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Dental health differences between boys and girls

The Child Dental Health Survey, Australia 2000

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Abbreviations

d	deciduous decayed teeth
D	permanent decayed teeth
dmft	deciduous decayed, missing (due to caries) and filled teeth
DMFT	permanent decayed, missing (due to caries) and filled teeth
f	deciduous filled teeth
F	permanent filled teeth
m	deciduous teeth missing due to caries
M	permanent teeth missing due to caries
SD	standard deviation
SiC	Significant Caries Index
SiC^{10}	Significant Caries Index (10%)

Symbols

n.a.	not available
—	nil or rounded to zero
. .	not applicable

Introduction

This publication provides descriptive epidemiological and service provision data concerning children's dental health in Australia. The tables and figures contained in this publication describe the demographic composition of the sample, deciduous and permanent caries experience, the extent of immediate treatment needs, prevalence of fissure sealants and other relevant information. Tables showing national trends and state/territory comparisons precede an examination of differences in dental health between boys and girls, and international comparisons. The publication also presents a description of the survey methods and discussion of the findings presented in the national tables.

The monitoring of children's dental health has been conducted since 1977. Between 1977 and 1988 it was managed centrally by the Australian Government Department of Health as an evaluation of the Australian School Dental Scheme. In 1989 responsibility for the national data collection was transferred to the Australian Institute of Health and Welfare's Dental Statistics and Research Unit at The University of Adelaide and conducted through the Child Dental Health Survey.

Description of survey methods

Source of subjects

Data for the report have been derived from the Child Dental Health Survey, which monitors the dental health of children enrolled in school dental services operated by the health departments or authorities of Australia's six state and two territory governments. Children are enrolled from both public and private schools. In New South Wales the School Dental Service has adopted a targeted statewide screening program termed Save Our Kids Smiles (SOKS). Whereas SOKS involves screening children every two years from Kindergarten to Year 8, the other school dental services provide dental care principally to primary school aged children. The care typically provided by the school dental services includes dental examinations, preventive services and restorative treatment as required. However, there are some variations among state and territory programs with respect to priority age groups and the nature of services. As a consequence there are variations in the extent of enrolment in school dental services, with some jurisdictions serving more than 80% of primary school children and others serving lower percentages.

Sampling

The data for the Child Dental Health Survey are derived from routine examinations of children enrolled in the school dental services. At the time of examination, children are sampled at random by selecting those born on specific days of the month. Victoria and Tasmania adopt other systematic sampling procedures based on selecting every *n*th case. In New South Wales full enumeration of all available consenting children is carried out.

Different sampling ratios, and consequently different days of birth, are used across the states and territories according to the scheme presented in Table 1. National data for the Child Dental Health Survey therefore constitute a stratified random sample of children from the school dental services. Children not enrolled with the school dental service or not consenting to participate in the SOKS program are not represented in the sample.

Table 1: Sampling ratios for Australian states and territories, 2000

State/territory	Sampling ratio[(a)]	Days of birth
New South Wales	1:1	Any
Victoria	1:8	Systematic
Queensland	1:15	1st and 6th
	1:1	Any[(b)]
Western Australia	1:8.5	28th, 29th, 30th, 31st
South Australia	1:12	13th, 30th, 31st
	1:5	13th, 26th to 31st[(c)]
Tasmania	1:2.5	Systematic
Australian Capital Territory	1:2.5	1st to 16th
Northern Territory	1:1.9	1st to 16th[(d)]
	1:1	Any[(e)]

(a) Sampling ratios are approximate only.

(b) 6- and 12-year-old children from the Gold Coast.

(c) From non-metropolitan clinics who have previously participated in the Child Fluoride Study.

(d) Includes Darwin.

(e) Includes all Northern Territory outside of Darwin.

The intention of stratification was to provide approximately equivalent numbers of children from each state and territory. However, due to full enumeration in New South Wales, the number of children sampled in this state is considerably larger than for the other states and territories. In addition, differences in administration and local data requirements of the services have created some variation among the other states and territories in terms of the number of children sampled.

Data items

Data items in the Child Dental Health Survey are collected at the time of routine clinical examinations conducted by dental therapists and dentists. The recorded characteristics of sampled children include some demographic information, including the child's age and sex.

The birthplace and the indigenous status of both child and mother are considered to be two items important to a health monitoring survey (Health Targets and Implementation Committee 1988). Both items have previously been obtained from information from the patient's treatment card or medical history. However, due to the increasingly limited recording of this information by the state and territory school dental services, it has not been included in the current report.

Service provision information includes the dates of current and previous examinations (if the child had been examined previously within the school dental services) and is dealt with in detail within state- and territory-specific reports. Information on last examinations was not collected in New South Wales (where screenings take place every two years).

The dental health status of sampled children covers the four areas listed below:

1. Deciduous caries experience is recorded as the number of deciduous teeth that are decayed, missing because of dental caries or filled because of dental caries, and is based on the coding scheme of Palmer et al. (1984).

2. Permanent caries experience is recorded as the number of permanent teeth that are decayed, missing because of dental caries or filled because of dental caries, and is based on the World Health Organization protocol (WHO 1997).

3. Immediate treatment needs are designated if, in the opinion of the examiner, the child has, or is likely to develop within four weeks, pain, infection or a life-threatening condition (WHO 1997). In New South Wales immediate treatment needs are indicated for children assessed as requiring treatment within a 24–48-hour period. Data collected for the current study on immediate treatment needs do not include children from Victoria, Western Australia, Tasmania or the Australian Capital Territory.

4. Fissure sealants are recorded as the number of teeth, otherwise sound and not restored, which have a fissure sealant. This data item was introduced in most states and territories in 1989.

Some data items are not collected uniformly by all states and territories. Consequently, some of the tables in this report refer only to specific states and territories.

The diagnostic criteria employed are based on the clinical judgement of the examining dental therapist or dentist. They follow written criteria for the data items described above; however, there are no formal sessions of calibration or instruction in diagnosis undertaken for the purpose of the survey and there are no repeat examinations for the purpose of assessing inter- or intra-examiner reliability.

Data analysis and weighting of data

National data contained in this report consist of counts, means, standard deviations and percentages that have been weighted to represent the relevant state- and territory-specific population of children aged 4–15 years. Where computed state or territory age-specific indices resulted in a relative standard error exceeding 40%, or the percentage of children sampled was considered very low, the age group for that jurisdiction was excluded from the analysis. As a result, 15-year-old children from New South Wales (sample n = 307) were excluded, as were 4-year-old children from the Australian Capital Territory (sample n = 7) and 4-year-old and 15-year-old children from Victoria (sample n = 68 and 7, respectively). Hence, results for 4-year-old children (which exclude children from Victoria and the Australian Capital Territory) and 15-year-old children (which exclude children from New South Wales and Victoria) should be interpreted with due care and with appreciation that they may not be representative of the Australian child population.

The weighting procedure is necessary since the Australian sample does not contain representative percentages of children from each state and territory. Unweighted estimates would result in over-representation of children from New South Wales or from less populous states or territories and under-representation of those from more populous jurisdictions. The relative sample sizes and population estimates by state and territory as a percentage of the total sample and of the Australian population (4–15 years of age) are shown in Figure 1.

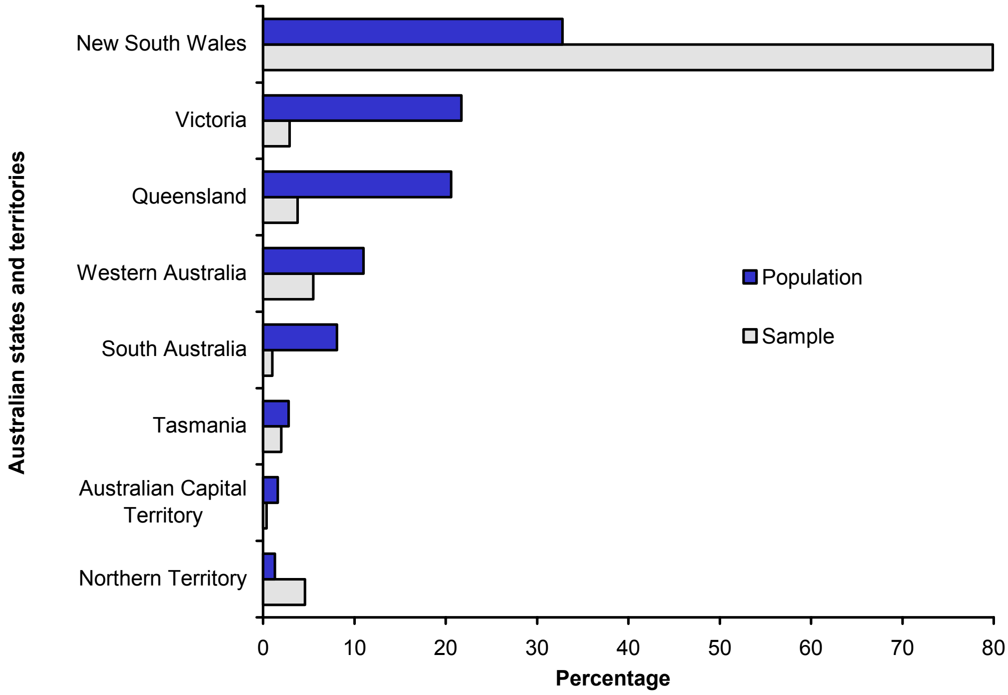


Figure 1: Percentage of children by state and territory for sample and for state/territory population, 2000

The weighting method follows standard procedures for weighting stratified samples using external data sources (Foreman 1991). State and territory estimates (ABS 2000) of the 2000 estimated resident population (ERP) within individual ages are used to provide numerators for weights that are divided by the age-specific number of cases in the samples from respective states and territories. Hence, observations from more populous states achieve relatively greater weight. The stratum-specific weights are further divided by the national ERP and total sample size to achieve numerical equivalence between the weighted sample and the original number of processed records.

Within the state and territories, data were also weighted according to sampling frame, region of sampling or time since last dental examination, this being consistent with statistical analyses presented in state- and territory-specific reports. In 2000 data within Victoria, Queensland, Western Australia, South Australia, Tasmania, the Australian Capital Territory and the Northern Territory were weighted on the basis of area of sampling and sampling fraction so as to give a more representative result for that state or territory. Data within Queensland, Western Australia, South Australia, Tasmania, the Australian Capital Territory and the Northern Territory were weighted by time since last dental examination so that children on longer recall intervals, who often have better oral health, were not under-represented in the analysis. Details of these weighting procedures are provided in the relevant state and territory reports.

The purpose of the weighting protocol was to produce estimates that are representative of the population covered by the school dental services for 2000. However, the estimates in this report cannot be applied to children who are not enrolled in the school dental services. Consequently, the results in this report do not represent the complete Australian child population, but only that portion of the population that is enrolled in the school dental services. Enrolment across Australia varies but in all states and territories is higher for primary-aged children than for children in secondary schooling. Hence, estimates for primary school children in this report may not differ substantially from estimates that would be obtained if all children in the country were surveyed; however, estimates for secondary school children may vary from those obtained if all children in the country were surveyed.

It is necessary to be cautious in drawing inferences from age-related trends, particularly among those aged over 12 years. In most states and territories, access to school dental services for older children tends to be restricted in comparison with access for younger children. Often the 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. Also, in New South Wales and Victoria no children aged older than 14 years are included in the analysis, so current estimates for 15-year-old children do not take those states into account.

Indices of caries experience were calculated from data collected over a 12-month period. Where children received more than one examination during this period, the information derived from examinations other than the first has been excluded.

Adjustments for the under-reporting of decay in New South Wales

In 1996 the New South Wales Health Department (NSW Health), through the school dental service, implemented the Save Our Kids Smiles (SOKS) program, incorporating three main components – oral health education, risk assessment and clinical care. A major change accompanying the program was the move from clinic-based examinations to oral assessments in school classrooms as the primary environment for data collection. In the clinic, better lighting and the availability of other facilities such as compressed air optimise conditions for assessing oral health.

Between 1995 and 1996, at the time the SOKS program was introduced, there was an apparent substantial improvement in the oral health of children in New South Wales. There was, for example, a 44% reduction in 5–6-year-old mean decay, a 57% reduction in 12-year-old mean decay, and a 12% increase in the percentage of 5–6-year-old children free of caries experience (dmft = 0) in their deciduous dentition.

In 2000 New South Wales Health commenced a wide-ranging review of SOKS, with one aspect being a quality assurance project aimed at assessing the reliability and validity of data collected under SOKS assessment conditions. The technical report (New South Wales Health Department 2001) found that, while there were no statistically significant differences in the reporting of missing and filled teeth between a field SOKS-style assessment and a clinical examination, there was a persistent and statistically significant under-reporting of the number of decayed teeth in non-clinical conditions. In deciduous teeth the mean number of decayed teeth for the SOKS assessment was 36% lower than that collected in the clinic, while the mean number of decayed permanent teeth was 41% lower. This underestimation of decay also resulted in a significant underestimation in the dmft and DMFT indices.

As a result of these findings, and the consistency of the results with the reported reductions in caries experience in New South Wales between 1995 and 1996, the current report has included national figures adjusted for the underestimation of decay in New South Wales (see Appendix A, Tables A1–A4). A weighting of 1.56 was used for calculations of deciduous decay and 1.68 for calculations of permanent decay for the New South Wales data. Although it is believed that these adjusted figures may represent a more accurate estimation of caries experience in New South Wales and therefore Australia, for the purpose of consistency with previous reports the data obtained via the SOKS assessments are retained for calculations in the body of this report.

Description of national findings

Number in sample and estimated resident population

There were a total of 311,346 children aged between 4 and 15 years reported for the 2000 calendar year. Children aged 3 years or less and 16 years or more were excluded from this sample as the small numbers receiving care in those age groups across Australia result in poor reliability of computed statistics for those ages. Furthermore, these children are outside the main target group of many of the school dental services, and it is likely that they have some special characteristics that make them less representative of their respective age groups within the Australian population.

The effects of the statistical weighting procedure can be appreciated from examining Table 2. The relatively large numbers of reported cases from New South Wales and the Northern Territory receive substantially lower weightings compared with other states and territories. Therefore, the weighted numbers of cases, which are used for estimates listed in subsequent tables, represent smaller numbers of children from those jurisdictions. Consequently, the national sample was representative of the relative populations of states and territories, rather than the number of reported cases.

Table 2: Number in sample and estimated resident population (ERP), 2000

State/territory	Processed cases	ERP	Weight	Weighted cases
	n	*n*		*n*
New South Wales [(a)]	248,647	971,371	0.39	98,016.6
Victoria [(b)]	8,980	640,717	7.20	64,650.3
Queensland	11,890	609,574	6.25	74,343.8
Western Australia	17,081	324,431	1.92	32,874.9
South Australia	3,108	240,723	7.68	23,860.1
Tasmania	6,216	82,949	1.37	8,486.4
Australian Capital Territory [(c)]	1,229	48,236	4.01	4,932.0
Northern Territory	14,195	39,424	0.29	4,181.8
Total	**311,346**	**2,957,425**	**1.00**	**311,346.0**

(a) Excludes 15-year-old children.

(b) Excludes 4-year-old and 15-year-old children.

(c) Excludes 4-year-old children.

Deciduous teeth

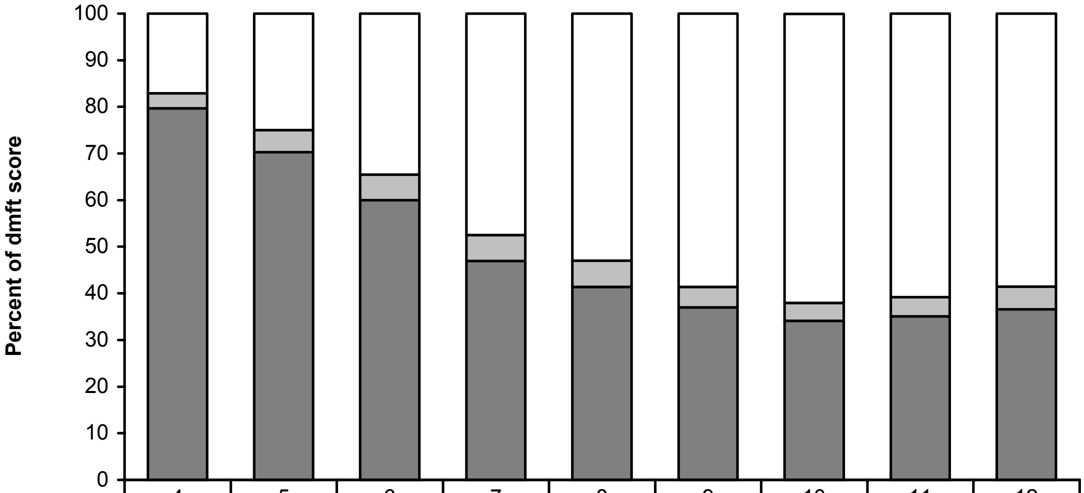
Caries experience in the deciduous dentition is expressed as the mean number of decayed, missing (due to caries) and filled teeth. The means and standard deviations for each of these components for the ages 4–12 years are given in Table 3. There was a steady decline in the presence of clinically detectable decay with increasing age, from 1.04 teeth among 5-year-olds to 0.15 teeth among 12-year-olds. A different pattern was shown by the mean number of filled teeth, increasing from 0.21 at age 4 to 0.97 teeth at age 9, before declining rapidly to 0.24 teeth at age 12. Across all age groups the number of teeth indicated as missing due to caries was small, with scores ranging from 0.01 to 0.10 teeth. The mean number of decayed, missing (due to caries) and filled teeth (dmft) increased from 1.23 to 1.82 teeth between the ages of 4 and 8 years before declining to 0.41 teeth for 12-year-olds.

Patterns in deciduous caries experience must be interpreted in light of the exfoliation of deciduous teeth with age. Table 3 shows the steady decline in the mean number of deciduous teeth present as children increase in age. From the age of 5 years, children exfoliate on average 2 to 3 deciduous teeth per year, reducing the total number from an average of 19.48 teeth at age 5 to 2.24 teeth at age 12.

The decayed, missing and filled components as a percentage of the dmft index are shown in Figure 2. In the youngest age groups the dmft score is composed principally of clinically detectable untreated decay. However, with the accumulation of restorations placed over time, the majority of the dmft index from the age of 8 years is represented by the presence of fillings. Relative stability in the percentages of decayed, missing and filled teeth occurs between the ages of 9 and 12 years.

Table 3: Deciduous dentition—decayed, missing and filled teeth, 2000

Age (years)	Children	Teeth present	Decayed (d)		Missing (m)		Filled (f)		dmft	
	n	mean	mean	SD	mean	SD	mean	SD	mean	SD
4	19,565	19.79	0.98	2.11	0.04	0.57	0.21	0.99	1.23	2.65
5	26,923	19.48	1.04	2.13	0.07	0.64	0.37	1.24	1.49	2.79
6	23,525	17.53	0.99	1.90	0.09	0.63	0.57	1.42	1.65	2.73
7	27,901	14.42	0.84	1.60	0.10	0.59	0.85	1.69	1.79	2.66
8	28,480	12.35	0.75	1.42	0.10	0.54	0.96	1.75	1.82	2.61
9	28,900	10.80	0.61	1.16	0.07	0.52	0.97	1.71	1.66	2.35
10	28,423	8.09	0.44	0.99	0.05	0.36	0.80	1.48	1.30	2.03
11	28,485	4.79	0.26	0.77	0.03	0.30	0.45	1.13	0.75	1.62
12	24,065	2.24	0.15	0.53	0.02	0.19	0.24	0.79	0.41	1.14



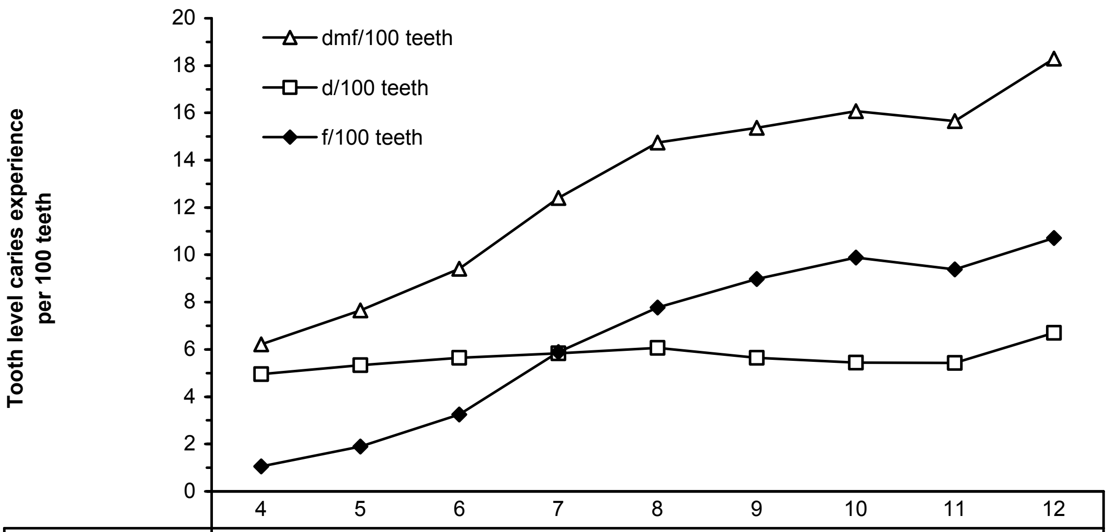
	4	5	6	7	8	9	10	11	12
Filled	17.1	25.0	34.6	47.5	53.0	58.6	62.0	60.8	58.5
Missing	3.3	4.7	5.5	5.6	5.6	4.4	3.9	4.1	4.9
Decayed	79.7	70.3	60.0	46.9	41.4	37.0	34.1	35.1	36.6

Age (years)

Figure 2: Decayed, missing and filled deciduous teeth as a percentage of dmft score by age, 2000

Figure 3 shows caries experience, expressed in terms of clinically detectable untreated decay, fillings and the mean dmft score, after controlling for the number of deciduous teeth present. Although the mean number of clinically decayed untreated teeth was shown to decrease consistently with age, the data indicate that this is principally a product of the exfoliation of deciduous teeth. Indeed, the rate of untreated decay in 2000 remained relatively stable between the ages of 5 and 11, varying from 5.34 teeth per 100 teeth at age 5 to 6.07 teeth per 100 teeth at age 8. The percentage of deciduous teeth with fillings increased with age and together these caries experience indicators combine to produce an increase in the dmft index per 100 teeth across age groups. The percentage of deciduous teeth that were decayed, missing or filled increased from 6.2% at age 4 to 18.3% at age 12.

The percentage of children with no deciduous caries experience (dmft = 0) steadily declined across the age range 4–9 years, from 65.8% to 50.3%; however, this percentage subsequently increased, and at 12 years of age 82.6% of children showed no evidence at their examination of caries experience in their deciduous dentition (see Figure 4). This is due to the exfoliation of deciduous teeth and the increasing percentage of children with no deciduous teeth and therefore no deciduous caries experience. The d/dmft ratio was highest among younger children (84.2%) and declined to 36.9% for children aged 10 years. This reflects the changing distribution of decayed and filled teeth with age.



Age (years)	4	5	6	7	8	9	10	11	12
dmf/100 teeth	6.22	7.65	9.41	12.41	14.74	15.37	16.07	15.66	18.30
d/100 teeth	4.95	5.34	5.65	5.83	6.07	5.65	5.44	5.43	6.70
f/100 teeth	1.06	1.90	3.25	5.89	7.77	8.98	9.89	9.39	10.71

Figure 3: Tooth level deciduous caries experience per 100 deciduous teeth by age, 2000

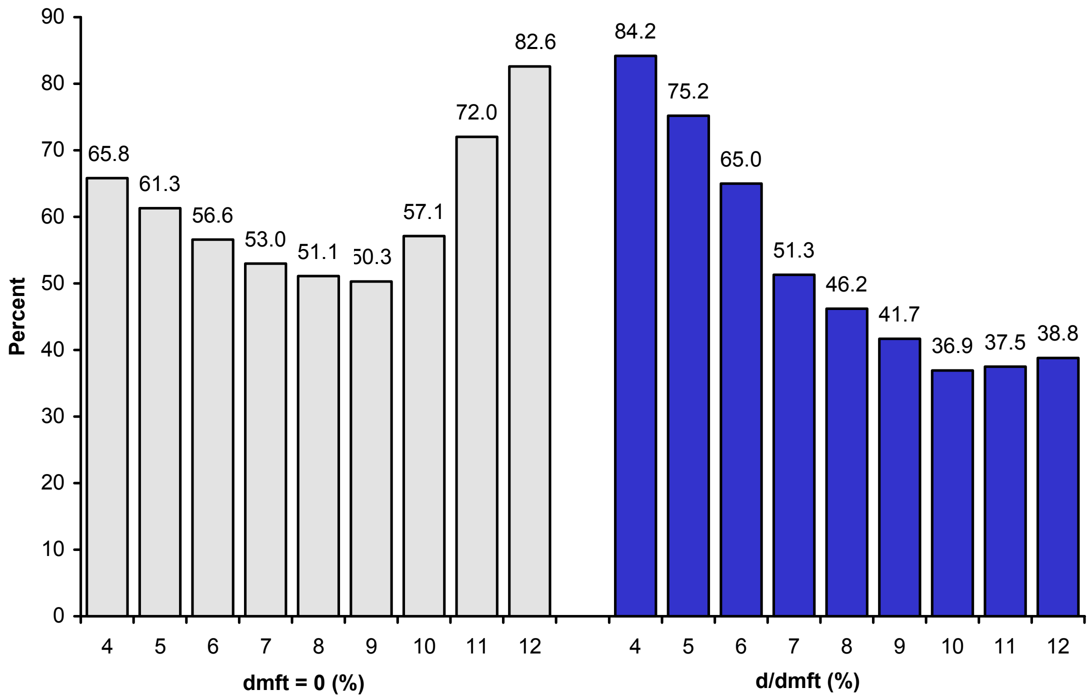
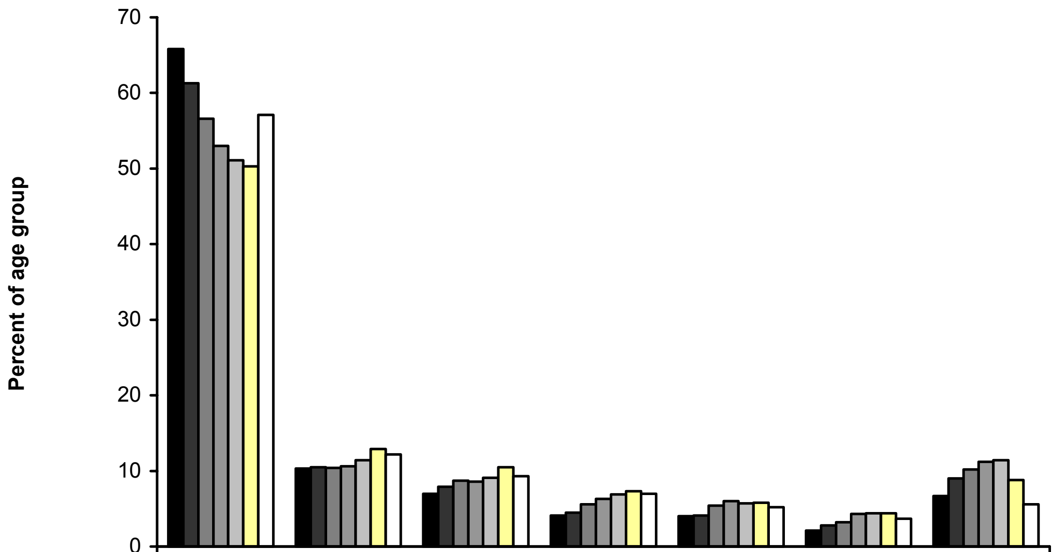


Figure 4: Deciduous dentition—dmft = 0 and d/dmft, 2000

While most Australian children have relatively low deciduous caries experience, there remains a minority of children who experience a considerable caries burden. Figure 5 shows the distribution of deciduous caries experience by age. As previously shown in Figure 4, between 50.3% and 65.8% of children in any age group had no clinically detectable deciduous caries experience. Between 10.3% and 12.9% of children in any age group had a deciduous dmft score of 1, with these percentages increasing slightly with increasing age of the children. The percentage of any age group with between 2 and 5 decayed, missing or filled teeth did not, for the most part, exceed 10%, and less than 5% of children in any age group had 5 decayed, missing or filled teeth. However, children with 6 or more decayed, missing or filled teeth comprised between 5.6% and 11.4% of children in any age group.



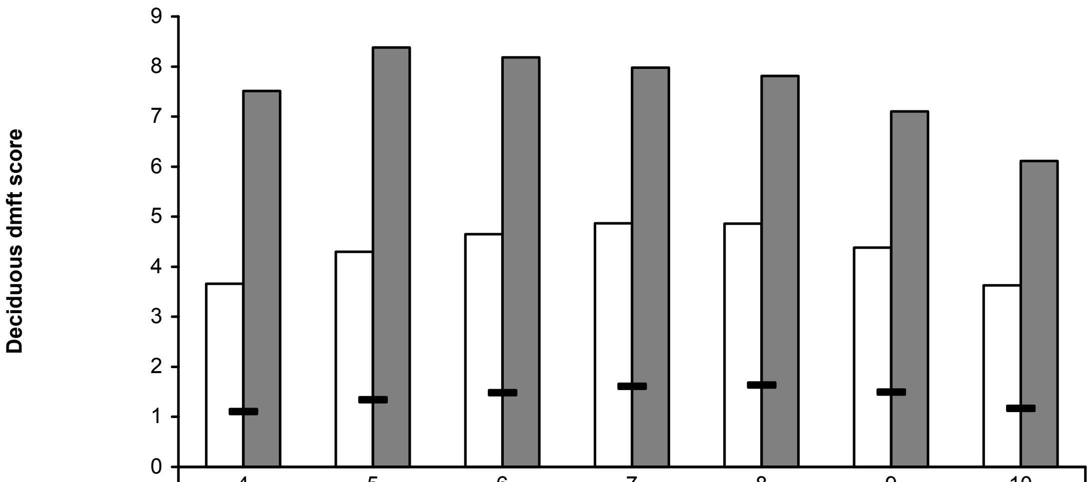
	0	1	2	3	4	5	6+
4-year-olds	65.8	10.3	7.0	4.1	4.0	2.1	6.7
5-year-olds	61.3	10.5	7.9	4.5	4.1	2.8	9.0
6-year-olds	56.6	10.4	8.7	5.6	5.4	3.2	10.2
7-year-olds	53.0	10.6	8.6	6.3	6.0	4.3	11.2
8-year-olds	51.1	11.4	9.1	6.9	5.7	4.4	11.4
9-year-olds	50.3	12.9	10.5	7.3	5.8	4.4	8.8
10-year-olds	57.1	12.2	9.3	7.0	5.2	3.7	5.6

Deciduous dmft score

Figure 5: Distribution of deciduous dmft scores by age group, 2000

While average caries experience scores for a population provide good summary statistics they can hide the existence of people within that population who have considerable caries experience. The Significant Caries Index (SiC) was designed to bring attention to those individuals with the highest scores in a population (Bratthal 2000; Nishi et al. 2001). The SiC Index is the mean dmft of the 30% of the population with the highest caries scores. A modified index, the SiC^{10}, is the mean dmft of the 10% of children with the highest dmft scores. Figure 6 shows the SiC and SiC^{10} indices for the deciduous dentition of 4–10-year-olds. For those children with the highest 30% of scores, dmft scores are considerably higher than the mean scores for the entire age group, and range between 3.63 and 4.87 dmft units. The disproportionate burden of disease is dramatically demonstrated for children with the highest 10% of dmft scores, where scores range from 4 (8- and 9-year-olds) to over 6 times higher (4-year-olds) than corresponding mean scores for the entire age group.

The patterns in deciduous caries experience suggest that children enter their school years with moderate caries experience in the deciduous dentition – a large proportion of it manifested as clinically detectable untreated decay (approximately 80% at 4 years of age). With continued treatment in the school dental services, decay experience becomes predominantly represented by past experience as indicated by the presence of fillings, rather than current experience. Despite steady increases in dmft scores and the accumulation of fillings across the ages 4–10 years, the exfoliation of teeth results in a reduction in the absolute number of untreated decayed teeth and increased numbers of children presenting with no deciduous caries experience. The majority of caries experience is represented in a minority of children.



	4	5	6	7	8	9	10
SiC	3.66	4.30	4.65	4.87	4.86	4.38	3.63
SiC 10	7.51	8.38	8.18	7.98	7.81	7.10	6.11
National mean	1.23	1.49	1.65	1.79	1.82	1.66	1.30

Age (years)

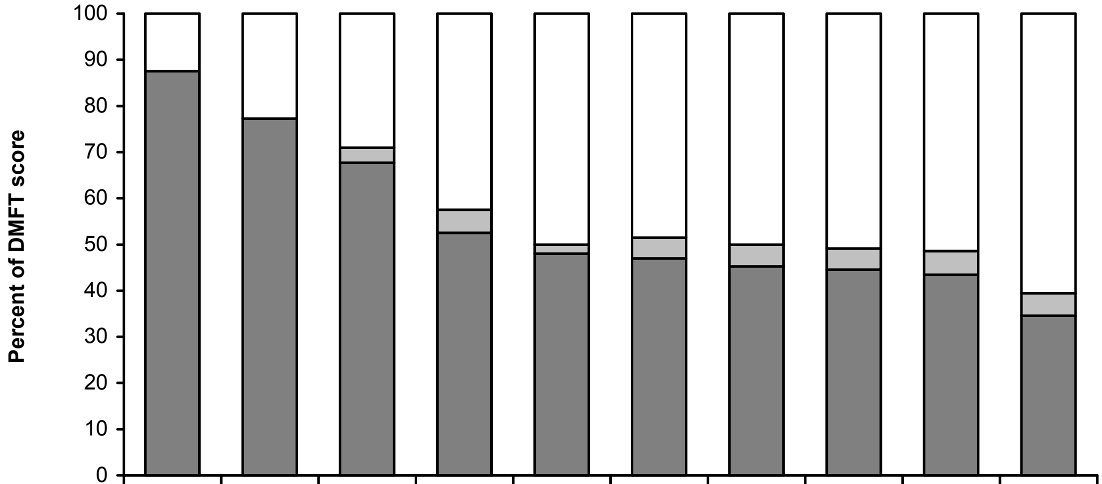
Figure 6: Significant Caries Indices (SiC and SiC^{10}) and mean deciduous dmft scores of 4–10-year-old children, 2000

Permanent teeth

The mean numbers of clinically detectable untreated decayed permanent teeth were smaller than the corresponding means for deciduous teeth across the age range 5–10 years (see Table 4). This primarily reflects reduced time-at-risk of those teeth present and, at younger ages, the low number of permanent teeth present. The mean number of clinically detectable decayed permanent teeth increased consistently with age, peaking at 0.64 for 15-year-olds. The mean number of teeth indicated as missing due to caries was very low for most ages but increased slightly to 0.09 teeth for 15-year-old children. The pattern with filled teeth was a consistent increase across the age ranges, from 0.00 for 5-year-olds to 1.12 teeth for 15-year-olds. Mean DMFT scores also increased consistently with age, from 0.02 at age 5 (at which time less than 1 permanent tooth on average was present) to 1.86 teeth at age 15 (when an average of 27.33 teeth were present). The mean DMFT score for 12-year-old children was 0.84 teeth.

Table 4: Permanent dentition—decayed, missing and filled teeth, 2000

Age (years)	Children	Teeth present	Decayed (D)		Missing (M)		Filled (F)		DMFT	
	n	mean	mean	SD	mean	SD	mean	SD	mean	SD
5	26,923	0.84	0.02	0.21	0.00	0.06	0.00	0.08	0.02	0.25
6	23,525	4.28	0.07	0.38	0.00	0.06	0.01	0.17	0.08	0.46
7	27,901	8.60	0.17	0.59	0.00	0.09	0.05	0.31	0.22	0.70
8	28,480	11.12	0.21	0.61	0.01	0.15	0.09	0.43	0.31	0.81
9	28,900	12.85	0.21	0.61	0.02	0.48	0.17	0.59	0.40	0.99
10	28,423	15.95	0.24	0.70	0.01	0.17	0.25	0.72	0.50	1.06
11	28,485	20.06	0.31	0.84	0.03	0.35	0.32	0.88	0.66	1.39
12	24,065	23.80	0.38	0.95	0.04	0.38	0.42	1.00	0.84	1.60
13	29,326	26.21	0.49	1.15	0.05	0.34	0.56	1.19	1.09	1.90
14	30,081	27.27	0.60	1.39	0.07	0.43	0.71	1.35	1.38	2.17
15	15,672	27.33	0.64	1.48	0.09	0.58	1.12	1.79	1.86	2.72



	6	7	8	9	10	11	12	13	14	15
Filled	12.5	22.7	29.0	42.5	50.0	48.5	50.0	50.9	51.5	60.6
Missing	0.0	0.0	3.2	5.0	2.0	4.6	4.8	4.6	5.1	4.9
Decayed	87.5	77.3	67.7	52.5	48.0	47.0	45.2	44.6	43.5	34.6

Age (years)

Figure 7: Decayed, missing and filled permanent teeth as a percentage of DMFT score by age, 2000

The mean number of decayed, missing and filled permanent teeth expressed as percentages of the DMFT index is shown in Figure 7. The pattern is similar to that shown in the deciduous dentition. In the youngest ages the DMFT score is primarily represented by the presence of clinically detectable untreated decay. By the age of 10 years, however, less than 50% of the DMFT score was attributable to untreated decayed teeth.

In excess of 80% of children in each age group 8 years old or less had no permanent tooth caries experience (DMFT = 0), and even by the end of their primary school years 64.9% of 12-year-olds had no permanent tooth caries experience (see Figure 8). However, by the age of 15 years only 44.9% of children presented free of caries experience in their permanent dentition.

After controlling for the number of permanent teeth present, an increase in the rate of caries experience could be seen with increasing age, although the trend was not consistent (see Figure 9). Between the ages of 7 and 10 years, clinically detectable untreated decay decreased from 1.98 to 1.50 teeth per 100 permanent teeth present, before increasing to 2.34 for 15-year-olds. From the age of 12 years DMFT per 100 teeth begins to climb sharply, increasing from 3.5% to 6.8% of teeth at age 15.

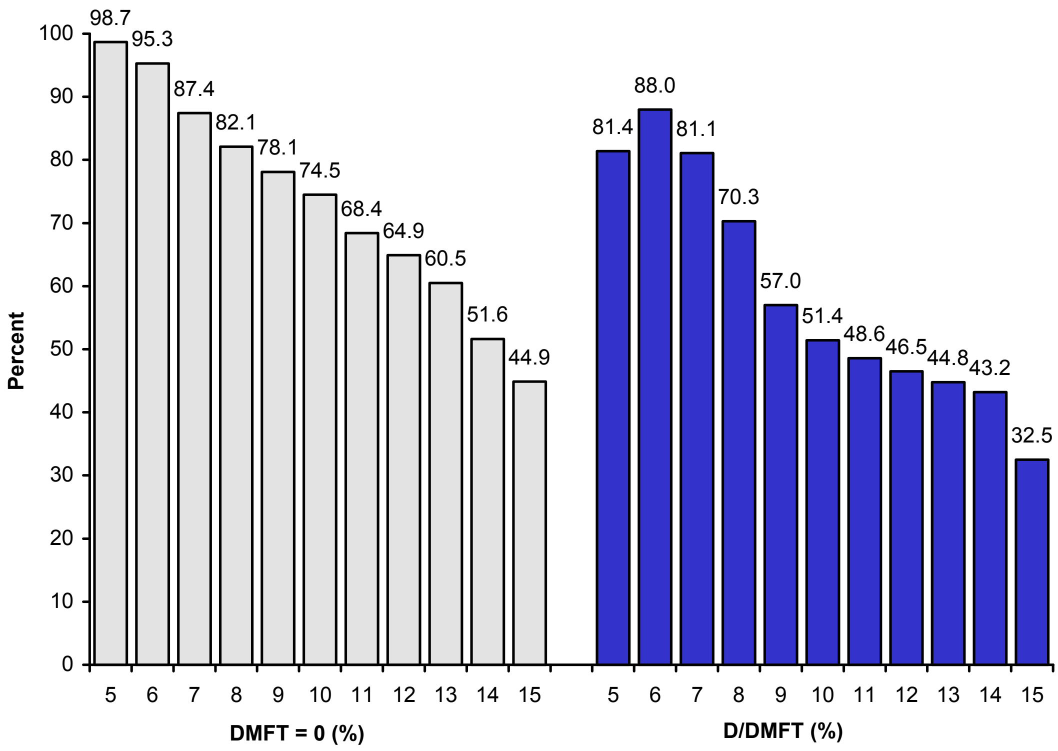
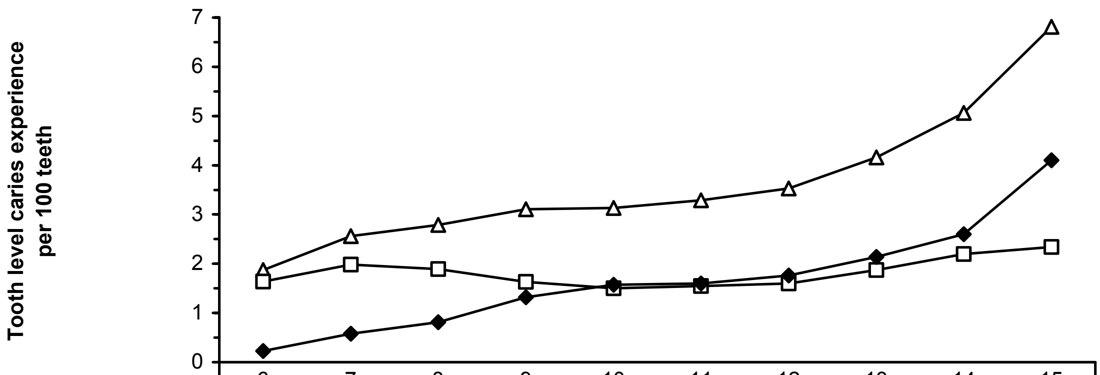


Figure 8: Permanent dentition — DMFT = 0 and D/DMFT, 2000

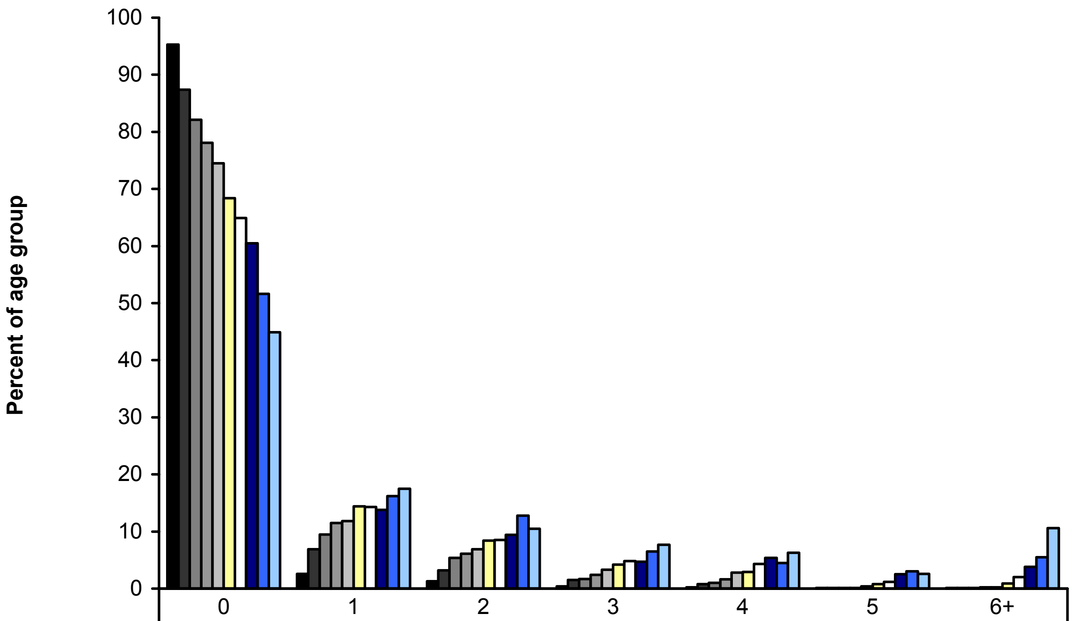


	6	7	8	9	10	11	12	13	14	15
DMF/100 teeth	1.87	2.56	2.79	3.11	3.13	3.29	3.53	4.16	5.06	6.81
D/100 teeth	1.64	1.98	1.89	1.63	1.50	1.55	1.60	1.87	2.20	2.34
F/100 teeth	0.23	0.58	0.81	1.32	1.57	1.60	1.76	2.14	2.60	4.10

Age (years)

Figure 9: Tooth level permanent caries experience per 100 permanent teeth by age, 2000

Figure 10 shows the distribution of permanent DMFT scores for children aged between 6 and 15 years. As previously shown in Figure 8, there was a consistent decline across the age range 6–15 years in the percentage of children without caries experience in the permanent dentition, as represented by reductions in the percentage of children with DMFT = 0. However, for the other permanent DMFT scores presented, there were generally consistent increases across older ages. Between the ages of 13 and 15 years, 3.8% to 10.6% of children had a DMFT score of 6 or greater.

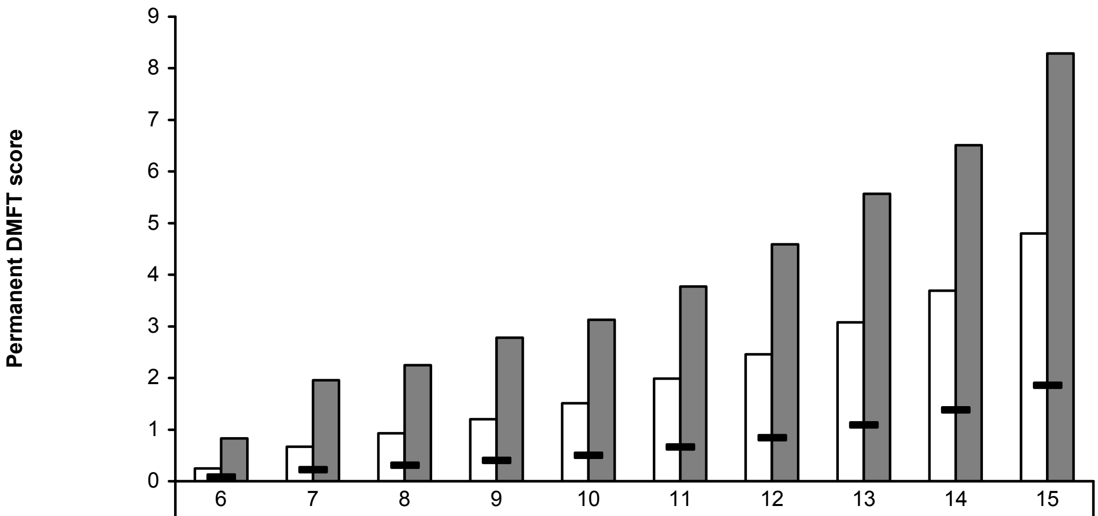


	0	1	2	3	4	5	6+
6-year-olds	95.3	2.6	1.3	0.4	0.2	0.1	0.1
7-year-olds	87.4	6.9	3.2	1.5	0.8	0.1	0.1
8-year-olds	82.1	9.5	5.4	1.7	1.0	0.1	0.1
9-year-olds	78.1	11.5	6.1	2.4	1.6	0.1	0.2
10-year-olds	74.5	11.8	6.9	3.3	2.8	0.4	0.2
11-year-olds	68.4	14.4	8.4	4.2	2.9	0.8	0.9
12-year-olds	64.9	14.3	8.5	4.8	4.3	1.2	2.0
13-year-olds	60.5	13.8	9.4	4.7	5.4	2.5	3.8
14-year-olds	51.6	16.2	12.8	6.5	4.5	3.0	5.5
15-year-olds	44.9	17.5	10.5	7.7	6.3	2.6	10.6

Permanent DMFT score

Figure 10: Distribution of permanent DMFT scores by age group, 2000

Figure 11 indicates the burden of disease in the permanent dentition of those children most affected by caries experience. Although the SiC and SiC[10] indices are relatively low compared to those shown in the deciduous dentition, especially in children up to the age of 10 years, it should be remembered that permanent DMFT scores for all children in these age groups is very low, rising to only 0.50 for 10-year-olds. Between the ages of 6 and 10 years, children with the highest 10% of DMFT scores (SiC[10]) had mean scores between 6 and 10.5 times higher than mean permanent caries experience scores for the corresponding entire age group. Scores for children aged between 11 and 15 years were some 4.5 times (15-year-olds) to almost 6 times (11-year-olds) higher for children with the highest 10% of scores in each age group than mean scores for the entire age group. The SiC Index increased from 0.25 DMFT units for 6-year-olds to 4.80 DMFT units for 15-year-olds, and for each age group ranged from approximately 2.5 to 3 times higher than the mean national DMFT.



	6	7	8	9	10	11	12	13	14	15
SiC	0.25	0.67	0.93	1.20	1.51	1.99	2.46	3.08	3.69	4.80
SiC 10	0.83	1.96	2.25	2.78	3.13	3.77	4.59	5.57	6.51	8.29
National mean	0.08	0.22	0.31	0.40	0.50	0.66	0.84	1.09	1.38	1.86

Age (years)

Figure 11: Significant Caries Indices (SiC and SiC[10]) and mean permanent DMFT scores of 6–15-year-old children, 2000

All teeth

Table 5 combines components of caries experience from both the deciduous and permanent dentition to provide an indicator of the total burden of disease among children receiving care within school dental services.

Untreated clinically detectable decay ($d+D \geq 1$) in the combined deciduous and permanent dentition was present for between 26.1% and 39.1% of children in the age range 5–15 years. The highest prevalence of untreated decay was observed among 8-year-olds (where only 60.9% had $d+D = 0$) while the greatest severity of clinically detectable untreated decay occurred in the youngest ages (e.g., 10.4% of 5-year-olds had 4 or more teeth with clinically detectable untreated decay). Based on observations from previous tables the largest contribution to caries experience among younger children came from deciduous teeth.

Missing teeth due to caries were relatively uncommon among children aged 5–15 years. The percentage of children with no fillings ($f+F = 0$) and no caries experience ($dmft+DMFT = 0$) showed a bimodal distribution, driven by changes in caries experience resulting from the exfoliation of deciduous teeth and the subsequent eruption of the permanent dentition. Among the key age range of 5–12 years, between 44% and 61% of children in any age group had no caries experience in either dentition.

Table 5: All teeth—age-specific caries experience, 2000

Age		d+D =								dmft+
(years)	Children	0	1	2	3	4	5+	m+M = 0	f+F = 0	DMFT = 0
	n	%	%	%	%	%	%	%	%	%
5	26,923	66.3	11.0	7.9	4.4	3.2	7.2	97.1	87.3	60.8
6	23,525	63.5	12.2	8.8	4.9	3.7	6.9	96.5	79.5	55.1
7	27,892	61.4	14.6	9.6	5.1	3.5	5.7	95.1	69.9	49.3
8	28,480	60.9	16.0	10.1	5.2	3.0	5.0	94.2	65.3	46.0
9	28,900	62.5	16.4	10.1	5.4	2.6	3.0	95.6	60.7	43.6
10	28,423	66.7	16.3	8.2	4.4	2.1	2.4	96.1	60.9	46.4
11	28,485	70.9	15.2	7.1	3.7	1.3	1.8	96.9	67.9	52.2
12	24,065	73.7	13.1	6.8	3.5	1.4	1.5	96.9	70.3	56.0
13	29,326	73.9	12.2	6.5	3.3	2.3	1.8	97.1	71.0	56.7
14	30,081	69.6	16.0	7.0	2.7	1.9	2.9	95.9	65.6	49.6
15	15,672	72.0	13.4	5.9	3.6	1.8	3.3	95.2	56.1	43.6

Fissure sealants

The mean number of fissure sealants present in permanent teeth increased with increasing age (see Table 6), and for all ages exceeded the mean number of decayed permanent teeth for each respective age group.

Children aged 6–15 years with permanent caries experience (DMFT ≥ 1) were between 35.3% and 400.0% more likely to have a fissure sealant than children with no permanent caries experience (DMFT = 0). Among the 12-year-old age group, 40.4% of children with DMFT ≥ 1 had fissure sealants compared with 25.6% of those with DMFT = 0. This can be interpreted as a tendency towards the preferential provision of fissure sealants to children deemed to have a greater likelihood of developing dental caries.

Table 6: Fissure sealants—age-specific experience, 2000

				DMFT = 0		DMFT ≥ 1	
Age (years)	Children	Sealants		Children	With fissure sealants	Children	With fissure sealants
	n	mean	SD	*n*	%	*n*	%
6	23,520	0.06	0.43	22,406	1.9	1,114	9.5
7	27,901	0.27	0.91	24,378	8.4	3,522	17.4
8	28,480	0.51	1.21	23,392	16.3	5,087	25.4
9	28,887	0.72	1.41	22,562	22.3	6,325	32.4
10	28,407	0.82	1.45	21,165	26.1	7,242	35.7
11	28,485	0.90	1.54	19,490	27.8	8,995	37.6
12	24,060	0.88	1.59	15,624	25.6	8,436	40.4
13	29,326	0.93	1.75	17,735	22.5	11,592	39.6
14	30,020	1.14	1.99	15,512	24.1	14,509	45.8
15	15,672	1.15	2.23	7,030	28.9	8,643	39.7

Immediate treatment needs

Immediate treatment need was recorded only in New South Wales, Queensland, South Australia, Tasmania and the Northern Territory in 2000 so the results presented here may not be representative of the Australian child population and should be interpreted with due caution. In addition, the protocol for assigning immediate treatment needs in New South Wales differed from other states and territories, with a more imminent expectation of pain required for this classification (24–48 hours, in contrast to a four-week period adopted elsewhere). The percentage of children with immediate needs was highest for 6-year-olds (4.9%) and lowest for children aged 13-year-olds (2.1%) (see Table 7).

Children with immediate treatment needs were found to have greater caries experience in comparison to children judged not to be in immediate need. Age-specific means for dmft and DMFT tended to be approximately 1.5–3 times higher than the national averages listed in previous tables. For example, 5-year-olds with immediate treatment needs had a mean dmft of 4.27 (compared with 1.49 in Table 3) and 42.8% had d+D ≥ 5 (compared with 11.8% in Figure 5).

It should be emphasised that the percentage of those deemed to be requiring immediate treatment reflects both the accumulated amount of dental disease and the methods of targeting and delivering school dental services. For example, clinics which provide care for a relatively small proportion of a population and which assign priority to treating those with symptoms will almost certainly record higher percentages of immediate treatment need than other clinics which have universal coverage of all children on a constant recall basis.

Perhaps the most important interpretation of Table 7 is that a subgroup of children with a substantial burden of dental caries could be identified within school dental services. Their state of poor dental health contrasts with the previous observation that between approximately 40% and 60% of 5–14-year-olds have no caries experience.

Table 7: Immediate treatment needs—age-specific distribution, 2000

Age (years)	All children	Children in need of immediate treatment						d+D =				
				dmft		DMFT		1	2	3	4	5+
	n	*n*	%	mean	SD	mean	SD	%	%	%	%	%
4	5,597	144	2.6	3.90	3.02	0.00	0.00	37.4	14.3	5.1	2.8	32.9
5	6,047	229	3.8	4.27	3.14	0.01	0.20	22.9	8.7	9.8	3.4	42.8
6	2,799	138	4.9	4.88	3.57	0.15	0.80	18.0	20.2	10.5	4.2	36.6
7	7,032	231	3.3	4.46	3.02	0.56	1.10	12.3	11.4	15.6	19.2	23.5
8	7,145	192	2.7	5.04	3.55	0.57	1.09	30.1	17.2	5.9	4.2	15.9
9	7,221	249	3.4	3.36	3.10	0.47	0.81	28.9	9.1	4.4	5.3	11.3
10	7,260	227	3.1	2.31	2.66	1.77	1.57	36.4	13.9	3.2	0.6	22.6
11	7,408	288	3.9	0.57	1.53	1.63	1.96	22.6	4.5	4.4	1.0	4.9
12	2,982	89	3.0	0.52	1.24	2.32	3.40	32.3	17.0	12.0	18.2	4.4
13	7,948	169	2.1	0.15	0.50	3.50	3.07	20.8	17.0	0.0	2.3	31.6
14	8,182	210	2.6	1.71	2.08	3.22	2.72	11.9	4.1	1.9	47.2	7.8
15	9,141	248	2.7	0.16	0.37	1.53	2.03	25.7	15.7	0.0	2.4	0.9

Interstate comparison—5- to 6-year-old dmft

Combined 5- and 6-year-olds represent a standard age group (cited, e.g., within World Health Organization publications); this group is, moreover, a useful one to consider in relation to school dental services since it represents, predominantly, the dental health status of children new to these services.

Table 8 shows that considerable differences existed among the states and territories between the lowest (New South Wales, mean = 0.98) and highest (Northern Territory, mean = 2.26) mean dmft scores. Decay scores were lowest for New South Wales (mean = 0.68) and highest in the Northern Territory (mean = 1.65). The recorded number of fillings also varied appreciably and was almost 3 times higher in Queensland (mean = 0.74) than in New South Wales (mean = 0.25). In assessing these differences it should be noted that there are historical differences in caries prevalence, as well as marked variations in population density, demography and levels of water fluoridation between these two jurisdictions. There are also differences in the organisation and delivery of school dental services between different states and territories, and these differences have increased with the introduction of the SOKS program in New South Wales. Additionally, the adoption of oral assessments in the field resulted in an estimated reduction of 44% in recorded decay in New South Wales.

Variation can also be seen in the percentage of dmft attributable to clinically detectable untreated decay, ranging from a low of 60.9% in Western Australia up to 75.2% in Victoria (see Figure 12). The variation in the percentage of children with no caries experience (dmft = 0), while representing to some degree the converse of mean dmft, showed less variation than that for mean dmft, ranging from 47.6% in Queensland to 68.3% in New South Wales.

Table 8: Interstate comparison—5- to 6-year-old dmft, 2000

State/ territory	Children	Decayed (d)		Missing (m)		Filled (f)		dmft	
	n	mean	SD	mean	SD	mean	SD	mean	SD
NSW[(a)]	17,911	0.68	1.56	0.05	0.47	0.25	0.92	0.98	1.98
Vic	12,987	1.39	2.40	0.13	0.74	0.47	1.32	1.99	3.15
Qld	8,110	1.28	2.29	0.10	0.79	0.74	1.74	2.12	3.22
WA	5,026	0.93	1.97	0.05	0.63	0.61	1.55	1.59	3.01
SA	3,618	0.76	1.60	0.05	0.40	0.56	1.46	1.46	2.47
Tas	1,285	0.94	1.88	0.12	1.02	0.47	1.24	1.53	2.62
ACT	823	1.13	1.90	0.00	0.06	0.69	1.72	1.83	2.99
NT	689	1.65	2.69	0.11	0.62	0.50	1.35	2.26	3.25
Australia	**50,448**	**1.02**	**2.03**	**0.08**	**0.64**	**0.46**	**1.33**	**1.56**	**2.76**

(a) NSW decayed teeth scores are from field examinations that underestimate decay experience. See Appendix A for adjusted estimates.

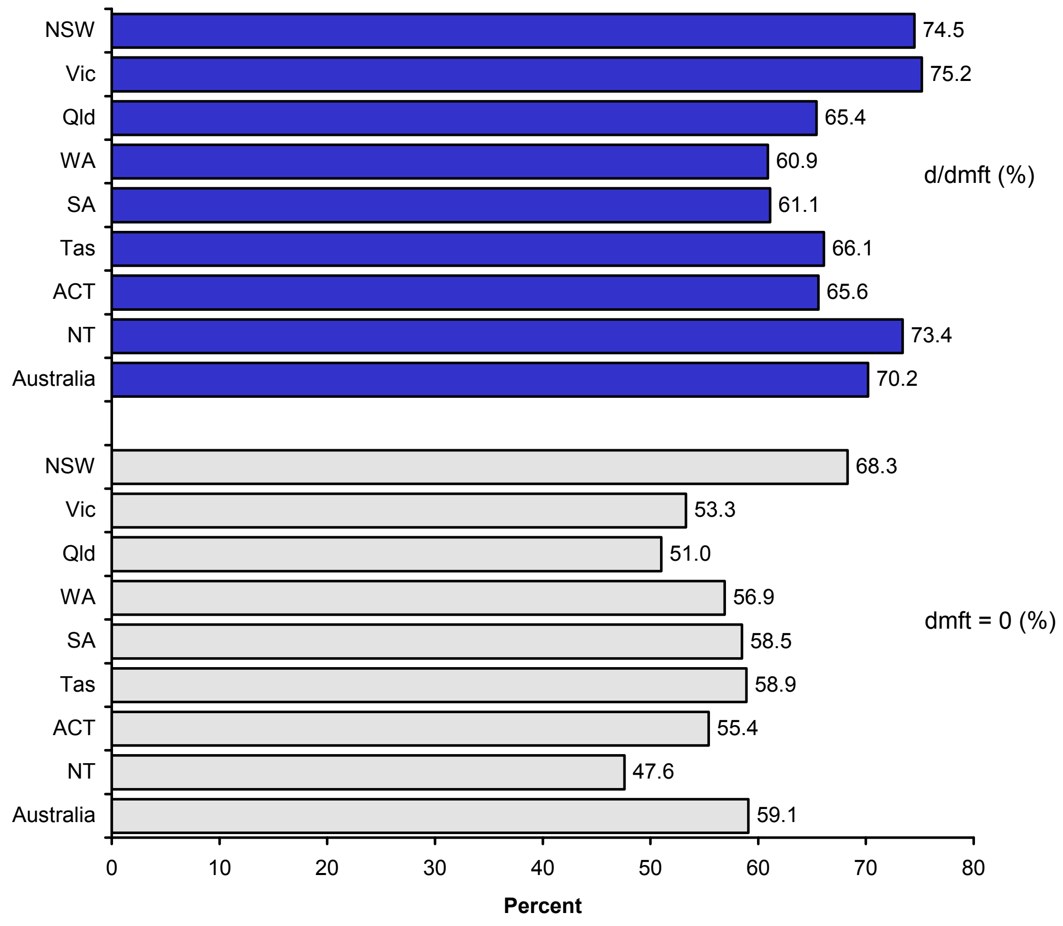


Figure 12: Interstate comparison—5- to 6-year-old d/dmft and dmft = 0, 2000

Interstate comparison—12-year-old DMFT

There was substantial variation in the mean DMFT scores among states and territories (see Table 9), with the highest mean score (1.39 in the Australian Capital Territory) being about 2.5 times that of the lowest (0.55 in New South Wales). In the case of permanent teeth, there was again quite a strong correspondence between mean DMFT and the mean number of decayed teeth, but a much weaker correlation between DMFT scores and the mean number of filled teeth.

New South Wales had the highest percentage of children with no caries experience, having almost 75% of children with DMFT = 0 (see Figure 13). By contrast, Queensland had the lowest percentage of children with DMFT = 0, with only 56.1% of 12-year-olds in that state presenting without a history of caries experience. There was also quite large variation in the ratio of D/DMFT, ranging from 36.7% in Queensland to 51.5% in Victoria.

Table 9: Interstate comparison—12-year-old DMFT, 2000

State/ territory	Children	Decayed (D)		Missing (M)		Filled (F)		DMFT	
	n	mean	SD	mean	SD	mean	SD	mean	SD
NSW [(a)]	8,755	0.27	0.80	0.02	0.19	0.27	0.80	0.55	1.21
Vic	6,351	0.55	1.12	0.06	0.39	0.50	1.02	1.11	1.80
Qld	2,628	0.40	0.93	0.07	0.68	0.69	1.35	1.17	1.86
WA	2,758	0.33	0.88	0.07	0.52	0.49	1.08	0.89	1.84
SA	2,050	0.24	0.62	0.00	0.04	0.35	0.88	0.60	1.13
Tas	727	0.43	0.99	0.02	0.34	0.53	1.02	0.98	1.45
ACT	478	0.63	1.60	0.04	0.19	0.71	1.25	1.39	2.52
NT	317	0.53	1.30	0.11	0.60	0.33	0.85	0.97	1.78
Australia	**24,065**	**0.38**	**0.95**	**0.04**	**0.38**	**0.42**	**1.00**	**0.84**	**1.60**

(a) NSW decayed teeth scores are from field examinations that underestimate decay experience. See Appendix A for adjusted estimates.

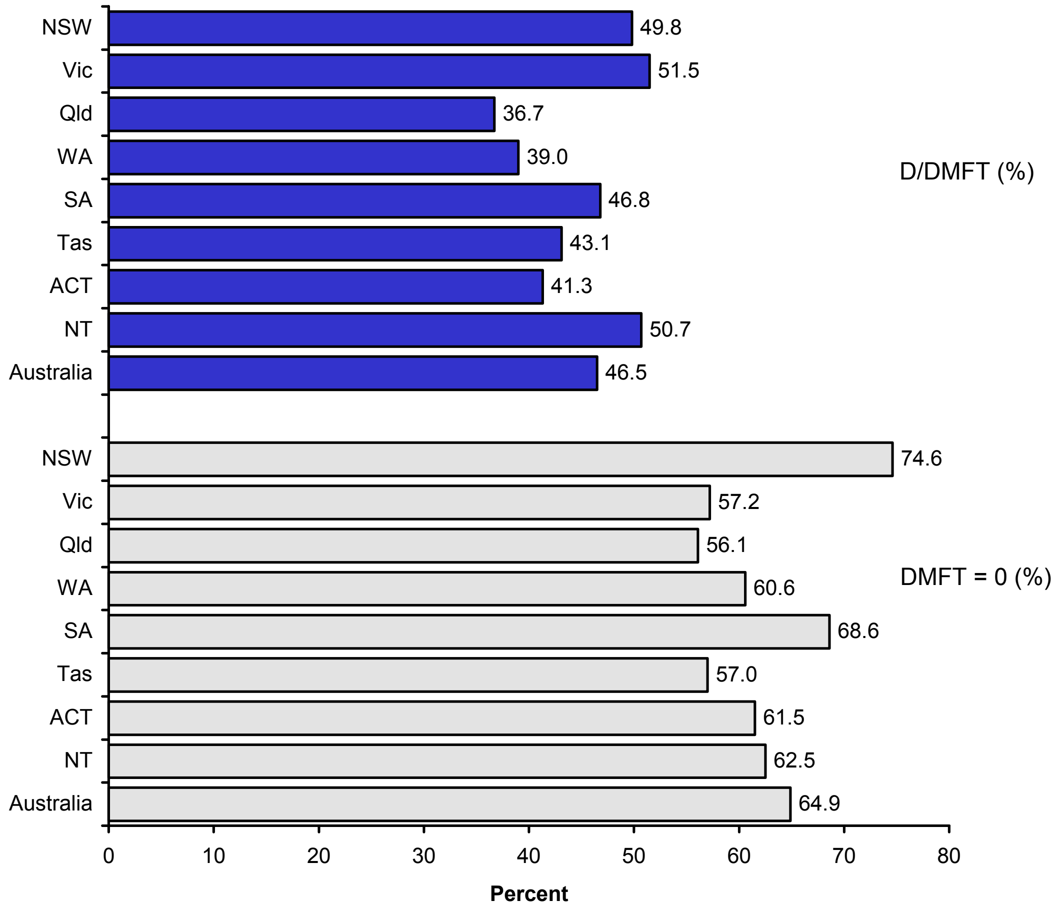


Figure 13: Interstate comparison – 12-year-old D/DMFT and DMFT = 0, 2000

Interstate comparison—all teeth

Age-standardised data were used to bring together data from all ages (children aged between 5 and 12 years) in all jurisdictions for interstate comparison. This is useful in the event that any age-specific statistics (e.g., for 5- to 6-year-olds) provide an unrepresentative picture of conditions in a specific state or territory. The purpose of age-standardisation is to adjust among states and territories for possible differences in the proportion of specific age groups, which is important because of the age-relatedness of most dental caries measures.

Table 10 illustrates further areas of interstate variation in caries experience. For example, there are appreciable differences in the percentage of children with 5 or more decayed teeth (d+D ≥ 5). The Northern Territory, Victoria and Queensland have the highest levels of untreated decay (d+D), whereas South Australia and New South Wales have the lowest levels of clinically detectable untreated decay. The percentage of children with no caries experience (dmft+DMFT = 0) was highest in New South Wales (63.2%). Consistent with Tables 8 and 9, the lowest percentages of children with no caries experience were found in Queensland (41.6%), Victoria (43.4%) and the Northern Territory (44.5%).

Table 10: Interstate comparison—all teeth age-standardised caries experience, 2000

State/ territory	Children	Children with d+D = 0	1	2	3	4	5+	m+M = 0	f+F = 0	dmft+ DMFT = 0
	n	%	%	%	%	%	%	%	%	%
NSW	71,411	73.8	12.0	6.7	3.2	1.9	2.5	97.6	81.7	63.2
Vic	51,824	56.3	15.6	11.2	6.5	3.9	6.6	92.5	67.2	43.4
Qld	45,050	60.9	16.6	9.6	5.2	2.6	5.0	95.7	57.8	41.6
WA	21,439	69.1	15.0	7.3	3.7	1.9	3.0	97.4	64.0	48.5
SA	15,284	70.4	14.5	7.9	3.7	1.7	1.9	98.1	70.1	53.5
Tas	5,489	63.8	15.0	9.4	4.9	3.2	3.8	97.5	65.3	46.1
ACT	3,504	63.1	16.3	8.2	5.2	2.5	4.7	98.7	63.6	46.4
NT	2,699	58.3	15.1	9.0	5.6	4.0	7.9	95.6	72.5	44.5
Australia	**216,700**	**65.6**	**14.4**	**8.6**	**4.6**	**2.6**	**4.1**	**96.0**	**69.9**	**50.9**

National summary

Age-standardised data were used to summarise data from all children aged between 5 and 12 years in all jurisdictions (see Table 11). Queensland had the highest levels of caries experience for deciduous teeth (mean dmft = 1.92, 51.6% dmft = 0), while children in New South Wales had the least caries experience (mean dmft = 0.81, 70.8% dmft = 0). The highest levels of permanent caries experience were found in the Australian Capital Territory (mean DMFT = 0.53, 75.6% DMFT = 0) while the lowest levels were seen in New South Wales (mean DMFT = 0.24, 87.1% DMFT = 0) and South Australia (mean DMFT = 0.25, 85.8% DMFT = 0).

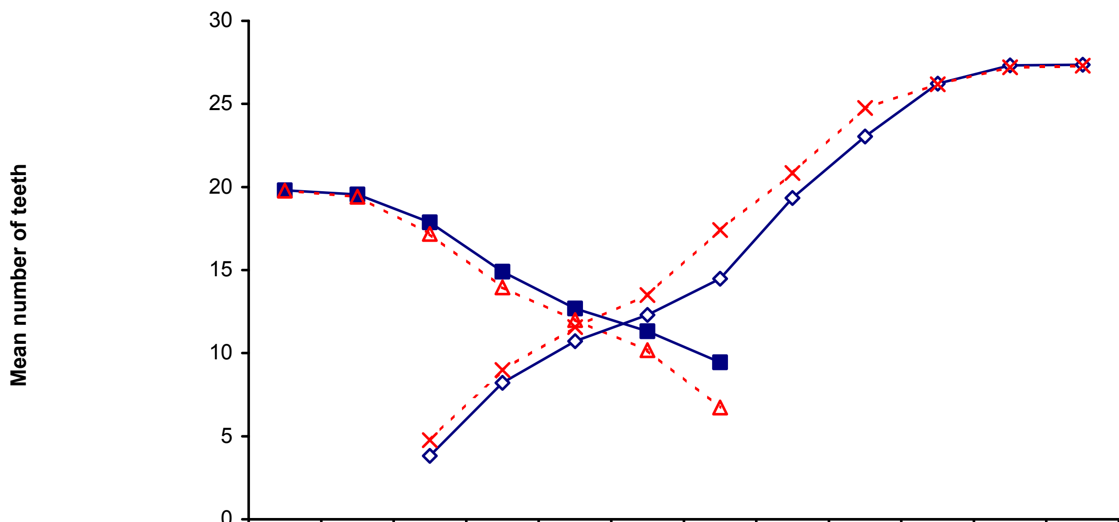
Table 11: National summary of caries experience of 5- to 12-year-old children, 2000

State/ territory	Children in sample	dmft		dmft = 0	DMFT		DMFT = 0	d+D = 0
	n	mean	SD	%	mean	SD	%	%
NSW	71,411	0.81	1.68	70.8	0.24	0.76	87.1	73.8
Vic	51,824	1.74	2.69	53.9	0.49	1.11	76.4	56.3
Qld	45,051	1.92	2.81	51.6	0.49	1.18	77.1	60.9
WA	21,439	1.27	2.24	59.0	0.41	1.29	79.1	69.1
SA	15,284	1.20	2.07	60.5	0.25	0.73	85.8	70.4
Tas	5,489	1.33	2.15	57.4	0.49	1.08	76.0	63.8
ACT	3,504	1.37	2.22	58.4	0.53	1.27	75.6	63.1
NT	2,699	1.64	2.57	53.8	0.37	1.03	82.1	58.3
Australia	**216,701**	**1.37**	**2.36**	**60.1**	**0.38**	**1.03**	**81.0**	**65.6**

Sex differences in children’s dental health

Figures 14–36 relate to sex differences in caries experience and fissure sealant provision between male and female children in Australia in the year 2000. These figures allow an insight into the differences between male and female children in a modern low-caries population. Previous research has painted a reasonably consistent picture regarding differences between boys and girls. Most epidemiological surveys have found higher age-specific caries experience in the permanent dentition of females than of males. This difference has been attributed principally to the earlier eruption of permanent teeth in girls than in boys (Mansbridge 1959).

Figure 14 shows the age-specific numbers of deciduous and permanent teeth for boys and girls, and uses available data from South Australia, Tasmania and the Australian Capital Territory only. These data are used here to estimate Australian figures, as there is no reason to assume that there are significant differences in the eruption time of teeth in the other states and territories. By the age of 10 years, in the deciduous dentition, males have approximately 2.5 more teeth present than females, as deciduous teeth are replaced by the permanent dentition earlier in girls. At age 10 years in the permanent dentition, girls have 3 extra teeth on average compared to same-aged boys and this represents the greatest sex difference in teeth present for any age group. Among older age groups similar numbers of teeth are present, although those teeth present in girls would have been erupted for longer periods and therefore had more time ‘at risk’ of developing caries than in boys.



	4	5	6	7	8	9	10	11	12	13	14	15
Male - decid.	19.80	19.55	17.87	14.90	12.69	11.32	9.45	. .	. .	. .	. .	. .
Female - decid.	19.79	19.41	17.17	13.96	11.99	10.19	6.73	. .	. .	. .	. .	. .
Male - perm.	. .	. .	3.81	8.21	10.72	12.30	14.47	19.34	23.04	26.23	27.32	27.35
Female - perm.	. .	. .	4.76	8.98	11.56	13.50	17.41	20.84	24.77	26.18	27.21	27.30

Age (years)

Figure 14: Mean deciduous and permanent teeth present for 4–15-year-old male and female children in Australia, 2000

Sex differences in caries experience of deciduous teeth

While studies have examined sex differences in the permanent dentition, finding girls to have greater caries experience than boys, comparatively little research has looked at differences between male and female children in the deciduous dentition. Presumably, given the greater number of teeth of boys than girls at any given age, it might be expected that male children have more caries experience in the deciduous dentition. Figures 15–18 show differences between boys and girls in the mean numbers of decayed, missing and filled teeth as well as in these components of caries experience combined. Also shown is the mean number of decayed, missing or filled teeth per 100 teeth present (using estimates of teeth present obtained from data from South Australia, Tasmania and the Australian Capital Territory). This is obtained by dividing the mean number of decayed, missing and filled teeth by the number of teeth for that age and sex, and then multiplying the total by 100.

Across all age groups boys had more decayed teeth than did girls (Figure 15). This difference was greatest up to the age of 6 years, thereafter varying between only 0.03 and 0.08 decayed teeth per child. Even after controlling for the number of teeth present, the higher prevalence of clinically detectable decay among boys in the 4–6 years age range persisted. However, girls had more decay experience in their deciduous teeth at the age of 10 years.

Except at age 5 years, boys generally had more missing teeth than did girls (Figure 16). Again, this pattern changes little after controlling for the number of teeth present. However, among children aged 10 years, girls generally had more missing teeth per 100 teeth present. In general, little difference existed between boys and girls in the prevalence of filled teeth (Figure 17). However, from the age of 9 years, girls had more filled teeth per 100 teeth present than did male children.

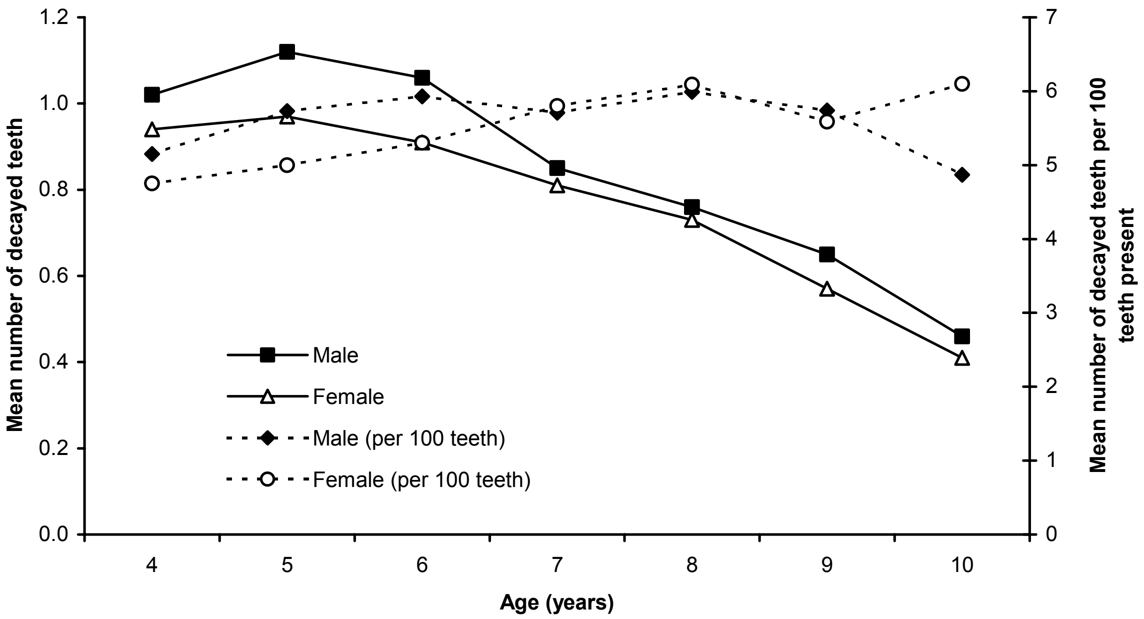


Figure 15: Mean decayed deciduous teeth for 4–10-year-old male and female children in Australia, 2000

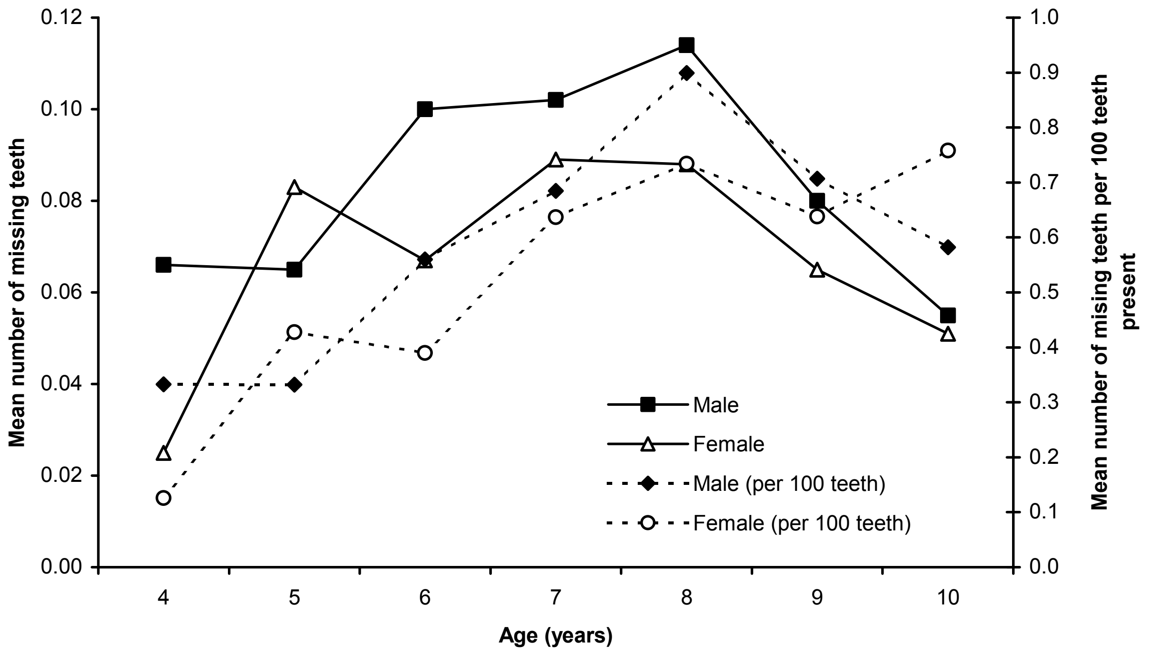


Figure 16: Mean missing deciduous teeth for 4–10-year-old male and female children in Australia, 2000

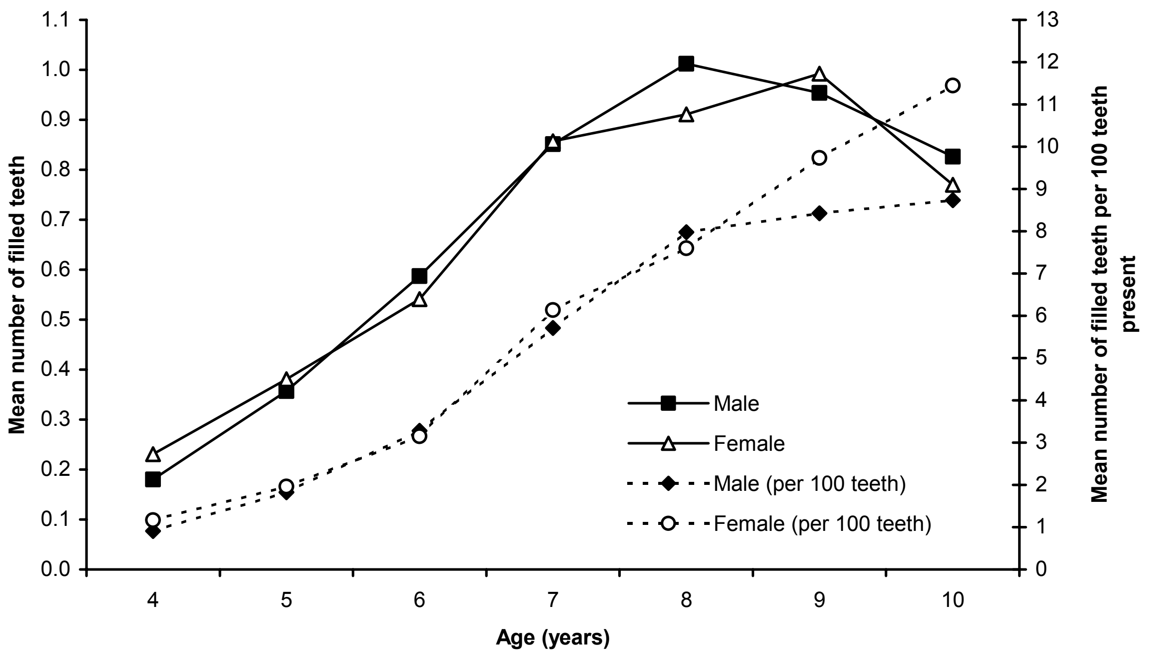


Figure 17: Mean filled deciduous teeth for 4–10-year-old male and female children in Australia, 2000

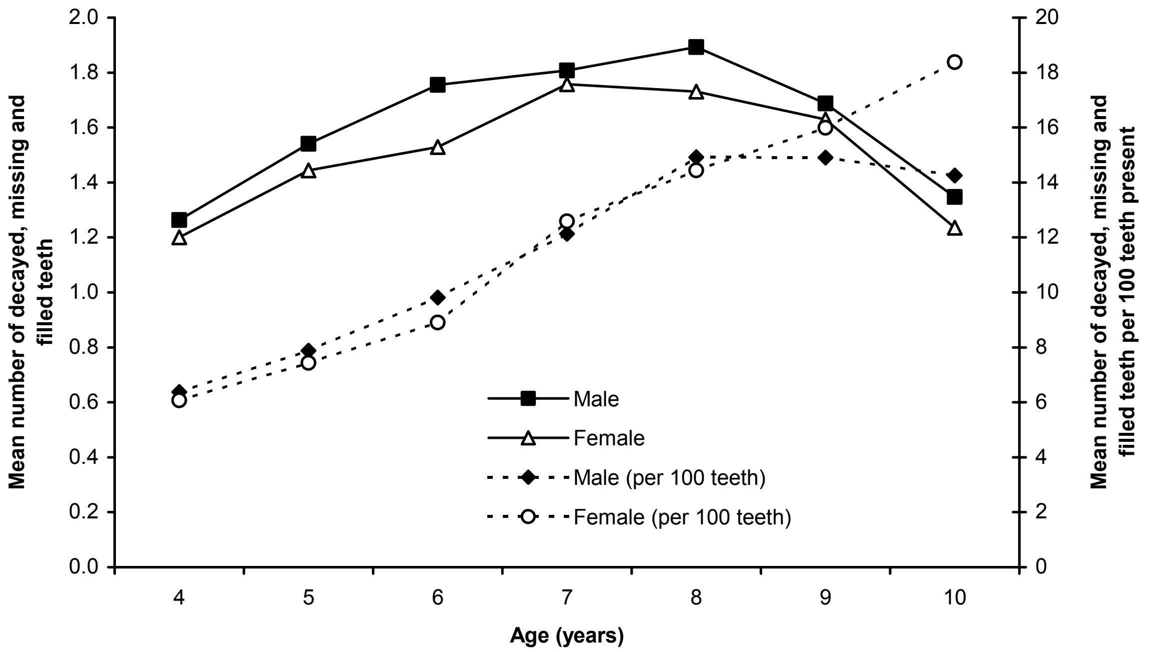


Figure 18: Mean decayed, missing and filled deciduous teeth for 4–10-year-old male and female children in Australia, 2000

Across every age group boys, in comparison to girls, had more decayed, missing and filled deciduous teeth (Figure 18). However, after taking into account the number of teeth present, few differences remained between boys and girls up to the age of 8 years, and from the age of 9 years girls showed a higher dmft rate per 100 teeth than did boys.

Sex differences in caries experience of permanent teeth

At every age female children showed more clinically detectable decayed permanent teeth than age-matched male children (Figure 19). However, these differences were reduced considerably after controlling for the number of teeth present (using estimates of teeth present obtained from data from South Australia, Tasmania and the Australian Capital Territory), with only the 14-year-old age group showing any appreciable difference.

The mean number of missing teeth and the mean number of missing teeth per 100 teeth showed fairly erratic changes across age groups, and comparisons between males and females are therefore difficult (Figure 20).

The sex differences that existed in the mean number of filled teeth were not large; however, boys had more filled teeth than girls at most ages (Figure 21). After adjusting for the number of teeth present, boys still had slightly higher numbers of filled teeth but these differences were generally small except for ages 10 and 11 years. Trends in the number of decayed, missing and filled teeth (DMFT) were similar to that demonstrated in relation to filled teeth, with boys having slightly more caries experience than girls (Figure 22). Differences were again small after controlling for the number of teeth present.

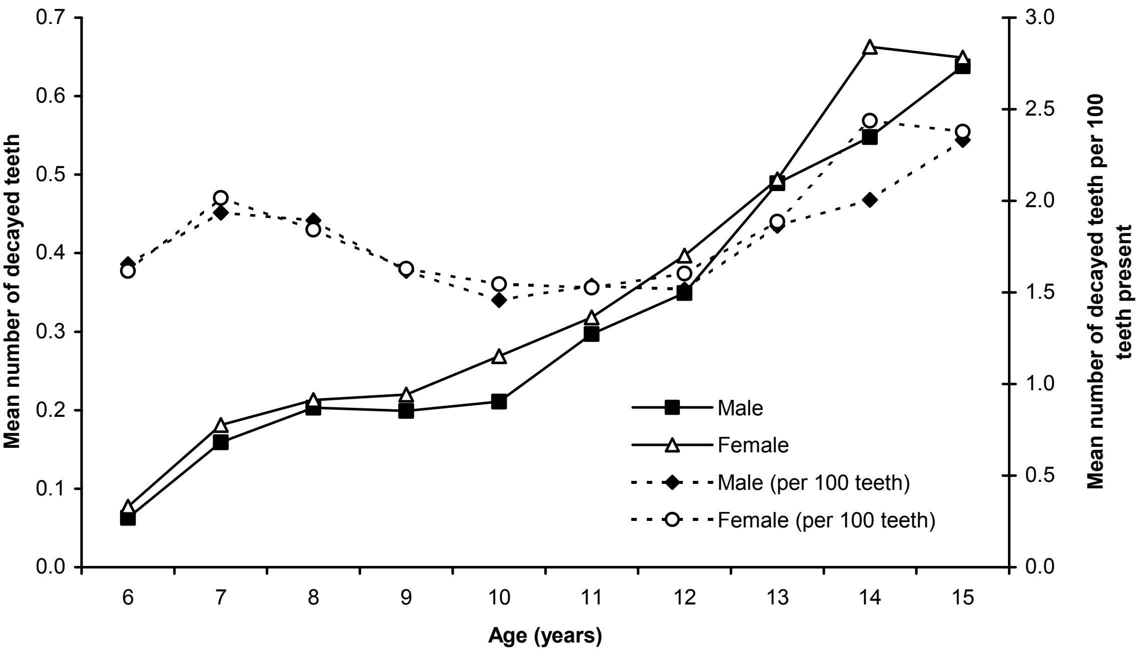


Figure 19: Mean decayed permanent teeth for 6–15-year-old male and female children in Australia, 2000

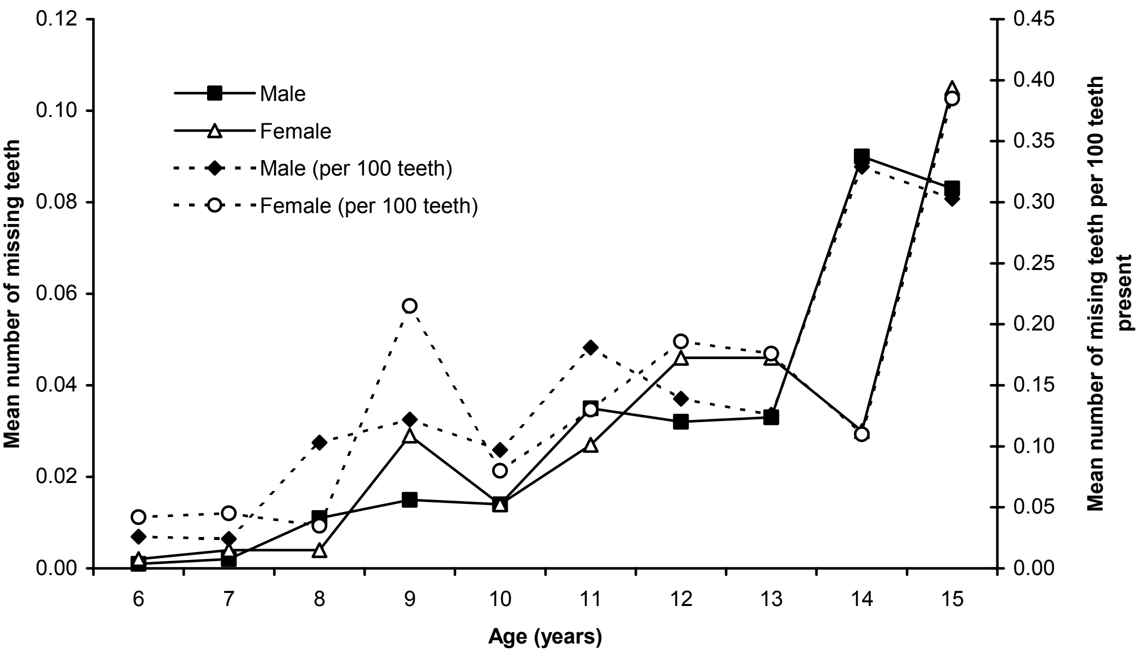


Figure 20: Mean missing permanent teeth for 6–15-year-old male and female children in Australia, 2000

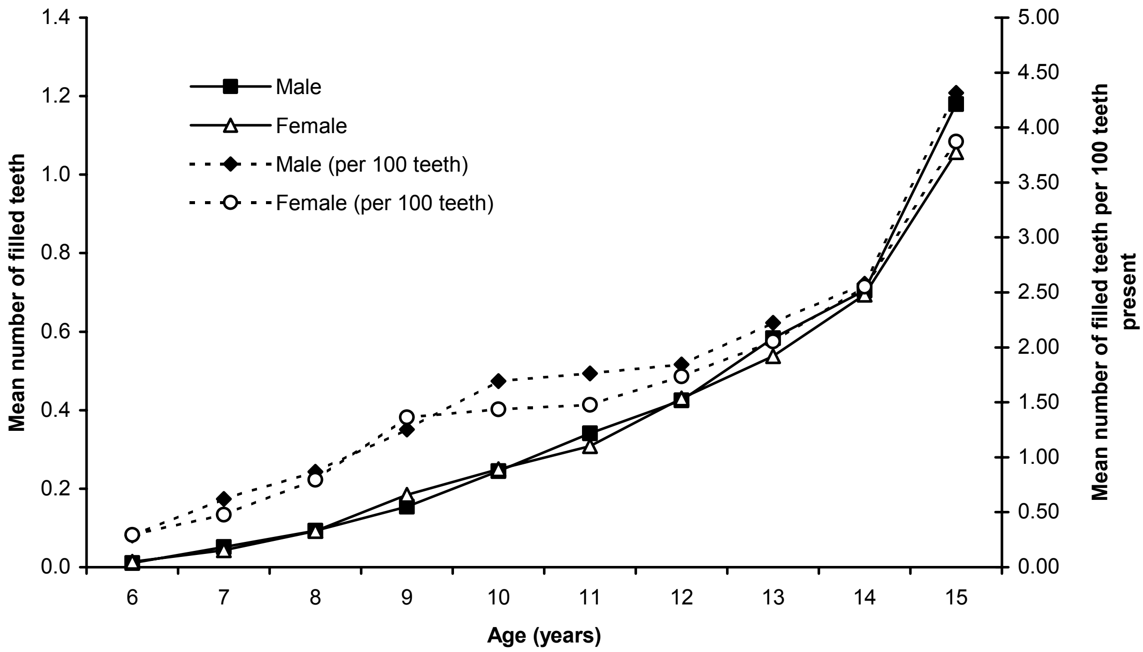


Figure 21: Mean filled permanent teeth for 6–15-year-old male and female children in Australia, 2000

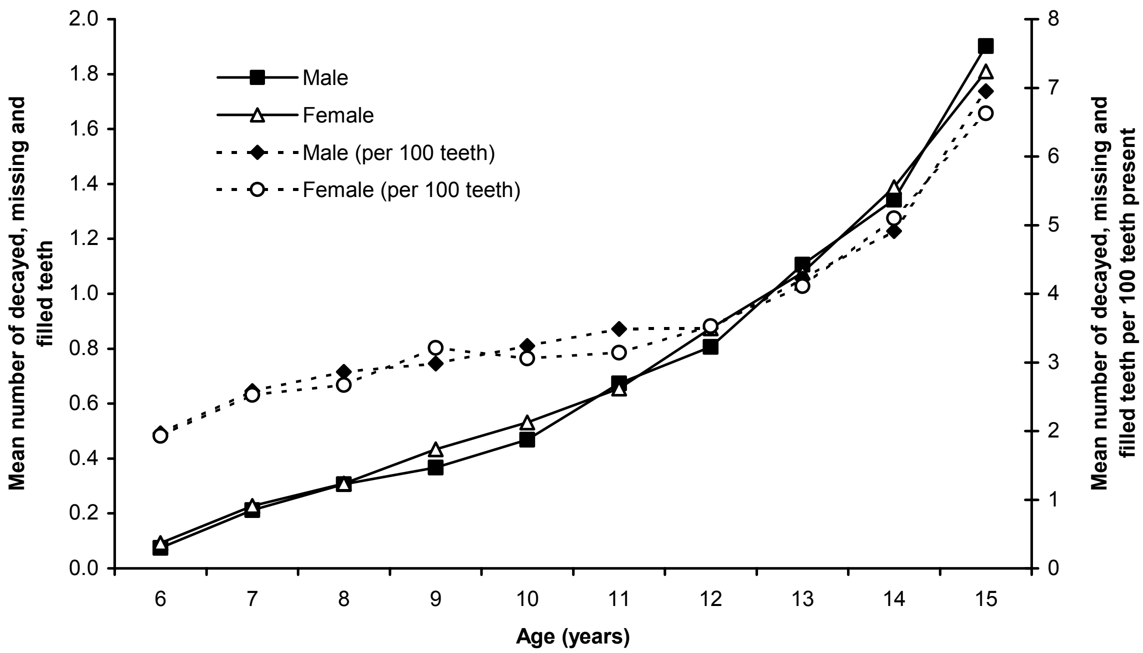


Figure 22: Mean decayed, missing and filled permanent teeth for 6–15-year-old male and female children in Australia, 2000

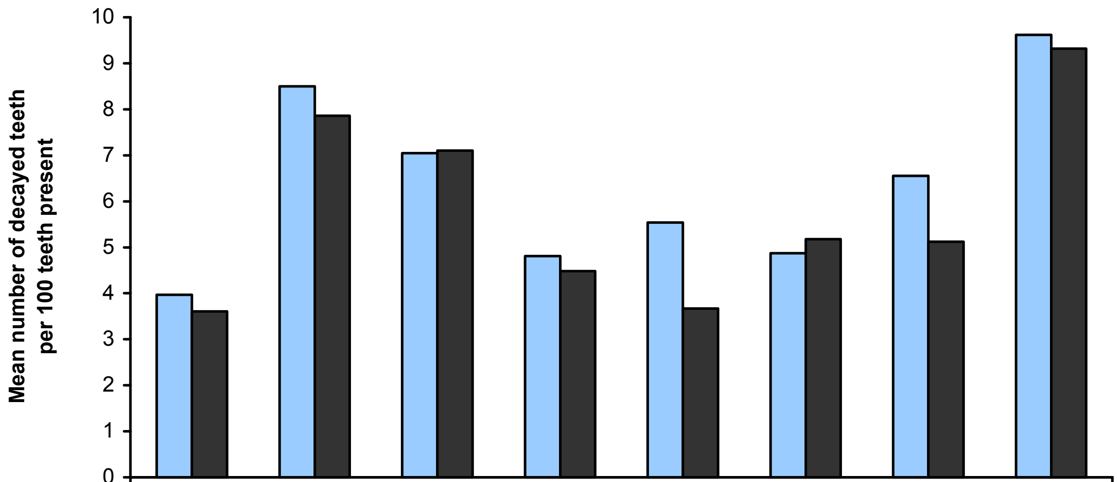
Sex differences in caries experience among states and territories

Figures 23–26 show 6-year-old deciduous caries experience for male and female children by state and territory. Boys had more clinically detectable decay than girls in all regions except Queensland and Tasmania, where girls had 0.7% and 6.4% more decay, respectively (Figure 23). Among those states and territories where boys had more decay than girls, South Australia and the Australian Capital Territory had larger differences (50.9% and 27.9% more, respectively) than the other regions.

Male children had more missing deciduous teeth than female children across all states and territories except Queensland (Figure 24). The differences were greatest in the Northern Territory, Victoria and Tasmania. In South Australia and the Australian Capital Territory no 6-year-old girls were reported as having any teeth missing due to caries in 2000.

Differences in filled teeth per 100 teeth present were less extreme (Figure 25), girls having more filled teeth than boys in New South Wales (3.9% higher), Queensland (12.2% higher) and South Australia (18.4% higher). In the other states and territories, the biggest difference between boys and girls occurred in the Australian Capital Territory (12.1% more filled teeth per 100 teeth present in boys than in girls).

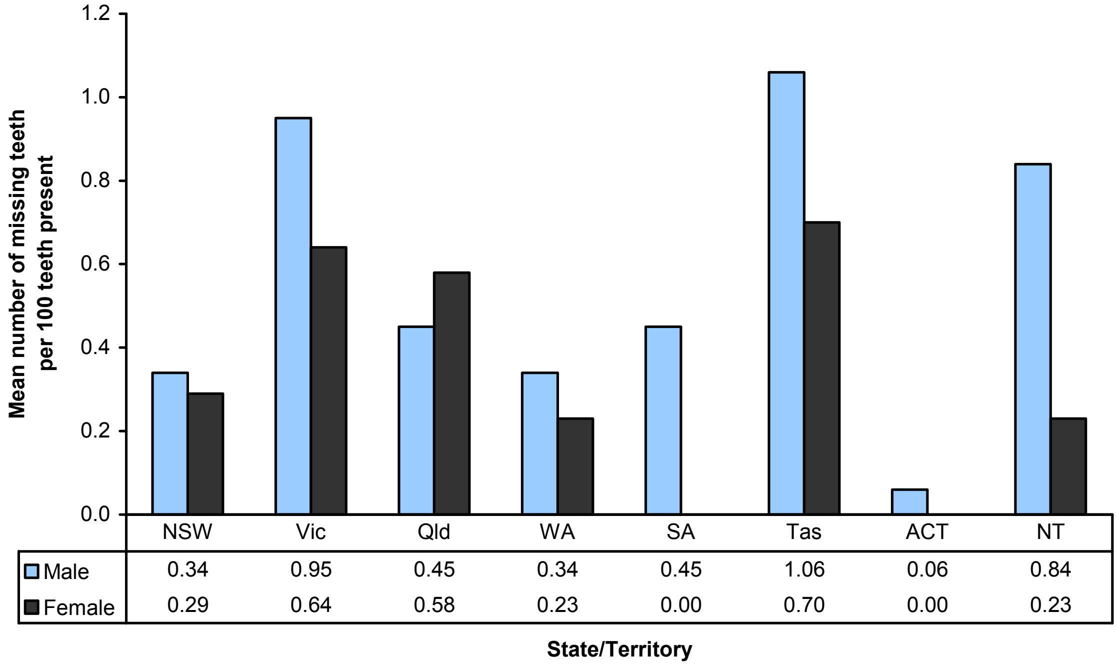
The mean number of decayed, missing and filled teeth (dmft) per 100 teeth present (using estimates of teeth present obtained from data from South Australia, Tasmania and the Australian Capital Territory) was greater for boys than girls in every state or territory except Queensland (Figure 26). The largest difference occurred in the Australian Capital Territory (21.5% difference).



	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Male	3.97	8.50	7.05	4.81	5.54	4.87	6.55	9.62
Female	3.61	7.86	7.10	4.48	3.67	5.18	5.12	9.32

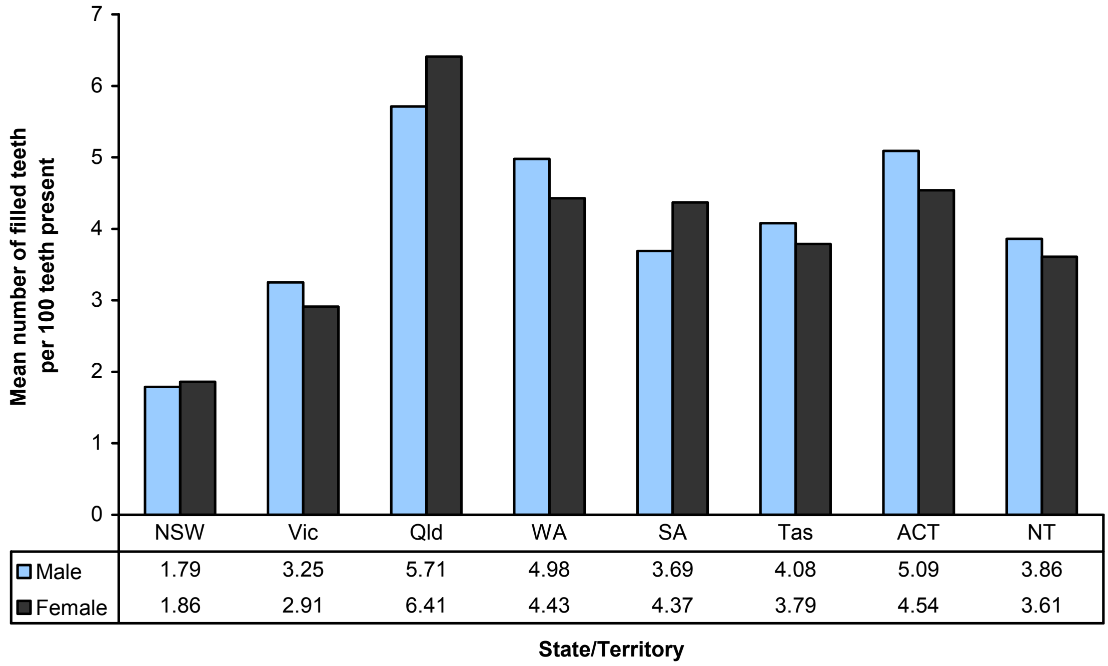
State/Territory

Figure 23: Mean decayed deciduous teeth per 100 teeth present for 6-year-old male and female children in Australia by state and territory, 2000



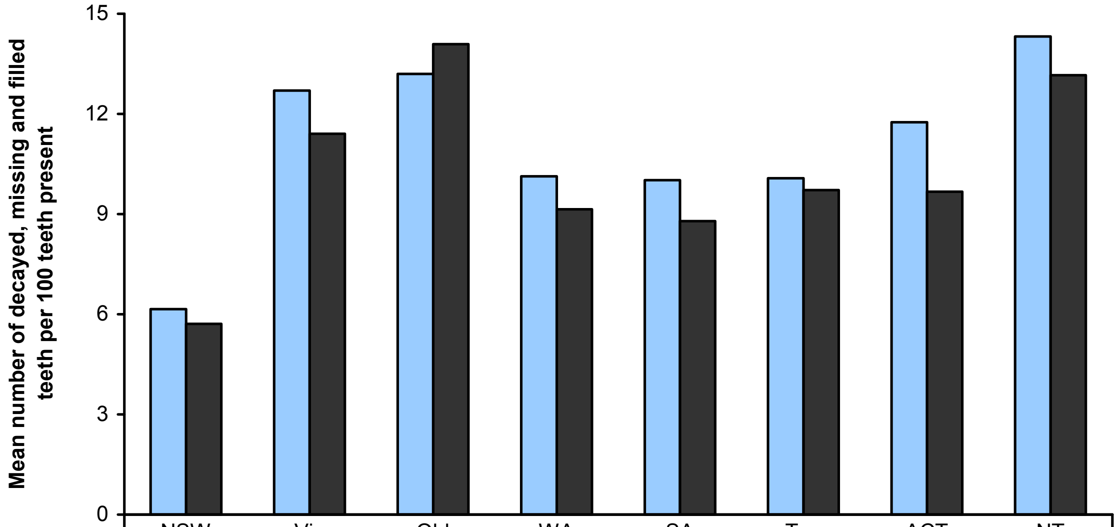
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Male	0.34	0.95	0.45	0.34	0.45	1.06	0.06	0.84
Female	0.29	0.64	0.58	0.23	0.00	0.70	0.00	0.23

Figure 24: Mean missing deciduous teeth per 100 teeth present for 6-year-old male and female children in Australia by state and territory, 2000



	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Male	1.79	3.25	5.71	4.98	3.69	4.08	5.09	3.86
Female	1.86	2.91	6.41	4.43	4.37	3.79	4.54	3.61

Figure 25: Mean filled deciduous teeth per 100 teeth present for 6-year-old male and female children in Australia by state and territory, 2000



	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Male	6.15	12.70	13.20	10.13	10.02	10.07	11.75	14.32
Female	5.71	11.41	14.09	9.14	8.79	9.72	9.67	13.16

State/Territory

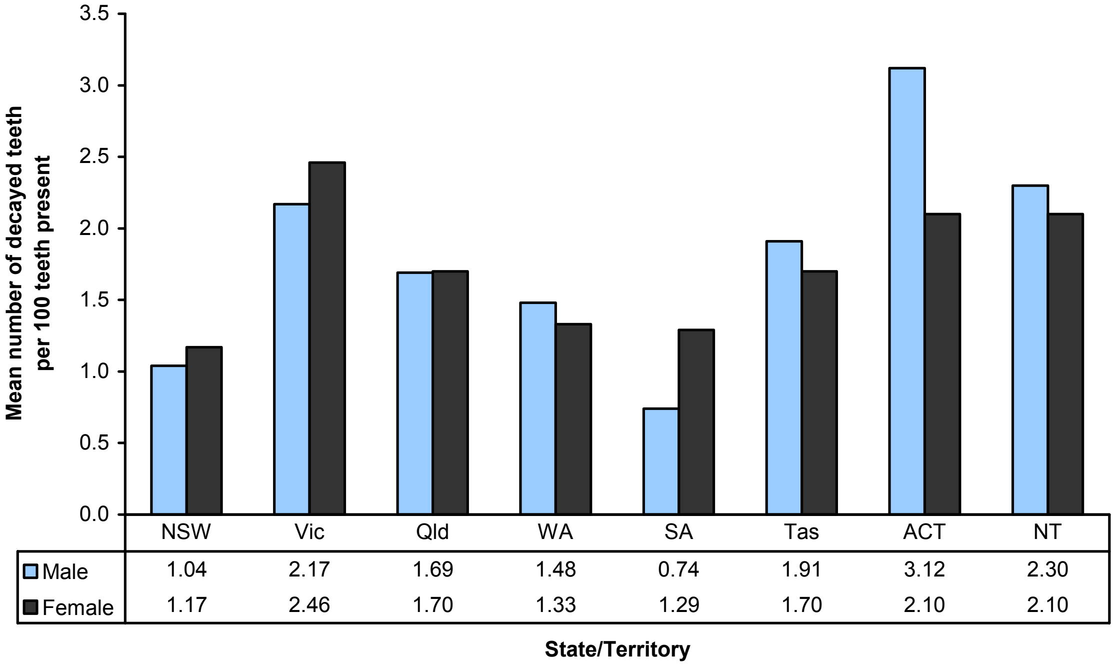
Figure 26: Mean decayed, missing and filled deciduous teeth per 100 teeth present for 6-year-old male and female children in Australia by state and territory, 2000

In the permanent dentition of 12-year-old boys and girls, boys had more decayed teeth per 100 teeth in Western Australia, Tasmania, the Australian Capital Territory and the Northern Territory, while girls had more decayed teeth in New South Wales, Victoria, Queensland and South Australia (Figure 27). The largest differences occurred in South Australia (females had 74.3% more decayed teeth) and the Australian Capital Territory (boys had 48.6% more decayed teeth).

In contrast to the deciduous dentition, 12-year-old girls had more missing permanent teeth than did boys (Figure 28). In some instances this difference was appreciable, e.g. in Queensland (477.8%), Tasmania (333.3%), the Australian Capital Territory (1033.3%) and the Northern Territory (110.0%). Only in Western Australia did boys have more missing teeth than girls.

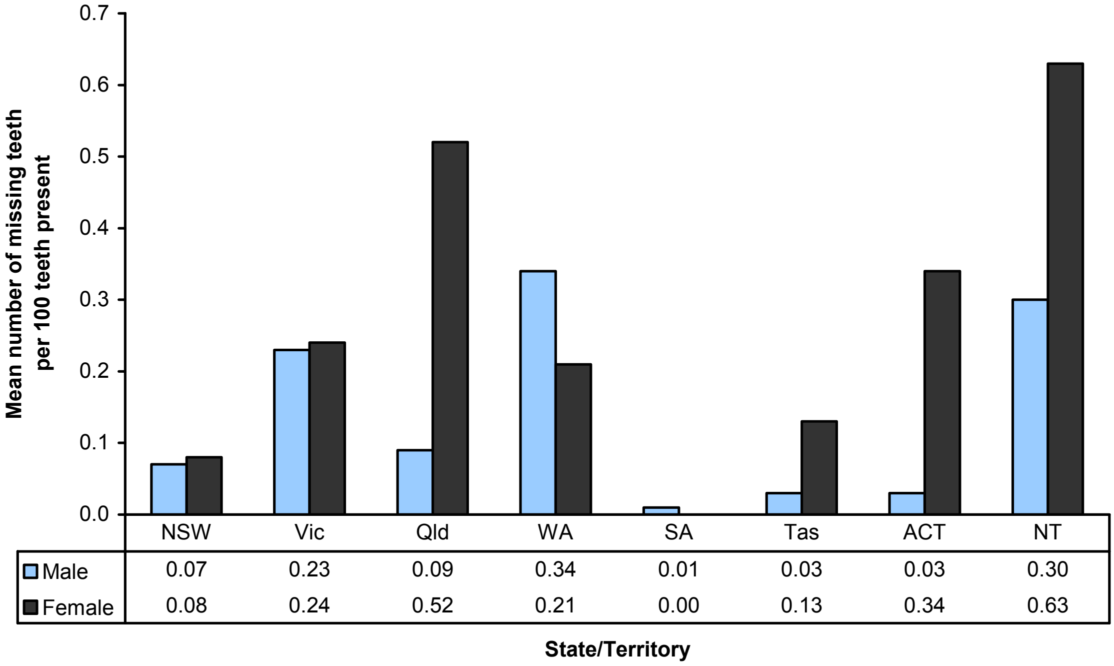
Filled teeth in the permanent dentition were more frequent for girls than boys in five of the eight states and territories, with boys having more filled teeth per 100 teeth in Victoria, Queensland and the Australian Capital Territory (Figure 29). There was a large difference between girls and boys in the ACT, with boys having more than twice the number of filled teeth than girls. Differences were not as extreme in the other states and territories.

The pattern for DMFT per 100 teeth (Figure 30) was similar to that for filled teeth. For all states and territories except Queensland, Western Australia and the Australian Capital Territory, 12-year-old female children had more decayed, missing and filled permanent teeth. Again, the Australian Capital Territory had the largest difference and this was driven by the result for filled teeth per 100 teeth present.



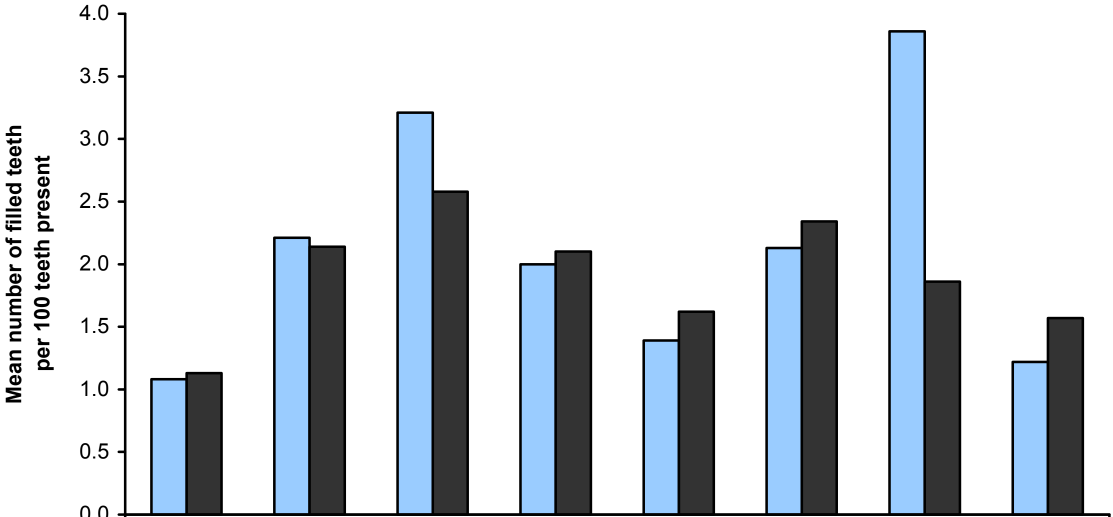
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Male	1.04	2.17	1.69	1.48	0.74	1.91	3.12	2.30
Female	1.17	2.46	1.70	1.33	1.29	1.70	2.10	2.10

Figure 27: Mean decayed permanent teeth per 100 teeth present for 12-year-old male and female children in Australia by state and territory, 2000



	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Male	0.07	0.23	0.09	0.34	0.01	0.03	0.03	0.30
Female	0.08	0.24	0.52	0.21	0.00	0.13	0.34	0.63

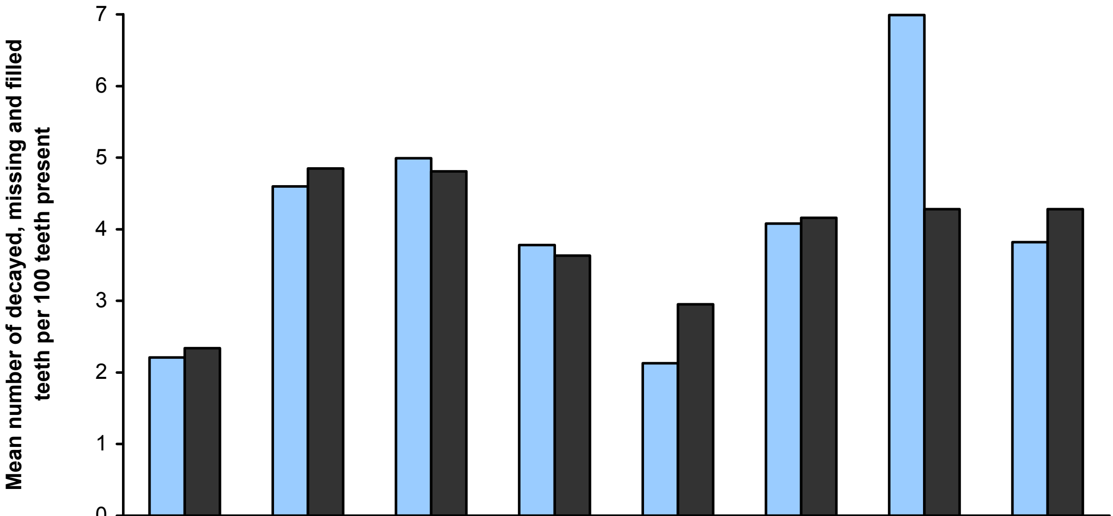
Figure 28: Mean missing permanent teeth per 100 teeth present for 12-year-old male and female children in Australia by state and territory, 2000



	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Male	1.08	2.21	3.21	2.00	1.39	2.13	3.86	1.22
Female	1.13	2.14	2.58	2.10	1.62	2.34	1.86	1.57

State/Territory

Figure 29: Mean filled permanent teeth per 100 teeth present for 12-year-old male and female children in Australia by state and territory, 2000



	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Male	2.21	4.60	4.99	3.78	2.13	4.08	6.99	3.82
Female	2.34	4.85	4.81	3.63	2.95	4.16	4.28	4.28

State/Territory

Figure 30: Mean decayed, missing and filled permanent teeth per 100 teeth present for 12-year-old male and female children in Australia by state and territory, 2000

Sex differences in Significant Caries Index (SiC)

The Significant Caries Index (SiC) was developed to highlight those people within the population who have the most caries experience (Bratthal 2000; Nishi et al. 2001). The SiC Index is the mean dmft of the 30% of the population with the highest caries scores.

In the deciduous dentition, boys at every age group had a higher SiC score than did girls (Figure 31). This difference was largest for 6- and 8-year-old children (differences of 11.5% and 7.9% respectively) and least for 9-year-old boys and girls, where the difference between the sexes was negligible. Boys had between 0.01 and 0.50 more dmft units than age-matched female children.

In the permanent dentition, female children had a higher SiC score than did male children for all age groups except 11-, 13-, and 15-year-olds (Figure 32). Among children up to and including 10 years of age, girls had between 2.2% (8-year-olds) and 18.2% (9-year-olds) higher SiC scores than boys. The biggest absolute difference, however, was for 15-year-olds where boys in comparison to girls had 0.40 more DMFT units.

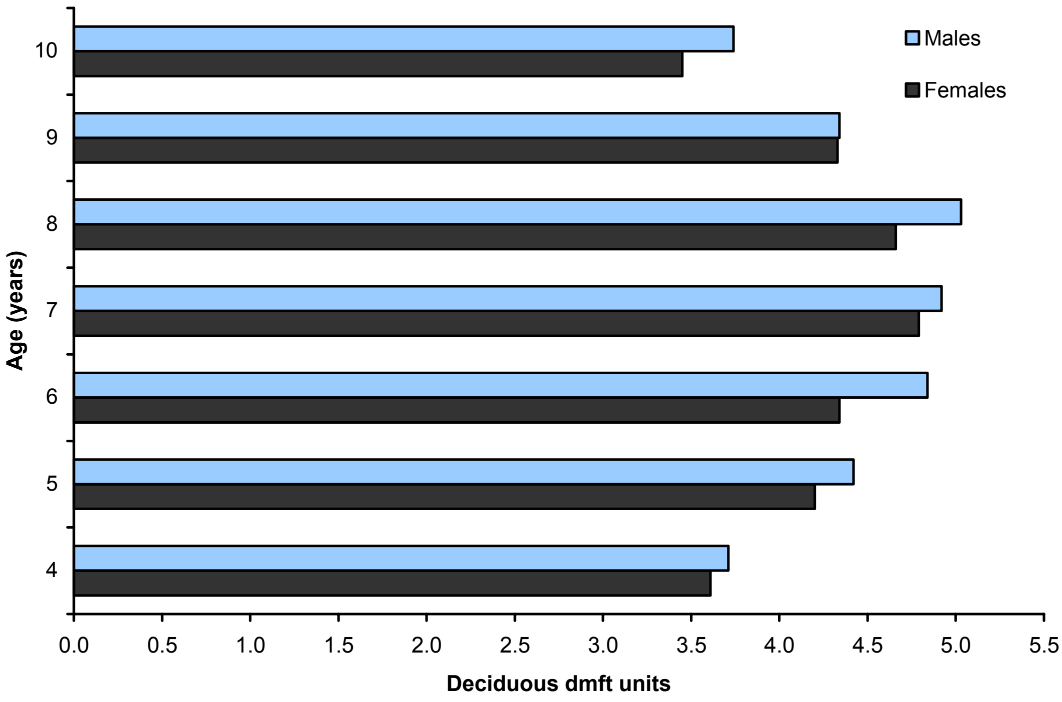


Figure 31: Significant Caries Index (SiC) of 4–10-year-old children in Australia, 2000

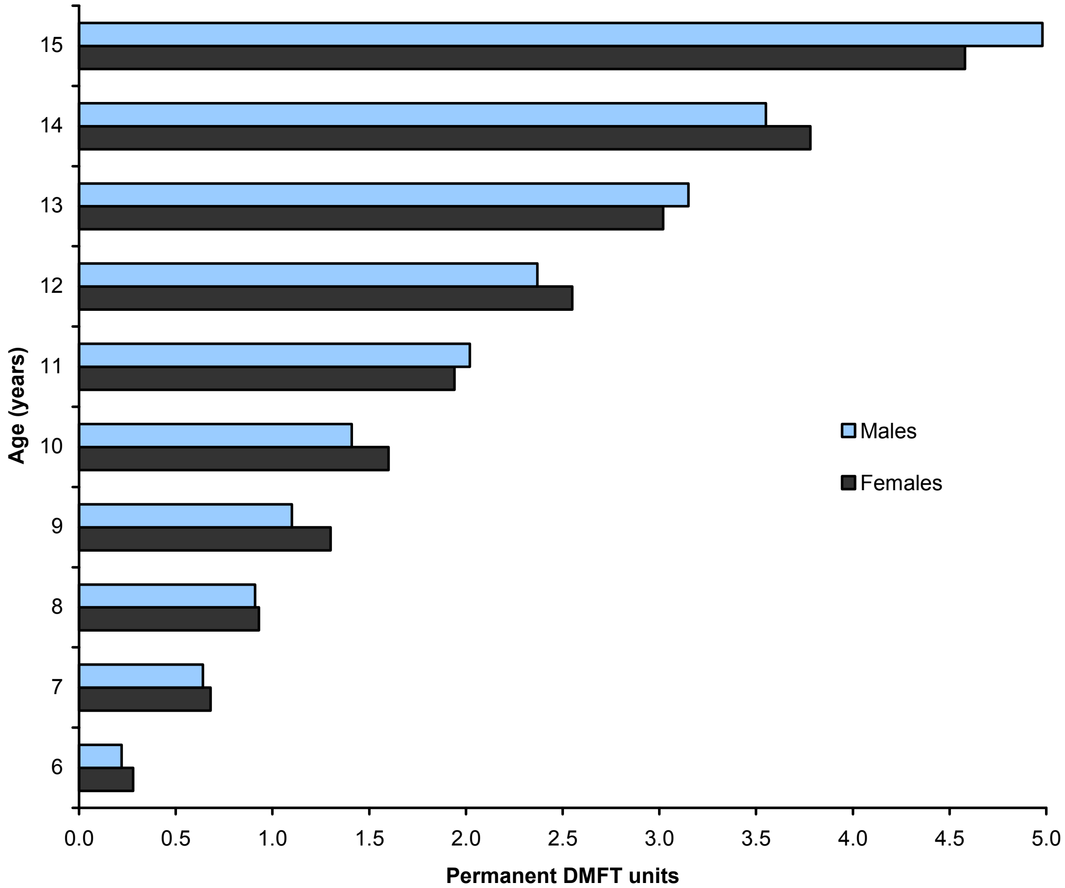
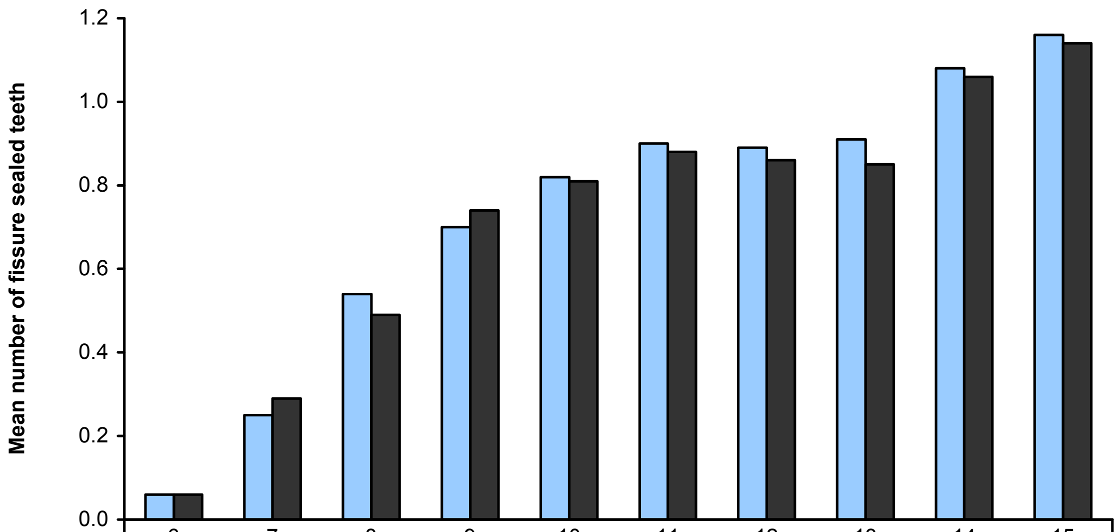


Figure 32: Significant Caries Index (SiC) of 6–15-year-old children in Australia, 2000

Sex differences in fissure sealed teeth

There was little difference in the mean number of fissure sealed teeth between boys and girls (Figure 33). However, from the age of 10 years, boys had slightly more fissure sealants than did girls at every age group. The differences ranged from 0.01 fissure sealed teeth at age 10 years to 0.06 fissure sealed teeth at age 13 years.

Figure 34 shows the percentage of children with fissure sealants among those with no decayed, missing and filled teeth (DMFT = 0) and among those with one or more decayed, missing and filled teeth (DMFT = 1+). Up to age 12 years little difference is evident between male and female children. However, from the age of 13 years, a higher percentage of boys than girls with no caries experience in their permanent dentition have fissure sealants. Similarly, among children with some caries experience, a higher percentage of males have fissure sealants than do females.



	6	7	8	9	10	11	12	13	14	15
Male	0.06	0.25	0.54	0.70	0.82	0.90	0.89	0.91	1.08	1.16
Female	0.06	0.29	0.49	0.74	0.81	0.88	0.86	0.85	1.06	1.14

Age (years)

Figure 33: Mean number of fissure sealed permanent teeth for 6–15-year-old male and female children in Australia, 2000

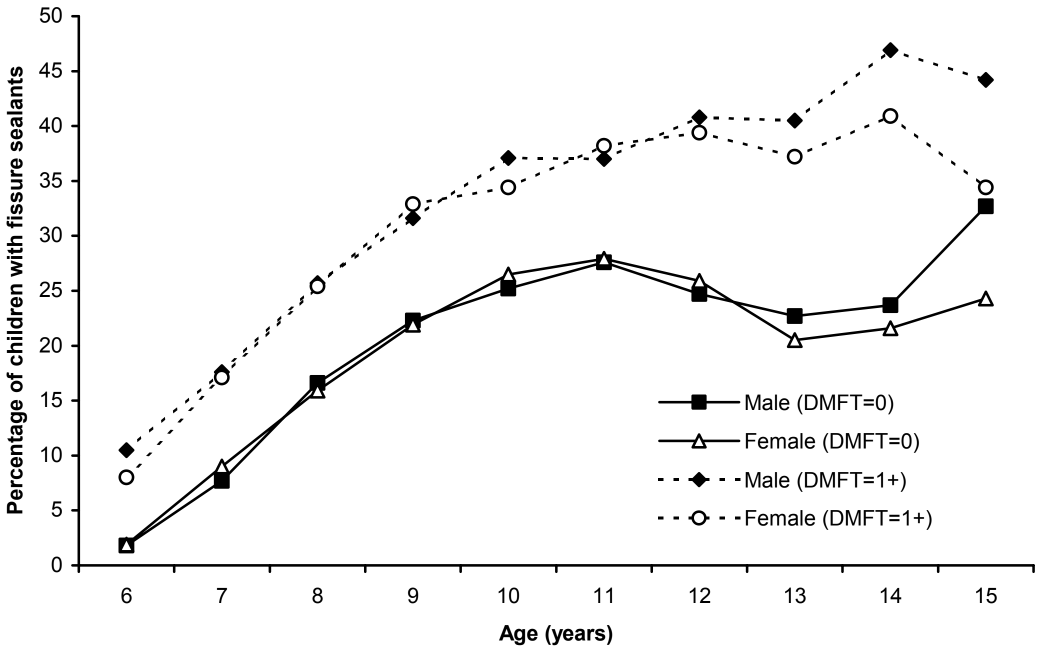


Figure 34: Percentage of 6–15-year-old male and female children with fissure sealants by caries experience in Australia, 2000

Sex differences in caries experience between children in metropolitan areas and those in rural and remote areas

Using the Rural, Remote and Metropolitan Areas classification (DPIE & DHSH 1994), children were categorised as living either in metropolitan areas or in rural or remote areas. In metropolitan areas the mean number of decayed, missing and filled teeth per 100 teeth present in the deciduous dentition was higher for boys than for girls across the age range 4–7 years but higher for girls than for boys among the older age groups (Figure 35). In rural and remote areas, although there was some variation, girls had more decayed, missing and filled teeth per 100 teeth present (using estimates of teeth present obtained from data from South Australia, Tasmania and the Australian Capital Territory) than did boys across most ages groups.

In the permanent dentition few differences existed between boys and girls in either the metropolitan or rural/remote areas, with any differences tending to be small (Figure 36). However, in metropolitan areas, male children had slightly more decayed, missing and filled teeth per 100 teeth present across most age groups than did girls. Only 9- and 13-year-old girls had more decayed, missing and filled teeth per 100 teeth present than age-matched boys. In rural and remote areas, the trend was less obvious, with the direction of sex differences varying from age group to age group. Overall, little difference in caries experience existed between boys and girls in rural and remote areas after controlling for the number of teeth present.

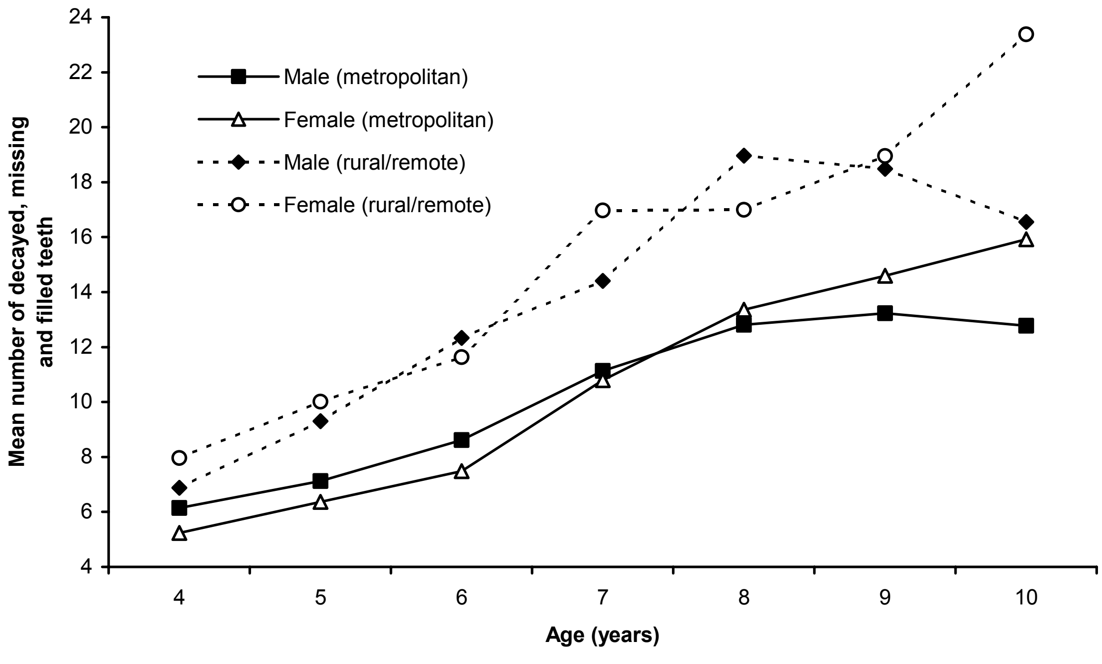


Figure 35: Mean decayed, missing and filled deciduous teeth per 100 teeth present for 4–10-year-old male and female children by residential location in Australia, 2000

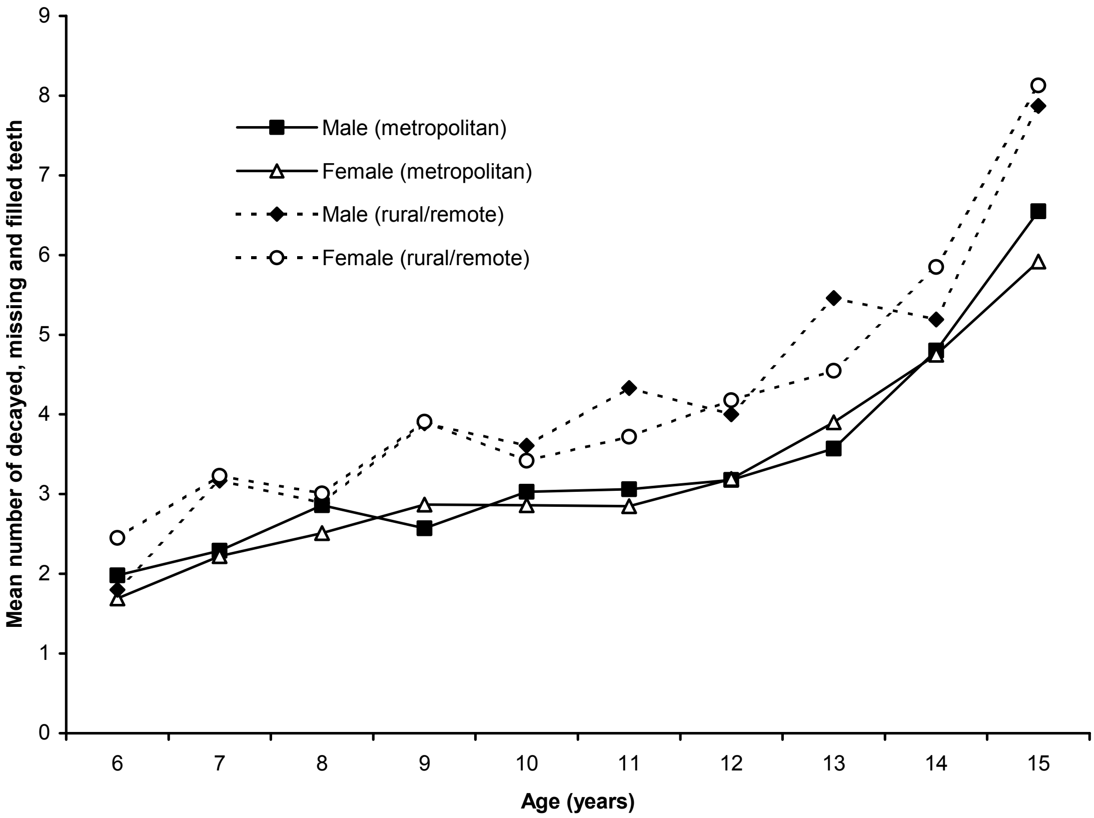


Figure 36: Mean decayed, missing and filled permanent teeth per 100 teeth present for 6–15-year-old male and female children by residential location in Australia, 2000

Sex differences: summary of findings

- At any given age, boys had more deciduous teeth present and girls had more permanent teeth present.
- Boys had more deciduous untreated decay than did girls but, after controlling for the number of teeth present, and although boys aged 4–6 still had more decayed teeth, girls aged 9 and 10 had more fillings and a higher dmft than boys of the same age.
- Girls had more decayed permanent teeth, although differences were small after controlling for the number of teeth present. Boys had more fillings and a higher DMFT index than girls (although the difference in DMFT was small).
- Sex differences varied somewhat among states and territories; however, the low numbers of children sampled in individual age groups means that comparisons for several jurisdictions may not be statistically reliable.
- At any given age, boys had a higher Significant Caries Index (SiC) in their deciduous teeth than girls. The SiC score was higher for girls of most age groups in the permanent dentition.

- There were few sex differences in the number of fissure sealants although a higher percentage of boys than girls between the ages of 13 and 15 years had at least one sealant.
- Girls had higher dmft in metropolitan and rural/remote areas in the deciduous dentition than did boys, although boys aged up to 7 years had more caries experience in metropolitan areas.
- Males in metropolitan areas had more decayed, missing and filled permanent teeth than did girls. There was little sex difference in rural and remote areas.

International comparisons

Children's oral health has improved in most developed countries and many developing countries over the last quarter of a century. A comparison of 12-year-old DMFT scores from 49 countries and 17 of the 30 OECD nations is presented in Table 12. For comparative purposes, only countries with DMFT data within two years of that presented for Australia have been included. The table shows that Australia has the fourth-lowest 12-year-old DMFT score, with only Belize, The Netherlands and Luxembourg reported as having lower scores. Of those countries with available data, Australia has the second lowest percentage of 12-year-old children with caries experience. It should be noted, though, that Netherlands figures are based only on children from the capital, The Hague.

Table 12: DMFT scores and percentage with caries for 12-year-old children by country

Country	Year	DMFT	Rank	% affected	Rank
Belize	1999	0.6	1	n.a.	. .
Netherlands * [(a)]	1998	0.6	1	30.0	1
Luxembourg *	1998	0.7	3	n.a.	. .
Australia *	**2000**	**0.8**	**4**	**35.1**	**2**
Hong Kong	2001	0.8	4	37.8	3
England (incl. Wales) *	2000/01	0.9	5	37.9	4
Pakistan	1999	0.9	5	n.a.	. .
Bangladesh	2000	1.0	8	46.4	7
Haiti	2000	1.0	8	n.a.	. .
Singapore	2002	1.0	8	n.a.	. .
Sweden *	2000	1.0	8	39.0	5
Denmark *	2001	1.2	12	39.6	6
Finland *	2000	1.2	12	65.0	17
Germany *	2000	1.2	12	n.a.	. .
Cuba	1998	1.4	15	50.0	8
El Salvador	2000	1.4	15	n.a.	. .
Fiji	1998	1.5	17	60.0	15
Norway *	2000	1.5	17	52.0	10
Bahamas	2000	1.6	19	n.a.	. .
Belgium *	1998	1.6	19	50.0	8
Thailand	2000	1.6	19	57.3	13
Israel	2002	1.7	22	53.9	12
Slovenia	1998	1.8	23	59.9	14
France *	1998	1.9	24	61.0	16
Grenada	2000	2.2	25	n.a.	. .
Costa Rica	1999	2.3	26	n.a.	. .
Syria	1998	2.3	27	n.a.	. .
Japan *	1999	2.4	28	n.a.	. .
Morocco	1999	2.5	29	72.0	18

(continued)

Table 12 (continued): DMFT scores and percentage with caries for 12-year-old children by country

Country	Year	DMFT	Rank	% Affected	Rank
Uruguay	1999	2.5	29	72.5	19
Belarus	2000	2.7	31	n.a.	. .
Estonia	1998	2.7	31	76.0	21
Greece *	1998	2.7	31	n.a.	. .
Macao	2001	2.7	31	75.4	20
Albania	2000	3.0	35	n.a.	. .
Macedonia	1999	3.0	35	95.2	30
Portugal *	2000	3.0	35	53.0	11
Tonga	1998	3.1	38	77.5	22
Czech Republic *	1998	3.4	39	86.0	25
Croatia	1999	3.5	40	85.1	24
Paraguay	1999	3.8	41	n.a.	. .
Poland *	2000	3.8	41	88.0	27
Latvia	2000	3.9	43	n.a.	. .
Gabon	2000	4.0	44	n.a.	. .
Slovak Republic *	1998	4.3	45	88.0	27
Bulgaria	2000	4.4	46	80.0	23
Philippines	1998	4.6	47	91.7	29
Brunei Darussalam	1999	4.8	48	87.1	26
Trinidad & Tobago	1998	5.2	49	n.a.	. .
Romania	1998	7.3	50	96.0	31

* Member of the Organization for Economic Co-operation and Development (OECD).

(a) Includes only children from The Hague.

Sources: World Health Organization (WHO) Oral Health Country/Area Profile Programme. OECD health data 2000: a comparative analysis of 29 countries.

References

Australian Bureau of Statistics (ABS) 2000. Population by age and sex: Australian States and Territories, June 2000. Cat. No. 3201.0. Canberra: ABS.

Bratthal 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 50:378–384.

Department of Primary Industries and Energy & Department of Human Services and Health (DPIE & DHSH) 1994. Rural, remote and metropolitan areas classification. 1991 Census edition. Canberra: AGPS.

Foreman EK 1991. Survey sampling principles. New York: M Dekker.

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

Mansbridge JN 1959. Sex differences in the prevalence of dental caries. British Dental Journal 106:303–308.

Nishi M, Bratthal D & Stjernswärd J 2001. How to calculate the Significant Caries Index (SiC Index). WHO Collaborating Centre [online]. PDF Vers. 1.0 Viewed 6 March 2001 <http://www.whocollab.od.mah.se/expl/significant.pdf>.

New South Wales Health Department 2001. Review of the Save Our Kids Smiles (SOKS) Program. Volume II: Technical Reports.

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

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

Appendix A

The following tables (A1–A4) present national and state and territory results with adjustments for the estimated under-reporting of clinically detectable decayed teeth in New South Wales (see page 5). A weighting of 1.56 was used for calculations of decayed deciduous teeth and 1.68 for calculations of decayed permanent teeth in the New South Wales data.

Table A1: Deciduous dentition caries experience (adjusted for NSW), 2000

Age (years)	Children	Decayed (d)		dmft		d/dmft
	n	mean	SD	mean	SD	%
4	19,565	1.18	2.55	1.44	3.01	84.7
5	26,923	1.17	2.40	1.62	2.99	75.6
6	23,525	1.13	2.19	1.79	2.94	65.6
7	27,901	0.95	1.83	1.90	2.80	51.9
8	28,480	0.85	1.65	1.92	2.73	46.8
9	28,900	0.69	1.35	1.74	2.44	42.3
10	28,423	0.50	1.14	1.36	2.10	37.4
11	28,485	0.29	0.85	0.77	1.66	37.8
12	24,065	0.16	0.59	0.42	1.17	39.0

Table A2: Permanent dentition caries experience (adjusted for NSW), 2000

Age (years)	Children	Decayed (D)		DMFT		D/DMFT
	n	mean	SD	mean	SD	%
5	26,923	0.02	0.22	0.03	0.26	81.4
6	23,525	0.08	0.43	0.09	0.50	88.1
7	27,901	0.20	0.69	0.25	0.78	81.2
8	28,480	0.24	0.72	0.34	0.90	70.4
9	28,900	0.24	0.73	0.43	1.07	57.3
10	28,423	0.28	0.83	0.54	1.15	51.6
11	28,485	0.35	0.97	0.71	1.47	48.9
12	24,065	0.44	1.14	0.91	1.73	47.0
13	29,326	0.55	1.31	1.15	2.00	45.3
14	30,081	0.68	1.59	1.46	2.31	43.7
15	15,672	0.64	1.48	1.86	2.72	32.5

Table A3: Interstate comparison—5- to 6-year-old and 12-year-old caries experience (adjusted for NSW), 2000

State/ territory	5–6-year-old deciduous					12-year-old permanent				
	Children	Decayed (d)		dmft		Children	Decayed (D)		DMFT	
	n	mean	SD	mean	SD	*n*	mean	SD	mean	SD
NSW	17,911	1.06	2.44	1.36	2.75	8,755	0.45	1.34	0.73	1.65
Vic	12,987	1.39	2.40	1.99	3.15	6,351	0.55	1.12	1.11	1.80
Qld	8,110	1.28	2.29	2.12	3.22	2,628	0.40	0.93	1.17	1.86
WA	5,026	0.93	1.97	1.59	3.01	2,758	0.33	0.88	0.89	1.84
SA	3,618	0.76	1.60	1.46	2.47	2,050	0.24	0.62	0.60	1.13
Tas	1,285	0.94	1.88	1.53	2.62	727	0.43	0.99	0.98	1.45
ACT	823	1.13	1.90	1.83	2.99	478	0.63	1.60	1.39	2.52
NT	689	1.65	2.69	2.26	3.25	317	0.53	1.30	0.97	1.78
Australia	**50,448**	**1.15**	**2.30**	**1.70**	**2.97**	**24,065**	**0.44**	**1.14**	**0.91**	**1.73**

Table A4: National summary of caries experience of 5- to 12-year-old children (adjusted for NSW), 2000

State/ territory	Children	dmft		DMFT	
	n	mean	SD	mean	SD
NSW	71,411	1.06	2.22	0.33	1.06
Vic	51,824	1.74	2.69	0.49	1.11
Qld	45,051	1.92	2.81	0.49	1.18
WA	21,439	1.27	2.24	0.41	1.29
SA	15,284	1.20	2.07	0.25	0.73
Tas	5,489	1.33	2.15	0.49	1.08
ACT	3,504	1.37	2.22	0.53	1.27
NT	2,699	1.64	2.57	0.37	1.03
Australia	**216,701**	**1.45**	**2.49**	**0.41**	**1.11**