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FOR POPULATION ORAL HEALTH

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Abbreviations

d	deciduous decayed teeth
m	deciduous missing teeth
f	deciduous filled teeth
dmft	deciduous decayed, missing and filled teeth
D	permanent decayed teeth
M	permanent missing teeth
F	permanent filled teeth
DMFT	permanent decayed, missing and filled teeth
SD	standard deviation

Purpose of this report

Information listed in the tables of this report includes: the age and sex of children in the sample, their deciduous and permanent caries experience, frequency of fissure sealants, history of school dental service examinations, and regional statistics.

The report also provides selected trends, highlighting differences between the years 1997 and 2001. However, no formal hypothesis tests have been undertaken and descriptions of differences between years are intended as a guide to the reader rather than as a formal statistical evaluation.

Source of subjects and sampling

The data used for this report were collected during the 2001 calendar year from Western Australia School Dental Service patients by dental therapists and dentists. A random sampling procedure was used to select approximately 1 in 8 patients. This was achieved by selecting those children whose birthday was on the 28th, 29th, 30th or 31st day of any month. Consequently, the data constitute a simple random sample.

Data preparation

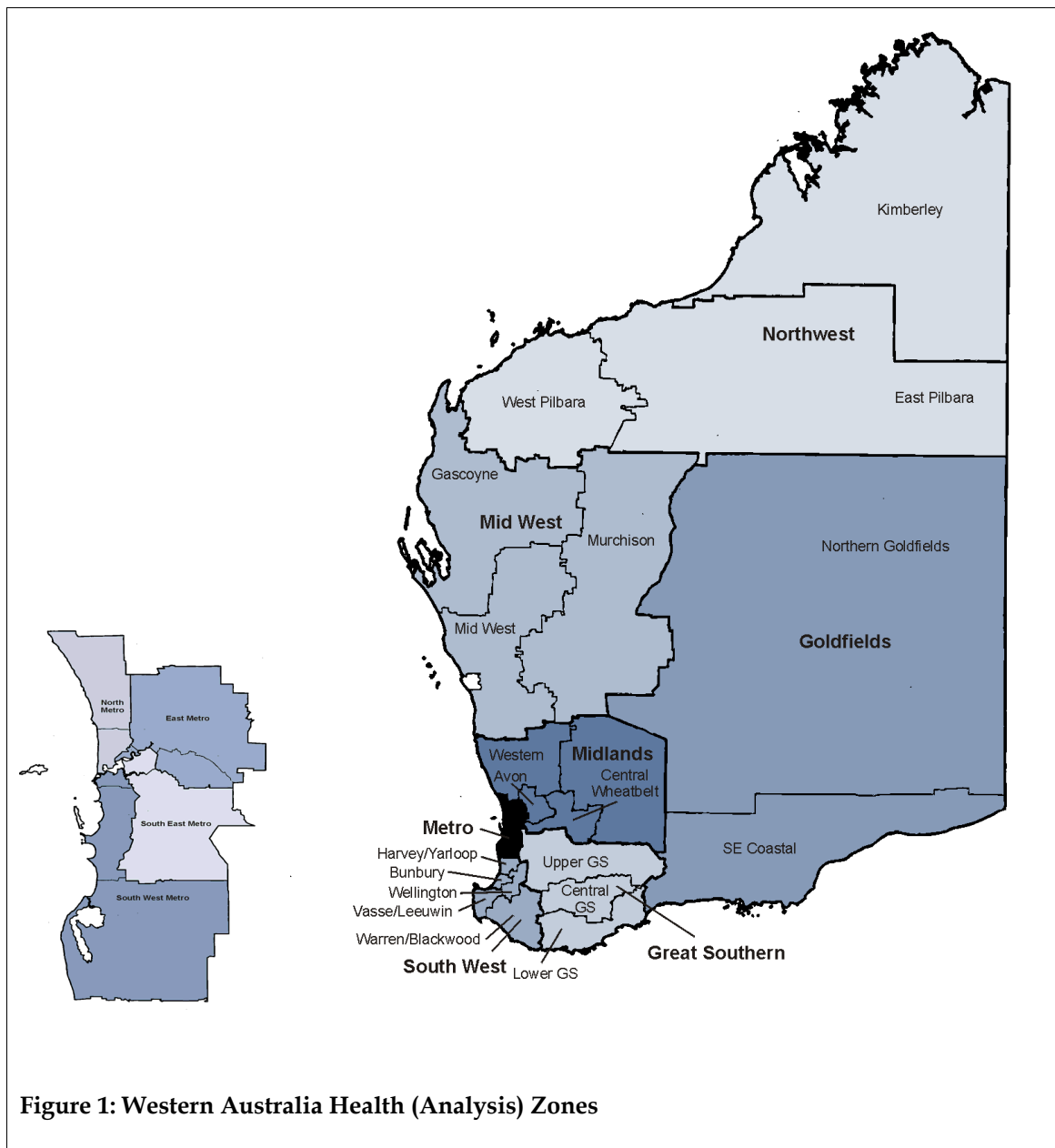
Data were collected on Optical Mark Reader (OMR) forms for scanning by Dental Services WA and then forwarded to the AIHW Dental Statistics and Research Unit (DSRU) for analysis.

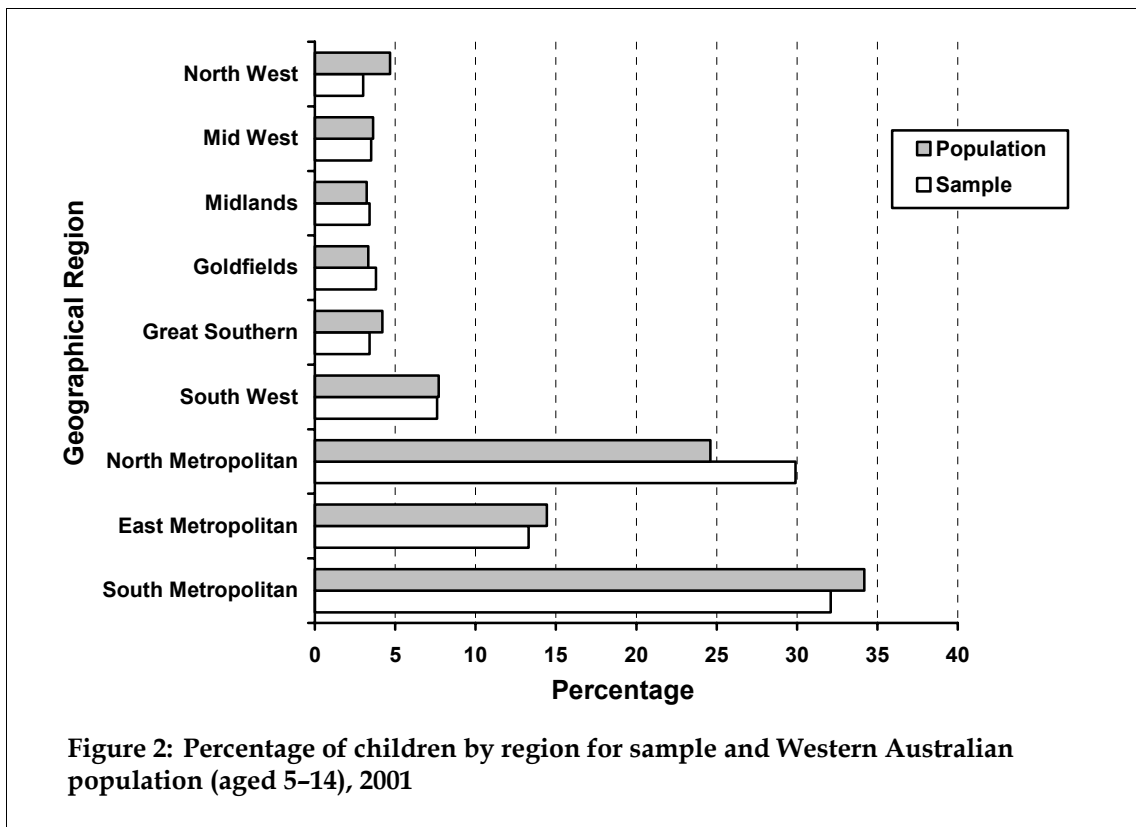
The data were cleaned prior to analysis, both before and after it was received by DSRU, to correct data recording errors. As a result, a small number of cases were deleted where it was apparent that they were the result of data recording errors.

Data analysis

All data were weighted for the analyses to more accurately reflect the child population (5–14 years old) in Western Australia for 2001. A map showing the Health (Analysis) Zones of Western Australia is presented in Figure 1. Although the Health Department of Western Australia incorporates 32 individual Health Service areas, larger subdivisions of Western Australia are used for routine analytical purposes, each comprising a number of Health Services. The regions used here include six from rural areas (North West, Mid West, Midlands, Goldfields, Great Southern and South West) and three from metropolitan Perth and surrounds (North Metropolitan, East Metropolitan, and South Metropolitan – for the purpose of this report South East and South West Metropolitan have been combined).

The data were first weighted by months since last visit (which was used due to the under-representation of students on longer recall schedules in the sample). Children with examinations 12 months previous or less were given the same weight as it was assumed that each of these children would be seen at least once per year. Unit records were further weighted to reflect the Estimated Residential Population (ERP) of 5-14-year-olds according to statistical units within Western Australia as at 30 June 2001 as published by the Australian Bureau of Statistics (2001). Weighting was not carried out by individual age groups within each region or by sex of the child. Statistical units were mapped to the Health Zones as shown in Figure 1. Assignment of Health Zones to all unit records was based on the location of the clinic to which a child attended.





The relative sample sizes and population estimates by Health Zone as a percentage of the total sample and of the Western Australian 5-14-year-old population are shown in Figure 2. In regions where there were a greater percentage of children in the population (grey bars) than in the sample (white bars), weights greater than 1.0 were generated for each sampled child. Table 1 shows that, as a result of weighting, the North West, Mid West, Great Southern, South West, East Metropolitan and South Metropolitan zones were weighted up in the analysis (mean weights = 1.54, 1.03, 1.23, 1.02, 1.08 and 1.07 respectively) while Midlands, Goldfields, and North Metropolitan zones were weighted down (mean weights = 0.96, 0.87 and 0.82 respectively). The final unit record weights were applied such that the weighted contribution of each Health (Analysis) Zone was proportional to the percentage represented by that Health Zone in the Western Australian population.

The purpose of the weighting protocol was to produce estimates that are representative of those of the population covered by the School Dental Service for 2001. However, the estimates in this report cannot be applied to children who are not enrolled in the WA School Dental Service. Consequently, the results in this report do not represent the complete WA child population, but only that portion of the population that is enrolled in the WA School Dental Service. In Western Australia, approximately 85% and 70% of 5-12-year-olds and 13-16-year-olds respectively are enrolled in the School Dental Service, and hence estimates in this report may not differ substantially from estimates that would be obtained if all children in the State were surveyed.

Table 1: Sample size and assigned weight by Health Zone

Region	Number Sampled	Weight
North West	484	1.54
Mid West	564	1.03
Midlands	539	0.96
Goldfields	610	0.87
Great Southern	546	1.23
South West	1,215	1.02
North Metropolitan	4,784	0.82
East Metropolitan	2,132	1.08
South Metropolitan	5,131	1.07

It should be noted that all analyses up to and including Table 10 use the weighted distribution of children to derive results. However, months since last visit was not used to weight the data in Tables 9 and 10 because the results included time since last visit. Weighted numbers are rounded to the nearest whole number for ease of interpretation. No weighting is applied to the regional analyses in Tables 11 and 12.

Age-specific indices denoted with an asterisk (*) are those in which the relative standard error exceeds 40% and population estimates of these indices are considered to be statistically unreliable and should be interpreted with due care.

Demographic composition of the sample

The majority of children in the sample (77.9%) were aged between 5 and 12 years inclusive, with between 1,300 and 1,700 children in each individual age group within this range (see Table 2). However, children aged between 13 and 15 years were represented in substantial numbers. There was some variation in the proportions of females and males in a number of the age groups.

Because of the very small numbers of children aged 17 years sampled, these children have been included in the adjacent age group for the purpose of analyses in this report.

Table 2: Demographic composition of the sample

Age (years)	Children in sample (unweighted)			Children in sample (weighted)		
	Males	Females	Persons	Males	Females	Persons
	<i>n</i>	<i>n</i>	<i>n</i>	<i>n</i>	<i>n</i>	<i>n</i>
5	754	728	1,482	714	697	1,411
6	822	773	1,595	793	747	1,540
7	878	803	1,681	865	801	1,665
8	829	800	1,629	838	790	1,628
9	822	838	1,660	840	830	1,670
10	812	746	1,558	823	744	1,567
11	832	775	1,607	828	778	1,606
12	706	673	1,379	714	670	1,384
13	621	572	1,193	641	593	1,234
14	497	509	1,006	518	530	1,048
15	424	382	806	443	403	847
16	197	199	396	198	193	391
17	6	7	13	7	8	15
Total	8,200	7,805	16,005	8,222	7,783	16,005

Deciduous teeth

The mean number of clinically detectable decayed teeth among children aged 5 to 12 years old declined steadily with age, from 1.09 to 0.19 (see Table 3). In contrast, the mean number of filled teeth climbed to a peak for 9-year-olds of 1.11 before declining. In a similar trend, mean dmft increased from 1.44 for the youngest children to 1.72 for 7-year-old children before declining. These findings must be interpreted in view of the exfoliation of deciduous teeth as children grow older. From the age of 10 onwards increasingly higher proportions of children have no deciduous dentition. The number of teeth deemed missing due to caries was low for all age groups.

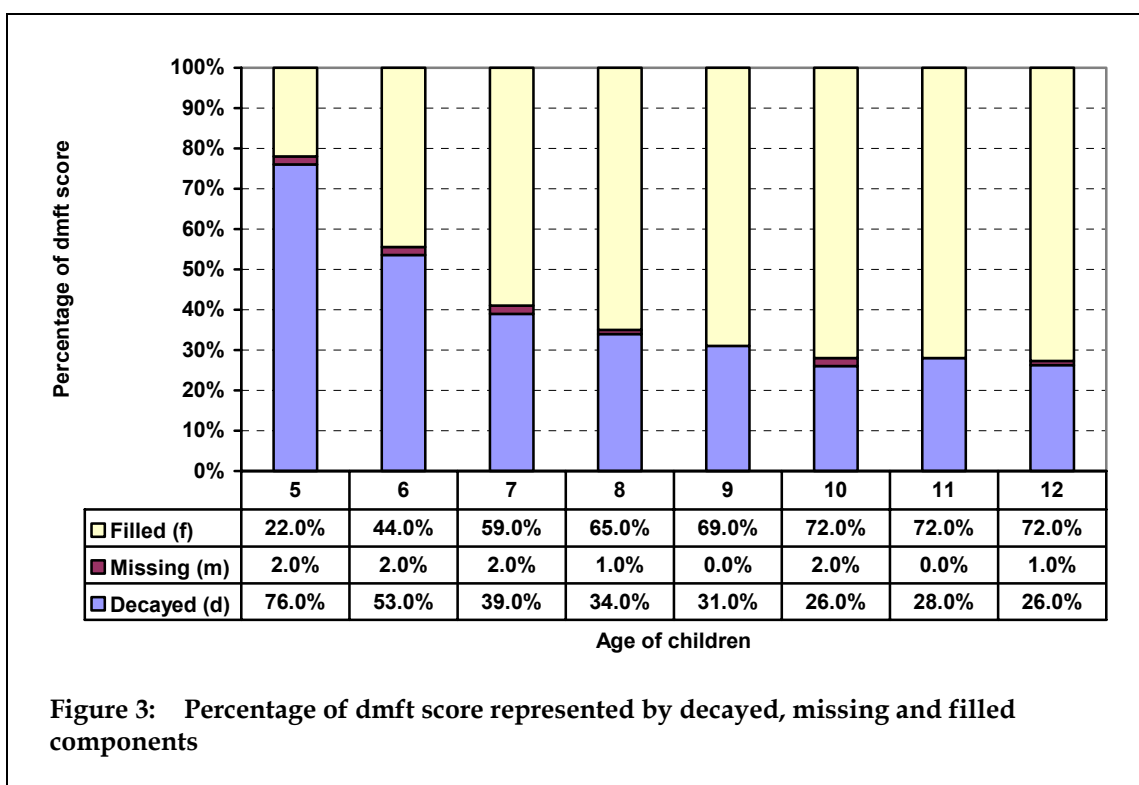
Table 3: Deciduous dentition – decayed, missing and filled teeth by age

Age	Children <i>n</i>	Teeth mean	Decayed (d)		Missing (m)		Filled (f)		dmft	
			mean	SD	mean	SD	mean	SD	mean	SD
5	1,411	19.41	1.09	2.28	0.02	0.27	0.32	1.08	1.44	2.60
6	1,540	17.30	0.86	1.84	0.03	0.40	0.72	1.59	1.62	2.68
7	1,663	14.06	0.67	1.36	0.04	0.40	1.01	1.79	1.72	2.51
8	1,623	12.10	0.56	1.13	0.02	0.24	1.09	1.76	1.67	2.21
9	1,646	10.41	0.50	1.07	0.01	0.15	1.11	1.75	1.61	2.17
10	1,435	8.08	0.34	0.79	0.02	0.33	0.94	1.50	1.30	1.84
11	1,135	6.11	0.28	0.76	0.00	0.03	0.71	1.24	0.99	1.54
12	620	4.37	0.19	0.48	0.01	0.07	0.52	1.06	0.72	1.22

The ratio of untreated decayed teeth to the total count of decayed, missing, and filled teeth serves as an indicator of how well a child's dental needs are being met. This is presented in Table 4 as the mean of individual children's d/dmft index. The percentage of caries experience due to decay (mean d/dmft index) showed an age associated decline, reducing from 75.6% for children aged 5 years old to 28.7% among 11-year-olds (Table 4). By comparison, the percentage of 'caries-free' children (% dmft = 0) shows a more modest reduction, from 62.0% among children aged 5 years old to 46.9% among 8-year-olds, before increasing to 63.6% for 12-year-olds.

Table 4: Deciduous teeth – caries experience indices by age

Age	Teeth present	Mean d/dmft index		dmft = 0	
	<i>n</i>	<i>n</i>	%	<i>n</i>	%
5	19.41	536	75.6	1,411	62.0
6	17.30	688	55.5	1,540	55.3
7	14.06	827	43.0	1,663	50.3
8	21.10	861	37.9	1,623	46.9
9	10.41	868	33.2	1,646	47.2
10	8.08	708	30.4	1,435	50.7
11	6.11	479	28.7	1,135	57.8
12	4.37	226	29.6	620	63.6



The ratio of untreated decayed teeth to the total count of decayed, missing, and filled teeth can also be expressed as the ratio of total decay in the population to total decayed, missing or filled teeth in the population (d/dmft ratio), and this is presented in Figure 3. Unlike the d/dmft index, the d/dmft ratio refers to the proportion of teeth with caries in the population. Thus, the ratio for 6-year-olds indicates that, among 100 teeth with caries experience among 6-year-olds, 53.0% had untreated decay. The d/dmft ratio shows a similar pattern to that of the mean dmft index, with the percentage d/dmft reducing across increasingly older age groups, declining from 76.0% for the youngest children to 26.0% among 12-year-olds. The percentage of dmft accounted for by filled teeth shows the opposite trend, increasing from 22.0% for children aged 5 years old to 72.0% for 10–12-year-olds.

Permanent teeth

Clinically detectable decay in the permanent dentition generally increased with increasing age (Table 5). As in the deciduous dentition, permanent teeth judged as missing due to caries were few although the average increased among the older children. The mean number of filled teeth rose steadily with increasing age, and from the age of 11 exceeded the mean number of decayed teeth across each age group. The mean DMFT also increased consistently across age groups, from 0.11 for children aged 6 years to 1.65 for children aged 16+ years. The mean DMFT score for 12-year-old children was 0.82.

The percentage of DMFT due to decay (mean D/DMFT index) and the percentage with no evidence of caries experience (DMFT = 0) both declined across age groups (Table 6). More than 60% of children in all age groups up to 12 years of age were 'caries free' in their permanent dentition. The D/DMFT ratio, which refers to the proportion of teeth with caries experience having untreated decay, showed a similar trend to the D/DMFT index, declining from 91.0% for 6-year-olds to 22.0% for children aged 16 years or older (Figure 4). Both D/DMFT and F/DMFT stayed relatively constant between the ages of 11 and 14.

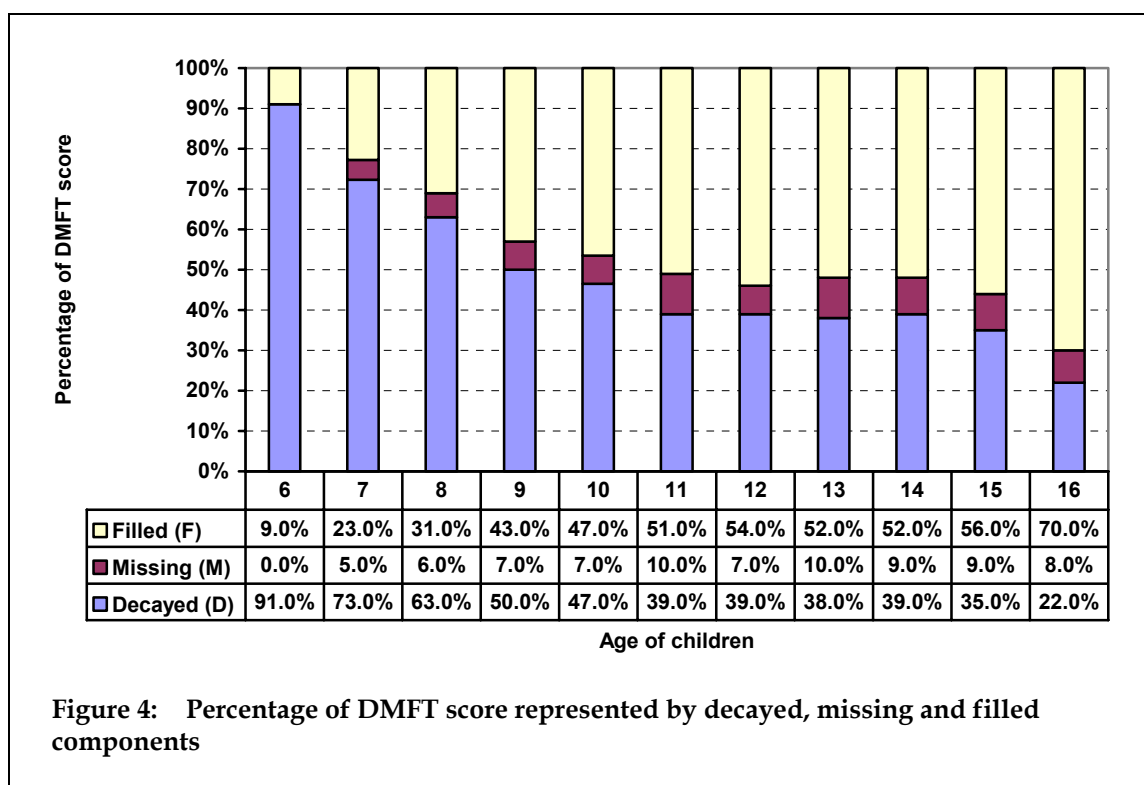
Table 5: Permanent dentition – decayed, missing and filled teeth by age

Age	Children	Teeth	Decayed (D)		Missing (M)		Filled (F)		DMFT	
			mean	SD	mean	SD	mean	SD	mean	SD
5	380	3.55	0.01*	0.12*	–	–	0.00	0.04*	0.02*	0.14*
6	1,244	5.59	0.10	0.53	–	–	0.01*	0.25*	0.11	0.72
7	1,637	8.78	0.16	0.61	0.01	0.17	0.05	0.32	0.22	0.74
8	1,623	11.09	0.22	0.66	0.01	0.15	0.11	0.44	0.35	0.83
9	1,666	13.13	0.22	0.61	0.03	0.23	0.19	0.58	0.44	0.91
10	1,564	16.35	0.27	0.98	0.03	0.24	0.27	0.71	0.58	1.30
11	1,605	20.49	0.28	1.12	0.07	0.40	0.37	0.84	0.72	1.48
12	1,384	24.13	0.32	0.89	0.07	0.38	0.44	0.92	0.82	1.43
13	1,234	26.17	0.38	0.95	0.10	0.52	0.53	1.06	1.01	1.62
14	1,046	27.21	0.49	1.02	0.11	0.57	0.65	1.31	1.25	1.84
15	843	27.32	0.50	1.36	0.14	0.64	0.81	1.57	1.44	2.27
16+	405	27.30	0.36	1.14	0.13	0.75	1.16	1.92	1.65	2.44

* relative standard error \geq 40%

Table 6: Permanent dentition – caries experience indices by age

Age	Teeth present	Mean D/DMFT Index		DMFT = 0	
	<i>n</i>	<i>n</i>	%	<i>n</i>	%
5	3.55	6	93.5	380	98.5
6	5.59	69	94.9	1,244	94.4
7	8.78	203	76.6	1,637	87.6
8	11.09	332	65.6	1,623	79.6
9	13.13	410	49.4	1,666	75.4
10	16.35	442	42.4	1,564	71.7
11	20.49	550	36.4	1,605	65.7
12	24.13	539	38.5	1,384	61.1
13	26.17	521	35.7	1,234	57.8
14	27.21	505	41.4	1,046	51.7
15	27.32	421	34.0	843	50.1
16+	27.30	221	19.2	405	45.4



All teeth

Untreated clinically detectable caries in the combined deciduous and permanent dentitions existed for between 19.3% and 37.4% of children in all age ranges (see Table 7). The greatest likelihood of untreated decay occurred for 8-year-olds. The most extensive levels of untreated decay (4 or more deciduous or permanent teeth) occurred in the younger age groups, with more than 5% of children aged 8 years or less being affected to this extent.

While no more than 5% of children aged 5 to 12 years had at least one deciduous or permanent tooth missing due to caries, much larger percentages presented with fillings, for which there was a consistent age-associated increase in children up to 9 years of age (45.6% with 1 or more fillings) followed by a decline to age 14 (30.5%) and a subsequent increase into the oldest age group (43.7%). There was also an increase in the percentage of children with caries experience in the combined deciduous and permanent dentition, from 38.0% for children aged up to 5 years old to 59.3% at age 9. From the age of 9 there was an increase in the percentage of children with dmft+DMFT = 0 to age 13, with a subsequent decline in percentages into the oldest age groups.

Table 7: All teeth – age-specific caries experience

Age	Children <i>n</i>	d+D =						m+M = 0 %	f+F = 0 %	dmft+ DMFT = 0 %
		0 %	1 %	2 %	3 %	4 %	5+ %			
5	1,411	68.0	8.1	8.5	4.1	4.2	7.1	99.1	87.9	62.0
6	1,540	64.5	14.4	9.3	3.7	2.6	5.5	98.7	72.7	53.8
7	1,665	64.7	14.8	8.8	5.3	3.1	3.3	97.6	63.4	47.4
8	1,628	62.6	18.5	9.1	4.4	2.4	3.0	98.2	57.7	41.3
9	1,670	65.7	16.8	8.8	4.7	1.3	2.8	97.3	54.4	40.7
10	1,567	69.4	17.0	7.6	3.1	1.5	1.4	97.1	56.0	43.3
11	1,606	74.7	15.2	5.4	2.3	1.3	1.2	96.4	62.1	48.9
12	1,384	75.4	15.0	6.3	2.4	0.4	0.6	95.7	66.8	51.9
13	1,234	77.3	12.9	6.0	1.8	0.3*	1.7	94.9	67.5	53.6
14	1,048	72.3	15.5	6.5	3.7	1.3	0.8	94.4	69.5	50.8
15	847	75.0	14.6	5.6	1.6	0.7	2.4	93.1	66.7	48.9
≥16	405	80.7	11.6	4.3	1.3	1.1*	1.0*	94.1	56.3	44.6

* relative standard error ≥ 40%

Fissure sealants

The mean number of fissure sealants per child increased with age although little variation occurred between the ages of 8 and 14 where the mean number of fissure sealants ranged from 0.14 to 0.20 (Table 8). Overall, the mean numbers of fissure sealants ranged from 0.02 for 6-year-olds to 0.24 for children aged 16 years and older. There is some evidence of preferential use of fissure sealants among those with caries experience, indicated by the percentage of children with fissure sealants among those with caries experience compared to those with no caries experience.

Table 8: Fissure sealants – age-specific experience

Age	Children <i>n</i>	Sealants		Children with sealants			
				DMFT = 0		DMFT ≥ 1	
		mean	SD	<i>n</i>	%	<i>n</i>	%
6	1,540	0.02	0.21	1,470	1.0	69	4.9
7	1,665	0.08	0.47	1,462	3.5	203	5.0
8	1,628	0.14	0.63	1,296	5.0	332	11.8
9	1,670	0.17	0.68	1,261	7.1	410	8.5
10	1,567	0.15	0.63	1,125	6.9	442	8.5
11	1,604	0.16	0.66	1,054	6.4	550	9.8
12	1,379	0.15	0.66	840	5.3	539	8.6
13	1,234	0.20	0.76	713	7.4	521	10.7
14	1,048	0.18	0.74	543	6.0	505	10.7
15	847	0.21	0.86	423	6.8	424	10.5
≥16	405	0.24	0.92	184	9.0	221	10.8

School Dental Service examinations

Table 9 demonstrates that the majority (at least 83%) of children 6 years of age or older had previously received examinations within the School Dental Service. A number of children in each age group were recorded as either having their first examination but were given a date of last examination or as not having their first examination but did not have a last examination date recorded. These children were not classified as either having had a previous examination or as having their first examination, and were not included in the results presented in Table 10.

Of those children known to have had a previous examination the majority had been 13–18 months previously (Table 10). A substantial number of children also had their last examination 7–12 months previously. Few children had had their previous examination either less than 6 months or more than 18 months previously. The mean time since last visit increased slightly with age, ranging from 12.22 months for 5-year-olds to 15.83 months for children aged 14.

Table 9: School Dental Service examinations – age-specific distribution

Age	Children examined <i>n</i>	Previous examination in School Dental Service		
		Yes %	No %	Unsure %
5	1,487	33.6	61.2	5.1
6	1,599	83.1	10.2	6.7
7	1,685	90.5	5.0	4.5
8	1,623	88.9	4.6	6.5
9	1,666	89.5	3.1	7.4
10	1,566	90.0	3.1	6.9
11	1,599	91.8	2.0	6.2
12	1,372	92.4	1.6	6.0
13	1,184	92.3	1.8	5.9
14	1,000	92.2	1.4	6.4
15	805	89.1	2.0	8.9
≥16	409	93.0	2.5	4.5

Table 10: School Dental Service examinations – time since last visit

Age	Children <i>n</i>	Months since last visit					mean	SD
		0–6 %	7–12 %	13–18 %	19–24 %	25+ %		
5	500	3.5	52.5	43.5	0.4*	0.0	12.22	2.73
6	1,328	2.0	27.5	60.7	9.0	0.7	14.21	3.53
7	1,524	2.1	26.1	60.0	8.5	3.4	14.67	4.42
8	1,442	2.1	27.1	56.8	10.0	4.0	14.87	4.85
9	1,491	2.1	28.5	55.9	8.6	4.9	14.92	5.02
10	1,409	1.9	24.7	58.7	10.9	3.7	15.00	4.70
11	1,467	1.2	24.6	60.3	10.0	3.9	15.09	4.39
12	1,268	1.4	25.7	59.4	9.3	4.3	15.07	4.75
13	1,093	1.2	23.0	58.3	11.4	6.2	15.74	5.20
14	923	1.4	22.0	58.9	11.3	6.3	15.83	5.28
15	717	1.9	23.7	56.6	10.7	7.2	15.74	5.74
≥16	380	1.0*	29.4	55.9	9.4	4.3	14.91	4.95

* relative standard error ≥ 40%

Caries experience by geographical location

Table 11 presents deciduous caries experience data for each of the Health (Analysis) Zones used in this report. Considerable variation can be seen in caries experience for the selected 5–6-year-old age group across geographical areas. Among these children, mean decay scores in the deciduous dentition ranged from 0.70 in the East Metropolitan zone to 1.64 in the North West zone. The mean number of teeth missing due to caries was highest in the Goldfields zone (mean = 0.13), while the mean number of filled teeth was highest in the North West and Midlands Heath Zones, the lowest being in the Great Southern zone. Mean dmft scores were highest in the North West (mean = 2.55) and lowest in the East Metropolitan (mean = 1.16) zone. Consistent with these findings the percentage of children with dmft = 0 was highest in East Metropolitan (62.4%) and lowest in the Goldfields (48.1%) and North West (47.7%) zones.

Table 11: Deciduous caries experience for 5-6-year-old children by Health (Analysis) Zone

	Children	Decayed (d)		Missing (m)		Filled (f)		dmft		dmft = 0
	<i>n</i>	mean	SD	mean	SD	mean	SD	mean	SD	%
North West	107	1.64	2.73	0.00	0.00	0.91	2.04	2.55	3.62	47.7
Mid West	108	1.06	2.28	0.01	0.10	0.58	1.31	1.66	2.72	54.6
Midlands	106	0.96	1.78	0.00	0.00	0.88	1.93	1.84	2.87	52.8
Goldfields	133	1.06	2.00	0.13	0.67	0.66	1.28	1.85	2.56	48.1
Great Southern	96	1.19	2.20	0.07	0.39	0.28	0.94	1.54	2.49	58.3
South West	224	1.11	2.14	0.09	0.88	0.72	1.59	1.92	2.84	50.9
North Metropolitan	889	0.85	1.85	0.03	0.34	0.51	1.27	1.39	2.44	60.0
East Metropolitan	425	0.70	1.52	0.01	0.17	0.45	1.31	1.16	2.07	62.4
South Metropolitan	989	0.96	2.11	0.02	0.25	0.55	1.41	1.53	2.68	58.5

The mean number of clinically detectable decayed teeth in 12-year-olds (see Table 12) was highest in the North West Health Zone and lowest in the Mid West zone. The mean number of filled teeth was highest in the Midlands zone (mean = 0.74) and lowest in the North Metropolitan zone (mean = 0.35) while DMFT scores were highest in the North West and lowest in the Mid West zone. Approximately 67% of 12-year-olds in Mid West had no history of caries experience in their permanent dentition, while only 40.0% of 12-year-old children in the North West zone had a DMFT score of zero.

Table 12: Permanent caries experience for 12-year-old children by Health (Analysis) Zone

	Children	Decayed (D)		Missing (M)		Filled (F)		DMFT		DMFT = 0
	<i>n</i>	mean	SD	mean	SD	mean	SD	mean	SD	%
North West	30	0.80	1.19	0.10	0.40	0.69	1.39	1.57	2.18	40.0
Mid West	43	0.07	0.26	0.02	0.15	0.49	0.99	0.58	1.05	67.4
Midlands	54	0.24	0.64	0.15	0.49	0.74	1.23	1.13	1.33	46.3
Goldfields	46	0.22	0.59	0.11	0.48	0.43	0.86	0.76	1.06	54.3
Great Southern	49	0.29	0.54	0.04	0.29	0.49	0.87	0.82	1.17	57.1
South West	109	0.46	1.72	0.08	0.39	0.52	0.94	1.06	2.00	56.0
North Metropolitan	417	0.26	0.71	0.04	0.30	0.35	0.79	0.66	1.20	67.4
East Metropolitan	190	0.32	0.77	0.09	0.51	0.42	0.86	0.83	1.37	63.2
South Metropolitan	441	0.29	0.67	0.07	0.36	0.50	1.02	0.86	1.40	59.2

Selected trends, 1997–2001

Presented below is a table and a series of figures of selected 5-year trends across the period 1991–2001. Trends are proved for sample size, deciduous and permanent caries experience, fissure sealants and time since last visit.

Table 13: Sample size and percentage of total sample by region, 1997–2001

Region	1997		1998		1999		2000		2001	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
North West	378	3.4	746	4.4	787	4.3	698	4.0	484	3.0
Mid West	314	2.8	645	3.8	583	3.2	569	3.2	564	3.5
Midlands	372	3.3	494	2.9	664	3.6	681	3.9	539	3.4
Goldfields	336	3.0	424	2.5	620	3.4	711	4.0	610	3.8
Great Southern	635	5.7	729	4.3	754	4.	789	4.5	546	3.4
South West	784	7.1	1455	8.6	1747	9.5	1585	9.0	1215	7.6
North Metropolitan	3336	30.0	5363	31.8	5582	30.3	5098	29.0	4784	29.9
East Metropolitan	1401	12.6	1923	11.4	2106	11.4	2000	11.4	2132	13.3
South Metropolitan	3442	31.0	5093	30.2	5528	30.0	5358	30.5	5131	32.1
Missing	118	1.1	0	0.0	73	0.4	97	0.6	0	0.0
<i>Total</i>	<i>11116</i>	<i>100.0</i>	<i>16872</i>	<i>100.0</i>	<i>18444</i>	<i>100.0</i>	<i>17586</i>	<i>100.0</i>	<i>16005</i>	<i>100.0</i>

