deciduous teeth by remoteness, 2009

Figure 3.3 shows that children from *Outer regional* areas had the highest mean number of filled teeth compared with other areas. This finding was consistent across all age groups.

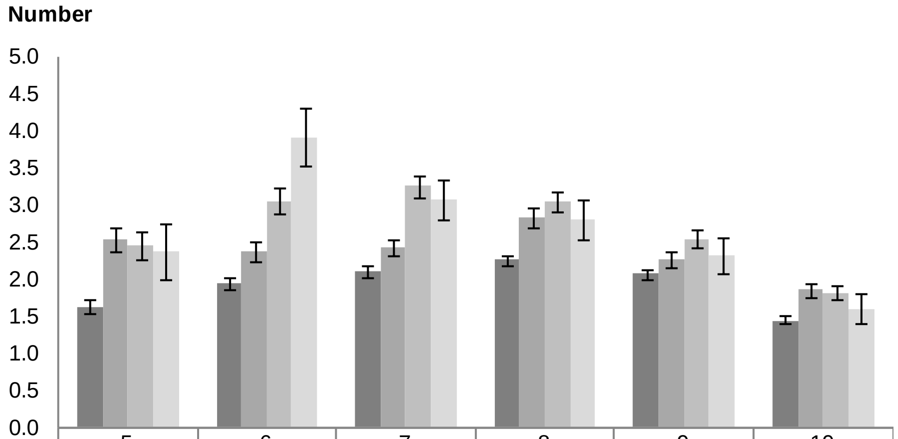


	5	6	7	8	9	10
Major cities	0.37	0.69	1.05	1.31	1.31	0.97
Inner regional	0.49	0.62	1.03	1.51	1.36	1.06
Outer regional	0.56	1.08	1.37	1.80	1.44	1.14
Remote/Very remote	0.51	0.98	1.32	1.30	1.28	0.87

Age (years)

Figure 3.3: Mean number of filled deciduous teeth by remoteness, 2009

The caries experience in deciduous teeth of children aged 5–10, as expressed by mean dmft score and by remoteness, is in Figure 3.4. The mean dmft score across the age groups was lowest among children in *Major cities*.

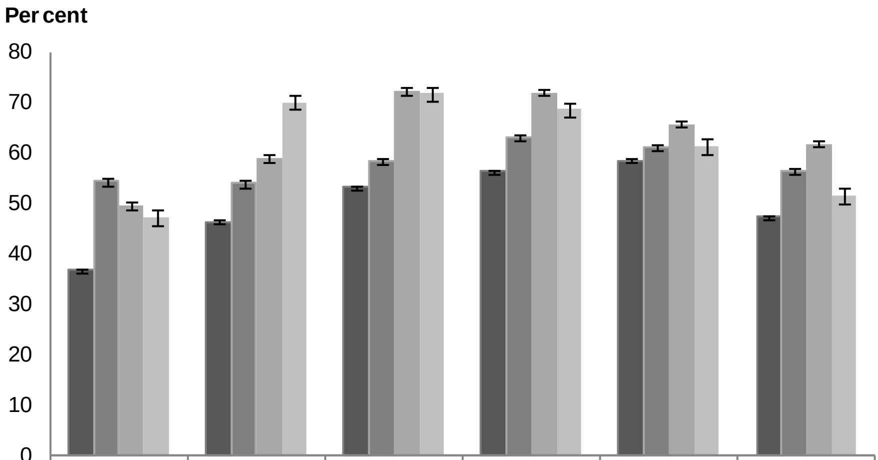


	5	6	7	8	9	10
Major cities	1.63	1.94	2.12	2.26	2.07	1.45
Inner regional	2.54	2.37	2.43	2.84	2.27	1.87
Outer regional	2.46	3.05	3.26	3.04	2.54	1.82
Remote/Very remote	2.37	3.91	3.08	2.80	2.32	1.61

Age (years)

Figure 3.4: Mean dmft by remoteness, 2009

The proportion of Australian children with deciduous dental decay in 2009 varied across geographic regions (Figure 3.5). The proportion of children with dmft > 0 was lowest among those in *Major cities*. Children aged 6–8 in *Remote/Very remote* or *Outer regional* areas had the highest proportion of deciduous teeth with decay experience. There was no clear pattern of caries experience among children aged 5, 9 or 10 in *Outer regional*, *Inner regional* or *Remote/Very remote* areas. Between 36.6% and 72.1% children experienced dental decay across all categories.



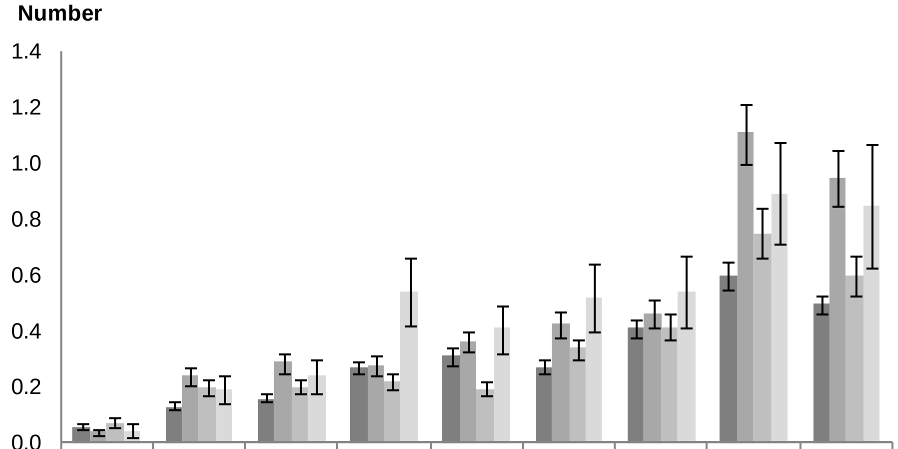
	5	6	7	8	9	10
Major cities	36.6	46.3	53.1	56.3	58.4	47.3
Inner regional	54.2	53.8	58.2	63.1	60.9	56.4
Outer regional	49.5	59.0	72.1	72.0	65.7	61.8
Remote/Very remote	47.1	69.9	71.7	68.6	61.2	51.4

Age (years)

Figure 3.5: Deciduous teeth—children with dmft > 0 by remoteness, 2009

Permanent teeth

Figure 3.6 shows the untreated decay experience in permanent teeth of children aged 6–14 by remoteness in 2009. There was a positive association between age and the number of decayed permanent teeth up to age 13—the mean number of decayed teeth was lowest at age 6 and highest at age 13 across nearly all locations. Children in *Major cities* had the lowest levels of untreated decay across ages 7, 8, 11, 12, 13 and 14.

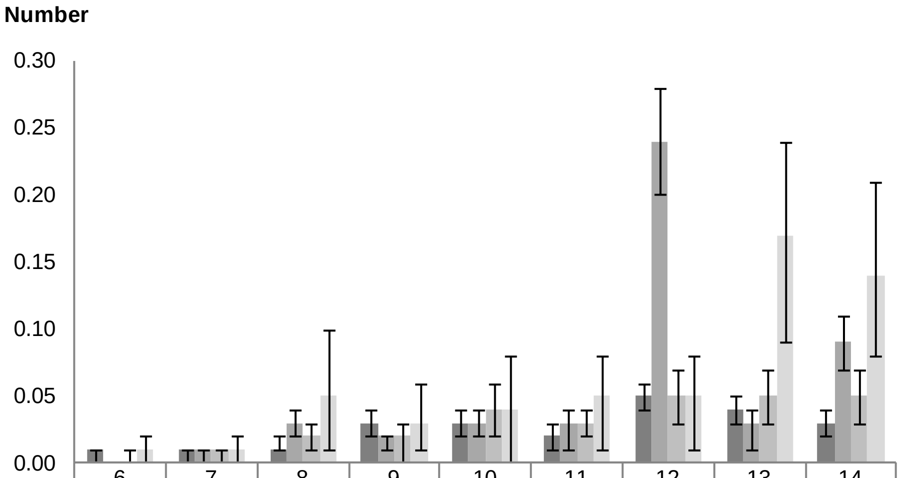


	6	7	8	9	10	11	12	13	14
Major cities	0.06	0.13	0.16	0.27	0.31	0.27	0.41	0.60	0.50
Inner regional	0.04	0.24	0.29	0.28	0.36	0.43	0.46	1.11	0.95
Outer regional	0.07	0.20	0.20	0.22	0.19	0.34	0.41	0.75	0.60
Remote/Very remote	0.04	0.19	0.24	0.54	0.41	0.52	0.54	0.89	0.85

Age (years)

Figure 3.6: Mean number of decayed permanent teeth by remoteness, 2009

The mean number of missing permanent teeth due to caries was relatively low, ranging from 0 to 0.24, across both locations and age groups (Figure 3.7). There was no clear gradient across remoteness categories.

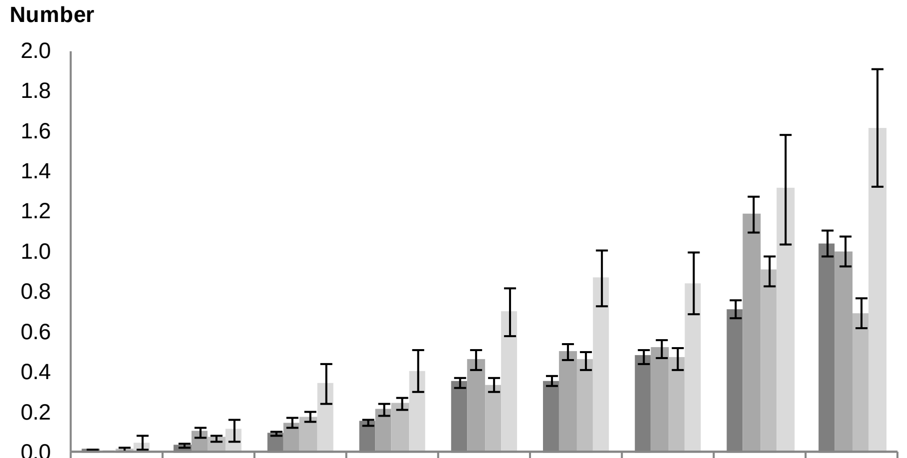


	6	7	8	9	10	11	12	13	14
Major cities	0.01	0.01	0.01	0.03	0.03	0.02	0.05	0.04	0.03
Inner regional	0.00	0.01	0.03	0.02	0.03	0.03	0.24	0.03	0.09
Outer regional	0.00	0.01	0.02	0.02	0.04	0.03	0.05	0.05	0.05
Remote/Very remote	0.01	0.01	0.05	0.03	0.04	0.05	0.05	0.17	0.14

Age (years)

Figure 3.7: Mean number of missing permanent teeth by remoteness, 2009

Figure 3.8 shows the mean number of filled permanent teeth for children of each age by remoteness location. Children from *Major Cities* had the lowest number of filled teeth at some ages, while children from *Remote/Very remote* areas showed the highest number of filled teeth across all age groups.

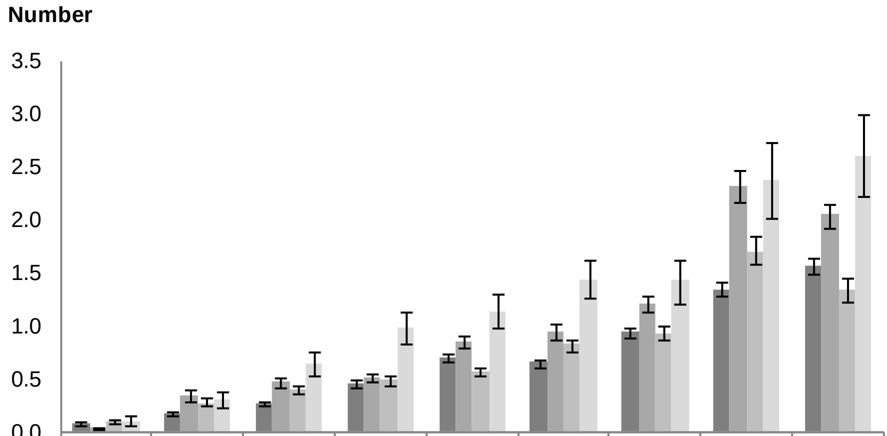


	6	7	8	9	10	11	12	13	14
Major cities	0.02	0.04	0.10	0.16	0.36	0.36	0.48	0.71	1.04
Inner regional	0.00	0.11	0.15	0.22	0.46	0.50	0.52	1.19	1.00
Outer regional	0.02	0.08	0.18	0.25	0.34	0.46	0.47	0.91	0.69
Remote/Very remote	0.05	0.12	0.35	0.41	0.70	0.87	0.84	1.32	1.62

Age (years)

Figure 3.8: Mean number of filled permanent teeth by remoteness, 2009

The mean DMFT was lower in *Major cities* than in other locations for almost all age groups, and older children experienced more dental decay than younger children (Figure 3.9). *Remote/Very remote* locations consistently reported the highest mean DMFT scores, which were highest for children aged 14, who had a mean DMFT of 2.61.

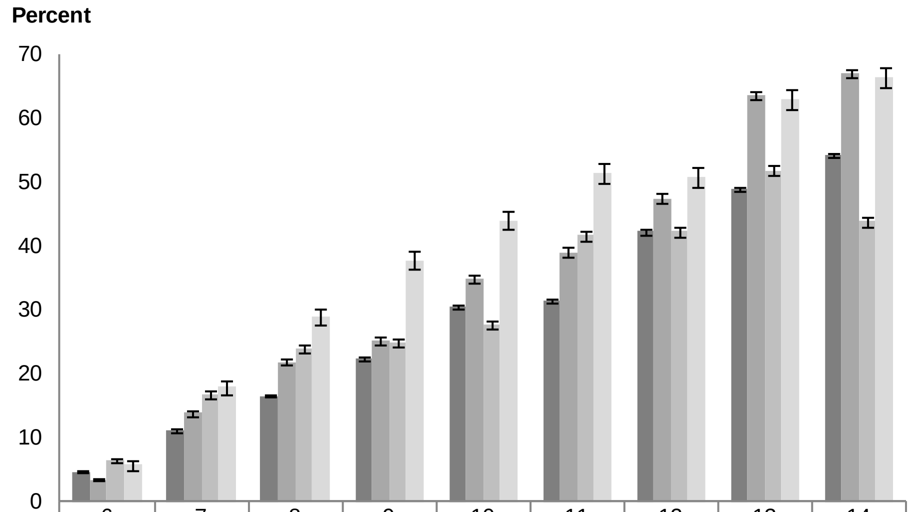


	6	7	8	9	10	11	12	13	14
Major cities	0.08	0.18	0.28	0.46	0.70	0.66	0.94	1.35	1.57
Inner regional	0.04	0.35	0.47	0.52	0.85	0.95	1.21	2.32	2.05
Outer regional	0.10	0.28	0.41	0.49	0.58	0.83	0.93	1.71	1.35
Remote/Very remote	0.10	0.31	0.64	0.98	1.14	1.44	1.43	2.38	2.61

Age (years)

Figure 3.9: Mean DMFT by remoteness, 2009

Figure 3.10 shows the prevalence of dental decay in permanent teeth of children aged 6–14 by remoteness in 2009. Children from *Major cities* had comparatively low levels of caries experience (ranging from 4.7% at age 6 to 54.2% at age 14). The overall proportion of children with dental decay in permanent teeth was generally higher among older children in all locations. Between 3.4% and 67.0% of children had experienced decay in their permanent teeth across all age groups and locations.



Age (years)	6	7	8	9	10	11	12	13	14
Major cities	4.67	11.03	16.54	22.47	30.56	31.52	42.19	48.92	54.23
Inner regional	3.42	13.79	21.87	25.19	34.9	39.05	47.48	63.66	66.98
Outer regional	6.47	16.74	23.84	24.97	27.63	41.57	42.2	51.83	43.83
Remote/very remote	5.72	17.87	28.81	37.79	44.03	51.49	50.68	62.89	66.42

Age (years)

Figure 3.10: Permanent teeth—children with DMFT > 0 by remoteness, 2009

4 Dental decay by state and territory

4.1 Children aged 5–6

The dental decay experience in deciduous teeth among children aged 5–6 by state and territory is shown in Table 4.1. The lowest level of decay experience was in the Australian Capital Territory, which recorded the lowest mean dmft (1.03), the fewest untreated decayed deciduous teeth per child (0.57) and the fewest missing deciduous teeth due to decay (0.03) in Australia.

Queensland children had the highest number of decayed teeth (1.72) per child, whereas the children in the Northern Territory reported the highest number of filled teeth (0.80) and the highest dmft score (2.68). The mean number of missing teeth per child was highest in Tasmania (0.46). Children from Queensland, the Northern Territory and Tasmania had greater levels of dental decay in deciduous teeth than the overall level (mean dmft = 2.13).

Table 4.1: Dental decay in the deciduous teeth of children aged 5–6 by state and territory, 2009

	Decayed teeth (d)		Missing teeth (m)		Filled teeth (f)		dmft	
State/territory	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**	**Mean**	**CI**
Qld	1.72	1.49–1.94	0.20	0.10–0.31	0.60	0.48–0.73	2.52	2.23–2.81
WA	1.05	0.95–1.14	0.02	0.01–0.03	0.42	0.36–0.47	1.49	1.38–1.60
SA	1.08	1.04–1.13	0.22	0.20–0.25	0.71	0.68–0.75	2.02	1.96–2.09
Tas	1.09	1.02–1.16	0.46	0.42–0.51	0.72	0.67–0.77	2.27	2.17–2.38
ACT	0.57	0.49–0.65	0.03	0.01–0.05	0.43	0.36–0.50	1.03	0.92–1.15
NT	1.59	1.39–1.80	0.28	0.19–0.37	0.80	0.66–0.95	2.68	2.40–2.96
Australia	1.38	1.34–1.42	0.17	0.16–0.19	0.58	0.56–0.60	2.13	2.08–2.18

Note: Results from Victoria are excluded due to lack of access to the data. New South Wales was excluded from the data collection in these 2 years due to a lack of representativeness of the sample.

Children from the Australian Capital Territory (30.6%) had the lowest prevalence of caries experience in deciduous teeth, while the Northern Territory (54.7%) and Tasmania (54.6%) shared the highest proportion of children with dental decay in deciduous dentition (Figure 4.1).

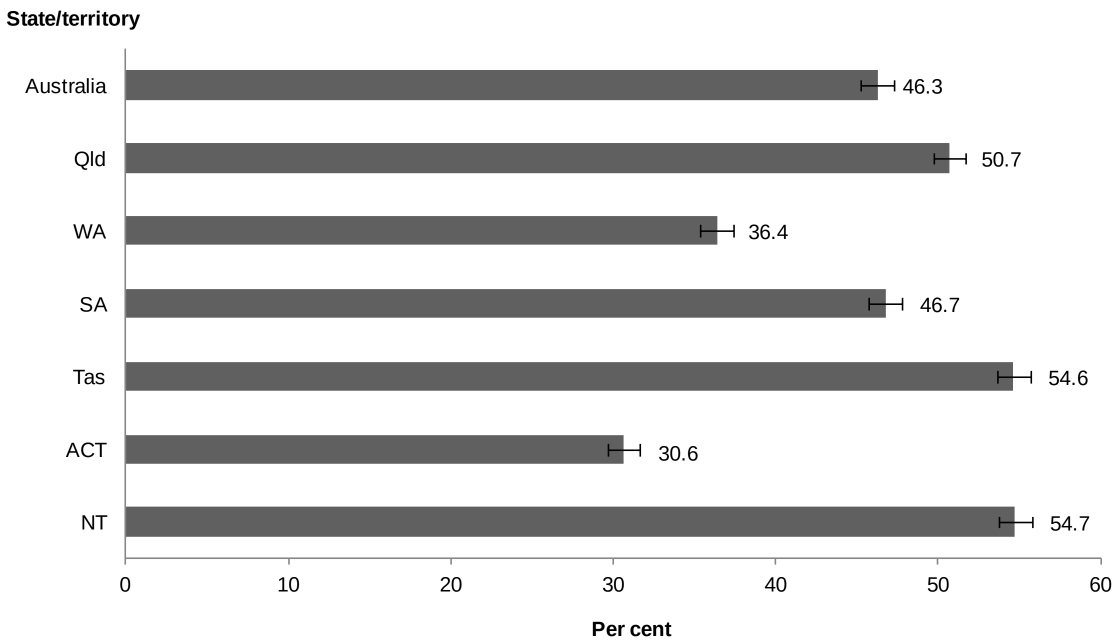


Figure 4.1: Deciduous teeth—proportion of children aged 5–6 with dmft > 0 by state and territory, 2009

Note: Results from Victoria are excluded due to lack of access to the data. New South Wales was excluded from the data collection in these 2 years due to a lack of representativeness of the sample.

4.2 Children aged 12

Table 4.2 shows that the pattern of caries experience in permanent teeth was similar to that of deciduous teeth. The lowest level of dental decay in permanent teeth was experienced by children from the Australian Capital Territory (mean number decayed and filled teeth = 0.21 and 0.03 respectively, and mean DMFT = 0.70), whereas the highest caries experience was in the Northern Territory (mean number of decayed teeth = 0.60, and mean DMFT = 1.88). While South Australia shared the lowest number of missing teeth (0.03) with the Australian Capital Territory, Western Australia shared the lowest DMFT score (0.70) with the Australian Capital Territory. On average, Australian children aged 12 had 1 permanent tooth affected with dental decay in 2009.

Table 4.2: Dental decay in the permanent dentition of children aged 12 by state and territory, 2009

	Decayed teeth (D)		Missing teeth (M)		Filled teeth (F)		DMFT	
State/territory	**Mean**	**95% CI**	**Mean**	**95% CI**	**Mean**	**95% CI**	**Mean**	**95% CI**
Qld	0.53	0.40–0.66	0.12	0.04–0.19	0.57	0.45–0.07	1.22	1.02–1.42
WA	0.30	0.25–0.35	0.06	0.02–0.09	0.34	0.28–0.40	0.70	0.61–0.79
SA	0.38	0.36–0.41	0.03	0.02–0.04	0.53	0.50–0.56	0.95	0.90–0.99
Tas	0.48	0.43–0.54	0.07	0.05–0.09	0.64	0.58–0.69	1.19	1.11–1.27
ACT	0.21	0.15–0.27	0.03	0.01–0.05	0.45	0.38–0.53	0.70	0.59–0.80
NT	0.60	0.44–0.76	0.10	0.04–0.16	1.17	0.95–1.40	1.88	1.61–2.15
Australia	0.44	0.42–0.46	0.08	0.07–0.09	0.53	0.50–0.55	1.05	1.01–1.08

Note: Results from Victoria are excluded due to lack of access to the data. New South Wales was excluded from the data collection in these 2 years due to a lack of representativeness of the sample.

Figure 4.2 shows the prevalence of dental decay in permanent teeth for children aged 12 in 2009. Western Australia had the lowest prevalence (31.9%), while the Northern Territory reported the highest (57.3%).

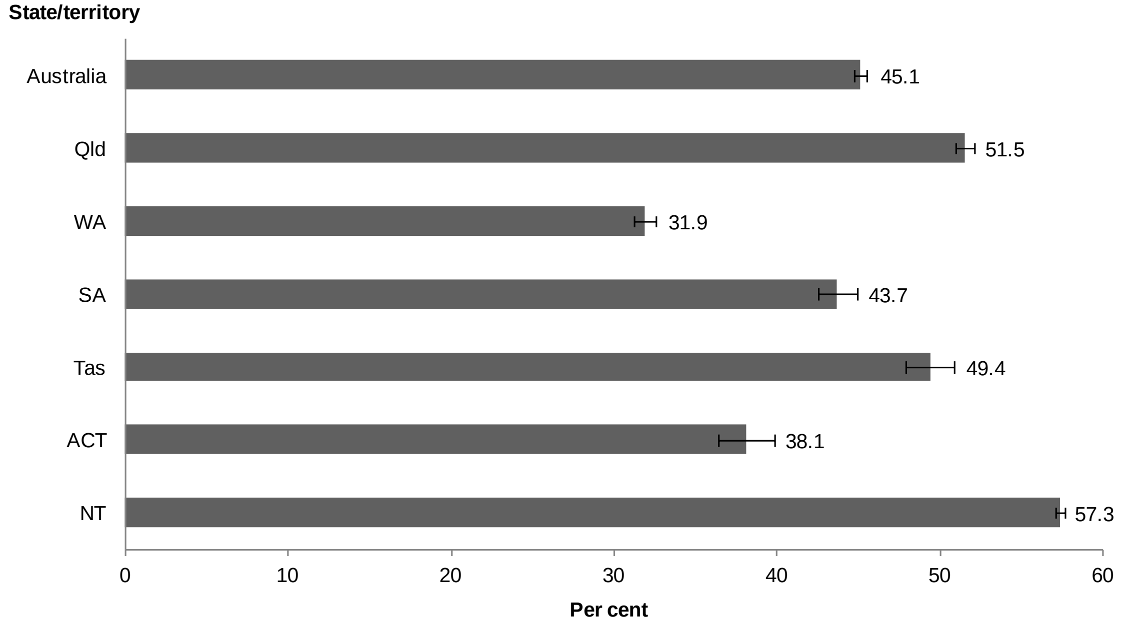


Figure 4.2: Permanent teeth—proportion of children aged 12 with DMFT > 0 by state and territory, 2009

Note: Results from Victoria are excluded due to lack of access to the data. New South Wales was excluded from the data collection in these 2 years due to a lack of representativeness of the sample.

4.3 Decay of combined deciduous and permanent teeth

Table 4.3 shows the dental decay experience of combined deciduous and permanent teeth among children by state and territory in 2009. The proportion of children with untreated decay in both deciduous and permanent teeth (d + D = 1 or more) ranged from 24.7% in the Australian Capital Territory to 44.2% in Queensland. Less than 10% of children had missing deciduous or permanent teeth due to dental decay in all states and territories, except for Tasmania, where about one-quarter of children had missing teeth. The Northern Territory reported the highest level of filled teeth (42.6%). The lowest proportion of children with filled teeth was reported in Western Australia (31.2%). Between 34.3% (Tasmania) and 54.3% (Australian Capital Territory) of children had not experienced dental decay in either their deciduous or permanent teeth.

Table 4.3: All teeth—dental decay experience among children aged 5–12 by state and territory, 2009 (per cent)

	d + D								
State/territory	**0**	**1**	**2**	**3**	**4**	**5+**	**m + M = 0**	**f + F= 0**	**dmft + DMFT = 0**
Qld	55.8	14.5	11.2	6.8	4.0	7.7	94.9	59.7	38.2
WA	69.9	13.9	7.4	3.1	1.8	3.8	98.2	68.8	51.9
SA	63.2	15.5	9.2	4.9	2.9	4.4	92.3	60.8	42.5
Tas	64.8	13.8	8.4	5.0	3.1	4.9	75.3	59.0	34.3
ACT	75.3	12.4	6.0	2.8	1.6	2.0	96.6	66.1	54.3
NT	61.5	12.4	8.2	5.3	3.4	9.3	90.6	57.4	35.1
Australia	**61.3**	**15.1**	**9.7**	**5.4**	**3.1**	**5.3**	**94.2**	**62.2**	**42.4**

Note: Results from Victoria are excluded due to lack of access to the data. New South Wales was excluded from the data collection in these 2 years due to a lack of representativeness of the sample.

4.4 Decay by remoteness

Table 4.4 shows the dental decay experience in the deciduous teeth of children aged 5–6 by remoteness and by state and territory. Children living in *Remote/Very remote* regions from the Northern Territory reported the highest mean dmft (3.68), whereas children from *Inner regional* areas in the Australian Capital Territory showed the lowest mean dmft (0.56). The overall pattern suggests that deciduous decay experience was lowest in *Major cities* and highest in *Remote/Very remote* locations, while in both *Inner* and *Outer regional* areas the dmft scores were in between. This pattern was essentially similar in South Australia and Western Australia.

Table 4.4: Dental decay in the deciduous teeth of children aged 5–6 by remoteness and by state and territory, 2009

	Major cities		Inner regional		Outer regional		Remote/Very remote	
State/territory	**Mean dmft**	**CI**	**Mean dmft**	**CI**	**Mean dmft**	**CI**	**Mean dmft**	**CI**
Qld	2.10	1.75–2.44	2.88	2.22–3.54	3.50	2.68–4.32	—	—
WA	1.39	1.26–1.52	1.54	1.25–1.82	1.74	1.39–2.08	2.14	1.34–2.94
SA	1.85	1.77–1.92	2.08	1.92–2.24	2.67	2.48–2.86	2.77	2.43–3.11
Tas	—	—	2.18	2.05–2.31	2.45	2.27–2.62	1.73	0.82–2.64
ACT	1.05	0.93–1.17	0.56	0.00–1.21	—	—	—	—
NT	—	—	—	—	1.61	1.29–1.94	3.68	3.25–4.10
Australia	1.78	1.72–1.84	2.45	2.35–2.55	2.75	2.62–2.87	3.17	2.89–3.45

Note: Results from Victoria are excluded due to lack of access to the data. New South Wales was excluded from the data collection in these 2 years due to a lack of representativeness of the sample.

Dental decay experience in the permanent teeth of children was highest in *Remote/Very remote* locations in the Northern Territory (mean DMFT = 2.31) (Table 4.5). The pattern of permanent caries experience in South Australian children, which was similar to the overall pattern, showed children living in *Major cities* had the lowest mean DMFT scores and *Remote/Very remote* areas the highest. In contrast, children living in *Remote/Very remote* areas reported the lowest levels of dental decay in Western Australia, and children living in *Inner regional* areas had the highest levels of dental decay in permanent teeth in both Western Australia and Queensland.

Table 4.5: Dental decay in the permanent teeth of children aged 12 by remoteness and by state and territory, 2009

	Major cities		Inner regional		Outer regional		Remote/Very remote	
State/territory	**Mean DMFT**	**CI**	**Mean DMFT**	**CI**	**Mean DMFT**	**CI**	**Mean DMFT**	**CI**
Qld	1.19	0.94–1.43	1.31	0.8–1.82	0.69	0.22–1.16	—	—
WA	0.63	0.52–0.73	1.08	0.68–1.48	0.82	0.62–1.02	0.54	0.20–0.88
SA	0.91	0.86–0.97	0.93	0.81–1.05	1.04	0.93–1.16	1.33	1.07–1.58
Tas	—	—	1.22	1.11–1.32	1.15	1.03–1.28	1.29	0.42–2.16
ACT	0.71	0.60–0.81	0.29	0.00–1.26	—	—	—	—
NT	—	—	—	—	1.51	1.13–1.88	2.31	1.92–2.70
Australia	0.94	0.89–0.98	1.21	1.13–1.29	0.93	0.87–1.00	1.43	1.22–1.63

Note: Results from Victoria are excluded due to lack of access to the data. New South Wales was excluded from the data collection in these 2 years due to a lack of representativeness of the sample.

5. Fissure sealants

5.1 By age

Fissure sealants are used as a preventive method to effectively halt the development of active decay in permanent teeth by sealing or covering the pits and fissures of teeth (usually molars) with a resin or glass-ionomer (cement) material (Rozier 2001). Fissure sealants act by preventing the future development of plaque and bacteria in the tooth grooves that are more at risk of decay.

The mean number of teeth with fissure sealants increased from 0.08 teeth among children aged 6 to 1.07 among those aged 13 (Table 5.1). In all age groups, the proportion of children who received sealants was greater for children who experienced dental decay (DMFT>0) than for children who had experienced no dental decay (DMFT=0). This was consistent with clinicians providing fissure sealants to children who had shown they were at risk of developing decay.

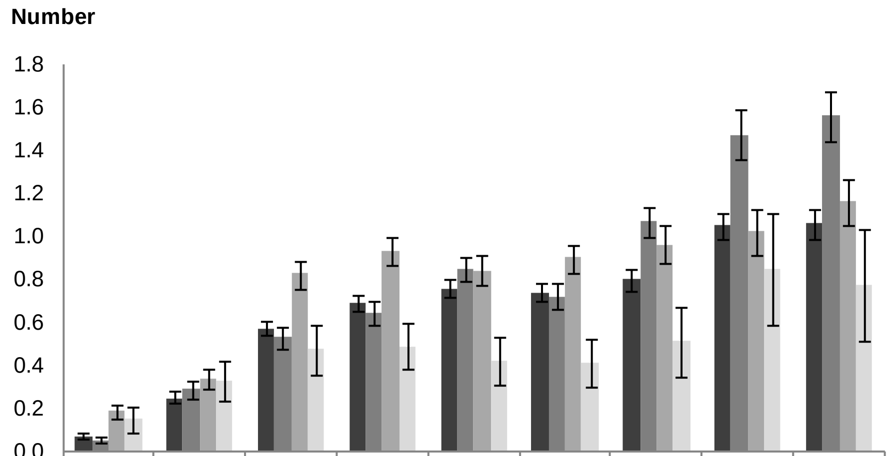
Table 5.1: Fissure sealant age-specific experience, 2009

Age (years)	Number of children[(a)]	All children		% with fissure sealants among children with DMFT = 0	% with fissure sealants among children with DMFT > 0
		Mean	CI		
6	9,537	0.08	0.07–0.09	2.8	7.0
7	9,804	0.27	0.25–0.29	8.2	16.9
8	9,850	0.58	0.56–0.61	18.4	26.8
9	9,771	0.70	0.67–0.72	23.2	28.2
10	9,751	0.77	0.74–0.80	25.0	31.0
11	9,165	0.72	0.69–0.75	23.5	34.0
12	7,833	0.91	0.87–0.94	26.5	40.3
13	6,834	1.07	1.02–1.12	28.7	39.7
14	5,968	1.06	1.01–1.11	26.0	40.8

(a) Unweighted number of children.

5.2 By remoteness

The mean number of teeth with fissure sealants among Australian children aged 6–14 by remoteness in 2009 is presented in Figure 3.11. While *Inner regional* areas reported both the lowest (0.05 at age 6) and highest (1.56 at age 14) mean values, it was apparent that children from *Remote/Very remote* areas tended to have a low use of fissure sealants compared with those in *Inner* and *Outer regional* areas, especially among children aged 8 and older.



	6	7	8	9	10	11	12	13	14
Major cities	0.07	0.25	0.57	0.69	0.76	0.74	0.80	1.05	1.06
Inner regional	0.05	0.29	0.53	0.64	0.85	0.72	1.07	1.47	1.56
Outer regional	0.19	0.34	0.83	0.93	0.84	0.90	0.96	1.02	1.16
Remote/Very remote	0.15	0.33	0.48	0.49	0.42	0.41	0.51	0.85	0.77

Age (years)

Figure 5.1: Mean number of fissure sealed teeth by remoteness, 2009

Appendix A: Description of survey methods

Source of subjects

Data for Queensland, South Australia, Western Australia, Tasmania, the Northern Territory and the Australian Capital Territory were sourced from the Child Dental Health Survey (CDHS) conducted in the 2009 calendar year. The CDHS is an annual surveillance survey that monitors the dental health of children enrolled in school and community dental services operated by the health departments or authorities of Australia's six state and two territory governments. In all jurisdictions, children from both public and private schools are eligible for dental care through a school dental service (SDS). The care typically provided in an SDS included dental examinations, preventive services and restorative treatment. However, there were some variations among state and territory programs regarding priority age groups and the nature of services. In some jurisdictions, caries risk assessment was used to determine recall interval and preventive treatment. Consequently, there were variations in the extent of enrolments in SDSs, with some jurisdictions serving nearly 80% of primary school children and others serving smaller proportions.

New South Wales was excluded from the data collection as the sample was not representative. Children were seen in the New South Wales public dental service only if they had been identified as having treatment needs; for example, decay. This meant that the dental health of these children did not represent the dental health of the entire child population of New South Wales, many of whom did not have treatment needs.

Estimates for Australia (overall estimates) in this report exclude Victoria due to lack of access to the 2009 data.

Sampling

The data sourced from the annual CDHS were derived from routine examinations of children enrolled in the SDSs. Children were sampled at random from SDS clinics by selecting those examined during the 2009 calendar year who were born on specific days of the month. The specific days of the month and approximate sampling ratios used in each state and territory are in Table A1. This sampling scheme ensured that a random sample of children enrolled with the SDSs was selected, but excluded children who were not enrolled with the SDSs.

The sampling ratios implemented were designed to provide similar numbers of children from each state and territory. However, due to full enumeration in South Australia, the Australian Capital Territory and Tasmania, the number of children included in the survey from those jurisdictions was considerably larger than for the other states and territories. In addition, differences in administration and local data requirements of each SDS created further variation in the number of children sampled by state and territory. This variation was accounted for in the weighting procedure.

Where children received more than one examination during the 2009 calendar year (for example, high-risk children might receive two or more examinations in a year), only one examination record was included in the survey. The higher probability of being selected associated with multiple visits was accounted for in the weighting procedure.

Table A1: Sampling ratios for Australian states and territories, 2009

State/territory	Sampling ratio[(a)]	Days of birth
Queensland		
Gold Coast	1:1	Any
Other Queensland	1:15	1st and 6th
Western Australia	1:8.5	28th, 29th, 30th, 31st
South Australia	1:1	Any
Tasmania	1:1	Any
Australian Capital Territory	1:1	Any
Northern Territory	1:1	Any

(a) Sampling ratios are approximate only.

Note: Victoria was excluded due to lack of access to the data; New South Wales was excluded from the data collection due to lack of representativeness of the sample.

Data items

Data sourced from SDS clinics were collected at the time of routine clinical examinations conducted by dental therapists and dentists. The application of diagnostic criteria used in this data collection was based on the clinical judgment of the examining dental therapist or dentist. Detailed instructions were provided to clinics to explain the collection of clinical data, but there were no formal sessions of instruction in diagnosis undertaken for the purpose of the survey, and no repeat examinations for the purpose of assessing inter- or intra-examiner reliability.

The examiner also recorded demographic characteristics of each sampled child, including age and sex. Country of birth and Indigenous status of both child and mother were also collected, and are considered to be two items important to a health monitoring survey (Health Targets and Implementation Committee 1988). Both items were obtained from information on the patient's treatment card or medical history. However, due to the increasingly limited recording of this information by each state and territory SDS, it was not included in this report.

Weighting of data and data analysis

National population estimates in this publication have been derived from weighted data. The weighting methodology reflected the sample design implemented in each state and territory. Data sourced from the annual CDHS were weighted at the regional level, with regions based on the 2006 Australian Standard Geographical Classification. Where sample size was adequate, regions within a capital city were defined as Australian Bureau of Statistics (ABS) Statistical Subdivisions and regions outside capital-city areas were defined as Statistical Divisions.

Population counts used in the weighting process were provided by the ABS. The file supplied was '2009 estimated residential population (ABS 2011) of Australia by postal area by age (5–14 years)', which provided population counts by individual age and postcode. Postcodes were mapped to region using the 'ABS 2006 Statistical Sub-Division 2006 Postcode Concordance File (2905055001 ssd 2006 from poa 2006)', and aggregated to produce regional-level population counts by individual age.

The initial weight for each person was calculated as the inverse of the child's probability of selection in the survey, based on the sampling ratios implemented across clinics in each state and territory. As children enrolled in SDS clinics may have experienced different recall periods, those on recall intervals of 12 months or less had a higher chance of selection during the survey period than children on longer recall intervals. To ensure that children on longer recall intervals, who often have better dental health, were not underrepresented in the analysis, data were also weighted by time since last dental examination.

Final weights were derived to reflect the regional age distribution of Australian children aged 5–14. Within each state or territory, substrata were defined by (individual) age and region. Survey records were allocated to region based on their postcode, and then linked to the estimated resident population for that region to derive a final weight for each child.

To enable population estimates from the survey to be compared and inferences made about characteristics of Australian children, 95% confidence intervals (CI) have been produced for each survey estimate.

The weighting protocol aimed to produce estimates that were representative of Australian children; however, in states and territories where data were sourced from the annual CDHS, only children enrolled in an SDS were surveyed. Consequently, the results in this report do not represent the complete Australian child population. Enrolment across Australia varies, but in all states and territories it was higher for primary school children than for those in secondary schooling. In some states and territories, older children must meet special eligibility criteria, with the consequence that they may be less representative of their respective age groups within the Australian population than is the case for younger children. Hence, in this publication, estimates for primary school children may not differ substantially from those that would be obtained if all children in the country were surveyed, whereas estimates for secondary school children may vary from those obtained for all children. It is therefore necessary to be cautious in drawing inferences from age-related trends, particularly among children aged 13–14.

Number in sample

There were 87,269 children aged 5–14 surveyed in the 2009 calendar year. Table A2 provides the number of children sampled in each state and territory, Table A3 provides the number of children sampled by age and Table A4 provides the number of children sampled by remoteness.

Table A2: Number of children sampled by state and territory, 2009

State/territory	Number of children sampled
Queensland	2,702
Western Australia	11,378
South Australia	45,515
Tasmania	18,297
Australian Capital Territory	6,066
Northern Territory	3,311
Total	**87,269**

Note: Results from Victoria are excluded due to lack of access to the data. New South Wales was excluded from the data collection.

Table A3: Number of children sampled by age, 2009

Age (years)	Number of children sampled
5	8,735
6	9,542
7	9,812
8	9,855
9	9,772
10	9,752
11	9,165
12	7,834
13	6,834
14	5,968
Total	**87,269**

Table A4: Number of children sampled by remoteness, 2009

States/territories	Major cities	Inner regional	Outer regional	Remote/ Very remote	Missing	Total
Queensland	1,548	496	372	8	278	2,702
Western Australia	7,647	1,475	1,671	429	156	11,378
South Australia	29,715	6,791	7,140	1,806	63	45,515
Tasmania	0	11,155	6,910	232	0	18,297
Australian Capital Territory	5,982	55	2	1	26	6,066
Northern Territory	9	7	1,653	1,635	7	3,311
Total	**44,901**	**19,979**	**17,748**	**4,111**	**530**	**87,269**

Appendix B: Data quality statement

Child Dental Health Survey 2009

Summary of key data quality issues

- All states and territories provide subsidised dental care to school-aged children.
- The Australian Institute of Health and Welfare (AIHW) Dental Statistics and Research Unit (DSRU) compiles data on a sample of children using information provided by states and territories.
- Data are not provided for New South Wales as children for whom data could be collected are not representative of those who approach the service for care.
- Data are not provided for Victoria.
- Although there are national standards for collecting data, there are some variations in school dental service coverage, level of enrolment, services policy focus, or access to services in rural or remote areas. Therefore, any comparison among states and territories should be made with caution.
- As the child populations of New South Wales and Victoria represent a sizeable proportion of the Australian child population, any comparisons with national estimates from previous years, or with international data, should be made with caution.

Description

All states and territories provide subsidised dental care for school-aged children (usually a school dental service). Each participating jurisdiction provides oral health data annually to AIHW DSRU. Data provided are for a sample of children who visit a service. These data are compiled into a national data set.

Institutional environment

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent statutory authority established in 1987, governed by a management board, and accountable to the Australian Parliament through the Health and Ageing portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The Institute also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. It works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national data sets based on data from each jurisdiction, to analyse these data sets and disseminate information and statistics.

The *Australian Institute of Health and Welfare Act 1987*, in conjunction with compliance with the *Privacy Act 1988* (Commonwealth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information, see the AIHW website at <www.aihw.gov.au>. The Child Dental Health Survey (CDHS) is conducted on behalf of AIHW by one of AIHW's collaborating units, the DSRU at the University of Adelaide. In this capacity the DSRU is subject to the provisions of the AIHW Act and the Privacy Act.

Timeliness

The data in the publication relates to the calendar year 2009.

Data are provided annually by state and territory jurisdictions, and published annually.

Data are provided to DSRU as soon as practicable for jurisdictions. For future iterations of this report, steps will be taken to improve the timeliness of reporting.

First release of CDHS 2009 data will be on 30 May 2013 in the report: *The dental health of Australia's children by remoteness: Child Dental Health Survey Australia 2009.*

Accessibility

National reports are produced annually and available from the AIHW website. See <http://www.aihw.gov.au/dental-and-oral-health-publications/>.

Individual state and territory reports up to 2002 are available from DSRU via the Australian Research Centre for Population Oral Health website. See <http://www.arcpoh.adelaide.edu.au/publications/report/statistics/>.

Customised tables are available on request (on a fee-for-service basis). Data access policy and data request form can be obtained by contacting <arcpoh@adelaide.edu.au>.

Interpretability

Detailed sampling methodology is outlined in the report: *The dental health of Australia's children by remoteness: Child Dental Health Survey Australia 2009*.

The published report provides estimates of decay experience in both deciduous and permanent teeth for children aged 5–14, as well as fissure sealants present at examination in the permanent teeth of children aged 6–14. The report features a chapter on the oral health of children across remoteness areas of location.

Relevance

Scope and coverage

The aim of the CDHS is to monitor the health of children attending the school dental services. No data are collected for New South Wales as children attending the service have been triaged and are not representative of children who approached the service for care. Data are not currently provided for Victoria. Sampling ratios vary between jurisdictions (TableB1).

Table B1: Sampling ratios, 2009

State/territory	Sampling ratio[(a)]	Days of birth
Queensland		
Gold Coast	1:1	Any
Other Queensland	1:15	1st and 6th
Western Australia	1:8.5	28th, 29th, 30th, 31st
South Australia	1:1	Any
Tasmania	1:1	Any
Australian Capital Territory	1:1	Any
Northern Territory	1:1	Any

(a) Sampling ratios are approximate only.

Reference period

Calendar year 2009.

Geographic detail

Data set includes children's postcode of residence.

Statistical standards

The criteria and procedures for examinations used by school dental services for the Child Dental Health Survey were first developed in 1977 and were redesigned in 2004 by AIHW DSRU, in conjunction with the states and territories. The methodology used follows those published by the World Health Organization (WHO) for oral epidemiological studies (WHO 1997). Written instructions for the survey were provided to clinical staff describing the assessment of caries experience and recording procedures.

Full Indigenous identification is included in the 2009 collection.

Types of estimates available: decay experience in deciduous (dmft) and permanent teeth (DMFT) by age, and fissure sealants in permanent teeth.

Accuracy

State and territory providers such as Queensland and Western Australia used standard forms to record information from school dental service clinical records that contain these items: Sex; Age; Postcode; School or clinic; Indigenous status; Number of decayed teeth; Number of missing teeth; Number of filled teeth; Number of fissure sealed teeth; and Number of teeth present. In Queensland and Western Australia, children were sampled at random from school dental service (SDS) clinics by selecting those examined during the 2009 calendar year who were born on specific days of the month. In other jurisdictions, a full count was extracted from electronic patient records. The number of children included in the survey from those jurisdictions was considerably larger than for Queensland and Western Australia.

New South Wales was excluded from the data collection as the sample was not representative. Children were seen in the New South Wales public dental service only if they had been through an initial assessment and had been identified as having treatment needs; for example, decay. This meant that the dental health of the children seen in the dental service did not represent the dental health of the entire child population who presented for initial assessment, many of whom did not have treatment needs.

Estimates for Australia (overall estimates) in this report exclude Victoria due to lack of provision of 2009 data.

Differences in administration and local data requirements of each SDS created further variation in the number of children sampled by state and territory. This variation was accounted for in the weighting procedure.

The main outcome of this study is caries experience. Caries experience was measured by the mean count of clinically detectable decayed, missing and filled teeth. The methodology used for diagnosis and reporting of caries experience follows those published by the WHO for oral epidemiological studies.

Although there are national standards for collecting data, there are some variations in SDS coverage, level of enrolment, services policy focus, or access to services in rural or remote areas. Therefore, any comparison among states and territories should be made with caution. As the child populations of New South Wales and Victoria represent a sizeable proportion of the Australian child population, any comparisons with national estimates from previous years, or with international data, should be made with caution.

All estimates are published with 95% confidence intervals.

Non-sampling error is minimised by collecting data similar to routinely recorded clinical data. Data are also collected by clinicians who are accustomed to recording oral health measures.

Indigenous status was reported for all jurisdictions other than Queensland. Children were reported as 'Non Aboriginal', 'Unknown', 'Aboriginal', 'Aboriginal and Torres Strait Islander' according to child/parent's report to examining clinician. There were about 1.4% children reported as 'Unknown'; 2.9% of children did not report their indigenous status.

The survey also was not specifically designed to obtain reliable national estimates for Aboriginal and Torres Strait Islander people. In this data set, there are about 4.6% of children recorded as either Aboriginal, Aboriginal and Torres Strait Islander or Torres Strait Islander.

Coherence

The population of children attending school dental services can be influenced by local policies, which may change from time to time. Changes in local policies should be considered when making comparisons between jurisdictions and across time.

Data for children attending services in Victoria for 2009 were not made available at the time of preparing this publication. In New South Wales, the SDSs targeted only schools identified by the state government Department of Education & Communities as being disadvantaged. Children at these schools were screened and entered the SDSs only if they required treatment. Therefore, the children in the SDS population in New South Wales would have greater need for treatment than both New South Wales children generally and children from other jurisdictions, therefore creating bias in the data. Consequently, New South Wales did not collect data for the CDHS.

The data quality statement for the Child Dental Health Survey 2009 is available from the AIHW website at <http://meteor.aihw.gov.au/content/index.phtml/itemId/515381>.

References

ABS (Australian Bureau of Statistics) 2003. Census paper 03/01. ASGC remoteness classification: purpose and use. Canberra: Commonwealth of Australia.

ABS 2009. 2006 Census data. ABS, Canberra: Viewed 15 March 2012, <http://www.abs.gov.au/websitedbs/d3310114.nsf/home/census+data>.

ABS 2011. 2007 estimated resident population, customised report. Canberra: ABS.

Ahovuo-Saloranta A, Hiiri A, Nordblad A, Mäkelä M & Worthington HV 2008. Pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents. Cochrane Database Systematic Review (4):CD001830.

AIHW (Australian Institute of Health and Welfare) 2006. Australian hospital statistics 2004–05. Cat. no. HSE 41. Canberra: AIHW.

AIHW 2009. A picture of Australia's children 2009. Cat. no. PHE 112. Canberra: AIHW.

AIHW DSRU (Dental Statistics and Research Unit). 2009. Geographic variation in oral health and use of dental services in the Australian population 2004–06. Dental Statistics and Research Unit Research report no. 41. Cat. no. DEN 188. Adelaide: AIHW.

Amarasena N & Ha DH 2012. Fissure sealant use among children attending school dental services: Child Dental Health Survey Australia 2008. Dental statistics and research series no. 59. Cat. no. DEN 222. Canberra: AIHW.

ARCPOH (Australian Research Centre for Population Oral Health). Water fluoridation map of Australia updated to 2008. Viewed 16 November 2011, <http://www.arcpoh.adelaide.edu.au/dperu/fluoride/atlas.htmlF2008>.

Armfield JM & Spencer AJ 2008. Quarter of a century of change: caries experience in Australian children, 1977–2002. Australian Dental Journal 53(2):151–9.

Bratthall D 2000. Introducing the Significant Caries Index together with a proposal for a new global oral health goal for 12 year olds. International Dental Journal 50:378–84.

Brennan DS & Spencer AJ 2001. Practice belief scales among private general dental practitioners. Australian Dental Journal 46(3):186–93.

Brennan DS & Spencer AJ 2007. Trends in private dental service provision by geographic location. Australian Journal of Rural Health 15:189–95.

Brennan DS, Spencer AJ & Roberts-Thomson KF 2008. Tooth loss, chewing ability and quality of life. Quality of Life Research 17:227–35.

BRS (Bureau of Rural Sciences) 2008. Country matters: 2008 social atlas of rural and regional Australia. Canberra. Commonwealth of Australia.

Chrisopoulos S & Nguyen T 2012. Trends in the Australian dental labour force, 2000 to 2009: Dental labour force collection, 2009. Dental statistics and research series no. 61. Cat. no. DEN 218. Canberra: AIHW.

Curtis B, Evans RW, Sbaraini A & Schwarz E 2007. Geographic location and indirect costs as a barrier to dental treatment: a patient's perspective. Australian Dental Journal 52(4): 271–5.

Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader M-J, Bramlett MD & Newacheck PW 2007. Influences on children's oral health: a conceptual model. Pediatrics 120:510-520. DOI: 10.1542/peds.2006-3084.

Gerritsen AE, Allen PF, Witter DJ, Bronkhorst EM & Creugers NHJ 2010. Tooth loss and oral-health-related quality of life: a systematic review and meta-analysis. Health and Quality of Life Outcomes 8:126.

Gussy MG, Waters EB, Riggs EM, Lo SK & Kilpatrick NM 2008. Parental knowledge beliefs and behaviours for oral health of toddlers residing in rural Victoria. Australian Dental Journal 53:52–60.

Harford J & Spencer AJ 2007. Oral health perceptions. In: Slade GD, Spencer AJ & Roberts-Thomson KF. Australia's dental generations: the National Survey of Adult Oral Health 2004–06. Canberra: AIHW, 173–95.

Health Targets and Implementation Committee 1988. Health for all Australians. Canberra: AGPS.

Humphreys J, Jones M, Jones JA & Mara PR 2002. Workforce retention in rural and remote Australia: determining the factors that influence length of practice. Medical Journal of Australia 176:472–6.

Jamieson LM & Roberts-Thomson KF 2008. Dental general anaesthetic receipt among Australians aged 15+ years, 1998–1999 to 2004–2005. BMC Oral Health 8:10.

Marinho VCC, Higgins JPT, Logan S & Sheiham A 2002a. Fluoride gels for preventing dental caries in children and adolescents. Cochrane Database of Systematic Reviews 2002, Issue 1. Art. No. CD002280. DOI: 10.1002/14651858.CD002280.

Marinho VCC, Higgins JPT, Logan S & Sheiham A 2002b. Fluoride varnishes for preventing dental caries in children and adolescents. Cochrane Database of Systematic Reviews 2002, Issue 1. Art. No. CD002279. DOI: 10.1002/14651858.CD002279.

Mount GJ & Hume WR 2005. Preservation and restoration of tooth structure, 2nd edn. Sandgate, Queensland: Knowledge Books.

NHMRC (National Health and Medical Research Council) 2007. NHMRC public statement: the efficacy and safety of fluoridation. Canberra: NHMRC.

Nishi M, Bratthall D & Stjernswärd J 2001. How to calculate the Significant Caries Index (SiC Index). WHO Collaborating Centre. Malmö University, Sweden. PDF version 1.0. Viewed March 2010, <http://www.whocollab.od.mah.se/expl/significant.pdf>.

Palmer JD, Anderson RJ & Downer MC 1984. Guidelines for prevalence estimates of dental caries. Community Dental Health 1:55–66.

Roberts-Thomson KF & Do L 2007. Oral health status. In: Slade GD, Spencer AJ & Roberts-Thomson KF (eds). Australia's dental generations: the National Survey of Adult Oral Health 2004–06. Dental statistics and research series no. 34. Cat. no. DEN 165. Canberra: AIHW, 81–142.

Rozier G 2001. Effectiveness of methods used by dental professionals for the primary prevention of dental caries. Journal of Dental Education 65:1063–72.

Sanders AE, Slade GD, Turrell G, Spencer AJ & Marcenes W 2006. The shape of the socioeconomic-oral health gradient: implications for theoretical explanations. Community Dentistry and Oral Epidemiology 34(4):310–19.

Sanders AE & Spencer AJ 2004. Social inequality in the perceived oral health among adults in Australia. Australian and New Zealand Journal of Public Health 28(2):151–8.

Slack-Smith LM 2003. Dental visits by Australian preschool children. Journal of Paediatric Health 39:442–5.

Spencer AJ & Lewis JM 1988. The delivery of dental services: information, issues and directions. Community Health Studies 12(1):16–30.

Teusner DN, Chrisopoulos S & Brennan DS 2007. Geographic distribution of the Australian dental labour force, 2003. Dental statistics and research series no. 37. Cat. no. DEN 168. Canberra: AIHW.

WHO (World Health Organization) 1997. Oral health surveys—basic methods, 4th edn. Geneva: WHO.

List of tables

List of figures

This publication describes the dental health of Australian children examined by school dental service staff in 2009 and provides insights into the dental health of rural children.

Dental decay was relatively common, with around half of children examined having a history of decay. Children in Regional and Remote areas were at increased risk of dental decay in their baby teeth compared with those in Major cities.