

Changes in South Australian children s caries experience: Is caries re-surfacing?

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Introduction

Dental caries rates of Australian children are among the lowest in the world. Since the Second World War, when relatively frequent surveys within Australia commenced, the average number of teeth decayed, missing due to caries or filled, has fallen dramatically.^{1,2} However, although caries experience has greatly diminished it has not disappeared. Despite the success of caries prevention strategies, there remain a minority of children with a majority of disease experience.³ In addition, the most recent Australian data show that the steady falls in children s caries experience have come to an end and there are signs that decay rates are starting to increase.³

Method

These phenomena were explored using up-to-date data from South Australia. South Australian children have traditionally had low caries experience in comparison to other Australian States and Territories. Data used in this report were collected during the period 1990-2002 by dental therapists and dentists from the South Australian School Dental Service (SADS). This School Dental Service provides general dental care for pre-school and primary school children in government and non-government schools. The service is free of charge to all pre-school and primary aged children while a subscription fee (introduced in 1995) applies to secondary school children who do not hold a School Card or Health Care Card.

Up to the year 2000, a random sampling procedure was used with children selected based on birth date. Beginning in 1997 data were weighted by time since last visit, which was to correct the under-representation of students on longer recall schedules in the sample. Between 1998 and 2000 data were also weighted to reflect the Estimated Residential Population of children according to Statistical Divisions within South Australia as published by the Australian Bureau of Statistics. The intended purpose of the weighting protocol was to obtain a sample with characteristics representative of the student population covered by the School Dental Service. In 2001 and 2002 de-identified data from all children

examined within the School Dental Service were made available through electronic records provided by EXACT MIS, a computer system used in SADS clinics. The children captured by EXACT comprise the population, therefore no weighting was applied to these data.

Results

(i) Caries experience of deciduous teeth in 2002

Table 1 presents the number of decayed, missing and filled deciduous teeth for children aged between four and 10 in 2002. The mean number of clinically detectable decayed teeth ranged from one tooth for 4 year olds to 0.48 teeth for 10 year olds. Teeth missing due to caries were rare, and was found only once for every 13 children on average aged between four and eight, and for every 20 children on average aged nine or 10. The mean number of filled deciduous teeth increased with age, from 0.37 teeth for 4 year olds to 1.27 teeth for 8 year olds, before declining to just under 1 tooth on average for 10 year olds.

Summing together results for decayed, missing and filled teeth produces the dmft index presented also in Table 1. Deciduous dmft was lowest for 4 year olds and 10 year olds and highest for 8 year olds. The decline in dmft for children aged nine and 10 can be explained by changes in the number of deciduous teeth present. From the age of five, children exfoliate between two and three deciduous teeth a year on average, so that by the age of 10 a child has less than half the deciduous teeth present at five years of age. Indeed, the number of decayed, missing and filled teeth as a proportion of the number of teeth present increases across successively older ages, from 7.38 per 100 teeth present for 4 year olds to 18.45 teeth per 100 deciduous teeth present for 10 year olds (Table 1).

Among older children, caries experience becomes represented mostly by treated disease. This can be seen in Fig 1, which shows the percentage of dmft accounted for by the untreated decayed teeth component. As children enter the School Dental Service approximately 80 per cent of the dmft index is represented by clinically detectable decayed teeth. However, as the number of decayed teeth declines across successively older ages and the numbers of previously treated (filled or extracted) teeth increase, d/dmft falls and by

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Table 1. Deciduous dentition – decayed, missing and filled teeth among South Australian children in 2002

Age (years)	Children	Teeth present	Decayed (d)	Missing (m)	Filled (f)	dmft	dmft/100 teeth
	<i>n</i>	mean	mean	mean	mean	mean	mean
4	4269	19.79	1.00	0.07	0.37	1.45	7.38
5	6291	19.41	0.93	0.09	0.57	1.60	8.30
6	6286	17.31	0.87	0.08	0.89	1.83	10.87
7	6448	14.37	0.75	0.07	1.11	1.93	13.88
8	6469	12.33	0.66	0.07	1.27	2.00	16.70
9	6207	10.74	0.57	0.05	1.23	1.85	18.03
10	5663	8.59	0.48	0.04	0.99	1.50	18.45

the age of nine years the decayed component presents no more than 40 per cent of the total dmft score.

Table 2 shows the distribution of dmft scores for the deciduous dentition in 2002. At age four, 65 per cent of children presented with no clinically detectable caries experience and this declined to 44.4 per cent at age eight. The percentages of children presenting with increasingly higher caries experience declined consistently across age groups. However, there remained between 10 and 18 per cent of children presenting with five or more decayed, missing or filled teeth.

Since 1990, 6 year old dmft has shown a period of decline to 1994, followed by a four-year period of variability which saw mean dmft scores rise and fall, sometimes dramatically (Fig 2). However, since 1998 6 year old dmft has increased 47.6 per cent, from 1.24 teeth to 1.83 teeth. At the same time, the percentage of 6 year old children with a dmft score of 0, after climbing from 51.3 to 65.6 per cent between 1990 and 1998, fell from 65.6 to 51.8 per cent in 2002. The percentage of children with no clinically detectable caries experience has fallen for four consecutive years, an unprecedented occurrence in South Australia since continuous measurements commenced in 1977.

(ii) Caries experience of permanent teeth in 2002

Caries experience in the permanent dentition is lower than in the deciduous dentition (Table 3). Up to the age of 10, the mean number of decayed, missing or filled teeth (DMFT) is less than 0.20 permanent teeth, with this figure increasing to only 0.50 teeth by age 14. Missing teeth in the permanent dentition are rare. Filled teeth increase to a mean of 0.51

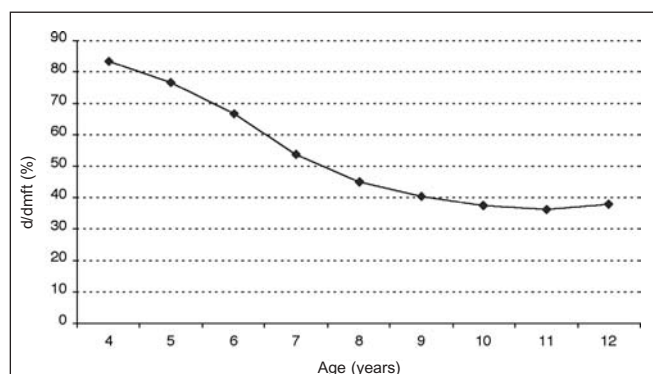


Fig 1. Percentage of deciduous dmft teeth that are untreated among South Australian children in 2002.

Table 2. Distribution of deciduous dmft by age among South Australian children in 2002

Age (years)	Children	dmft=					
		0	1	2	3	4	5+
	<i>n</i>	%	%	%	%	%	%
4	4269	65.0	8.2	6.6	4.1	4.2	11.9
5	6291	58.7	10.6	7.7	5.6	4.4	13.0
6	6286	51.8	11.7	8.7	6.5	5.5	15.8
7	6448	48.2	11.5	9.2	7.8	6.6	16.7
8	6469	44.4	12.5	10.6	7.9	6.6	18.0
9	6207	44.5	13.4	10.9	9.1	7.0	15.1
10	5663	48.7	15.4	11.4	8.2	5.9	10.4

teeth for 12 year olds and peaks at 0.87 teeth for 14 year olds. The mean DMFT reflects the consistent increase in both the decayed and filled components and the 12 year old DMFT in 2002 was 0.83. As in the deciduous dentition, DMFT/100 permanent teeth increases across successively older ages, although at a much slower rate.

The percentage of the DMFT index accounted for by the decayed teeth component decreases through to the age of nine years before stabilizing in the older age groups at between 35 and 40 per cent (Fig 3).

Table 4 shows the distribution of permanent caries experience (DMFT) by age. In the younger age groups permanent caries experience is rare and this can be explained by the few teeth present at these ages and short time at risk for those teeth present. However, by the age of 14 years more than 50 per cent of children have had caries experience in the permanent dentition. The distribution of DMFT shows a positively skew and unimodal shape, with lower percentages of children within each age group having higher levels of caries experience. This distribution becomes less extreme in the older ages of children.

The trend in 12 year old mean DMFT reveals a steady decline up to 1996 followed by six years of relatively consistent increases to 2002. The converse trend is apparent for the percentage of children with a DMFT of 0, which increased between 1990 and 1996, then declined up to 2002. Between 1990 and 1996, 12 year old mean DMFT fell by almost two-thirds, while the percentage of children with a DMFT of 0 rose from 50.3 to 71.8 per cent. Subsequent to 1996, 12 year old DMFT increased 76.6 per cent from 0.47

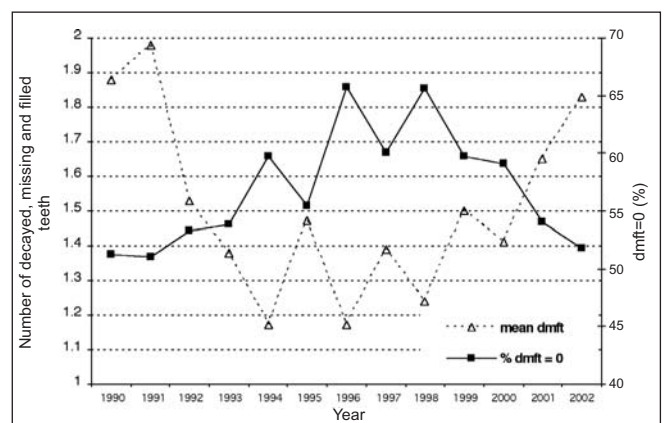


Fig 2. Mean deciduous dmft scores and percentage of children with dmft=0 for 6-year-old South Australian children from 1990 to 2002.

Table 3. Permanent dentition – decayed, missing and filled teeth among South Australian children in 2002

Age (years)	Children	Teeth present	Decayed (D)	Missing (M)	Filled (F)	dmft	dmft/100 teeth
	<i>n</i>	mean	mean	mean	mean	mean	mean
6	5195	5.61	0.07	0.00	0.02	0.09	1.31
7	6346	8.75	0.14	0.00	0.07	0.22	2.34
8	6461	11.13	0.18	0.01	0.19	0.37	3.32
9	6274	13.09	0.17	0.00	0.30	0.47	3.62
10	6106	16.18	0.17	0.01	0.36	0.53	3.38
11	5799	20.41	0.24	0.00	0.40	0.65	3.24
12	5164	24.09	0.31	0.01	0.51	0.83	3.44
13	3649	26.22	0.38	0.02	0.65	1.05	4.03
14	3409	27.18	0.50	0.03	0.87	1.40	5.15

teeth to 0.83 teeth. At the same time the percentage of 12 year old children with a DMFT of 0 has declined from 71.8 to 63.1 per cent.

Discussion

Historically, South Australia children have had low caries levels and this remains the situation in 2002. Caries experience in the deciduous and permanent dentitions compares favourably to other Australian States and Territories. However, there is strong evidence that the declines in caries that occurred through to the 90s have come to an end and have reversed. Since the mid 1990s, 6 year old deciduous dmft and 12 year old permanent DMFT have been increasing.

Increases in children's caries experience in South Australia cannot be attributed to changes in data collection methodology. The introduction in 1997 of weighting by time since last visit effectively resulted in a lowering of caries indices from the previous years because those children on longer recall schedules with generally better oral health were weighted up in the analysis while people on shorter recall intervals with generally poorer oral health were weighted down in the analysis. Similarly, the implementation of weighting by Statistical Subdivision cannot be the cause of increases in recorded caries experience. While there may have been an increase in dmft and DMFT scores in 1998 due to the weighting up of cases from non-metropolitan South Australia where caries experience is generally higher, there were continued increases in caries in 1999. Also, while the introduction of EXACT in 2001 may have had some impact on caries scores in that year a change in data collection

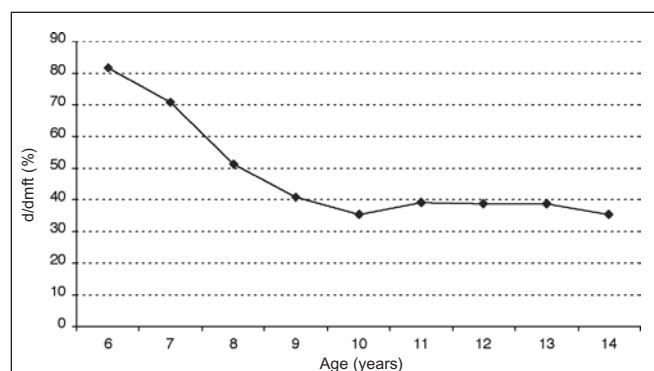


Fig 3. Percentage of permanent DMF teeth that are untreated among South Australian children in 2002.

Table 4. Distribution of permanent DMFT by age among South Australian children in 2002

Age (years)	Children	dmft=					
		0	1	2	3	4	5+
	<i>n</i>	%	%	%	%	%	%
6	5195	94.1	3.8	1.4	0.4	0.3	0.0
7	6346	87.2	7.1	3.7	1.1	0.9	0.0
8	6461	79.2	10.4	6.3	2.2	1.8	0.0
9	6274	74.9	11.8	7.5	2.9	2.7	0.3
10	6106	72.8	12.7	7.3	3.4	3.3	0.4
11	5799	68.7	14.0	8.4	4.1	3.6	1.2
12	5164	63.1	15.9	9.2	4.9	4.1	2.8
13	3649	56.5	16.9	11.2	5.8	5.3	4.3
14	3409	48.5	18.2	12.3	7.2	6.2	7.6

methodology cannot explain the continued increase in caries scores between 2001 and 2002.

Participation rates for the school dental service is high for primary aged children and moderate for older children.⁴ Primary school participation is approximately 80 per cent and has changed little over the past two decades. However, secondary school participation has fallen decreasing from 76.3 per cent in 1994 to approximately 50 per cent following the introduction of a subscription fee in 1995.

The examination of South Australian data may provide a pointer to broader trends occurring nationally. Australian data on children's oral health, reported annually in The Child Dental Health Survey, a national surveillance survey conducted by the Australian Institute of Health and Welfare Dental Statistics and Research Unit at the Australian Research Centre for Population Oral Health, shows a levelling off of caries experience in the mid 1990s and since then an increase.³ However, more recent information on children's caries experience at the national level is required before trends in South Australia can be confirmed as occurring nationally.

References

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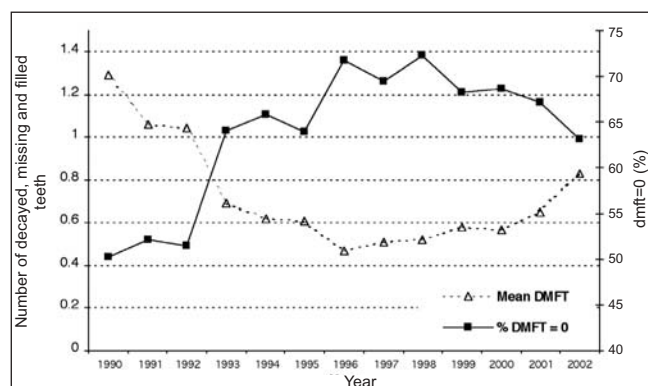


Fig 4. Mean permanent DMFT scores and percentage of children with DMFT = 0 for 12-year-old children from 1990 to 2002.