

High caries children in Australia: A 'tail' of caries distribution

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Introduction

Population epidemiology of dental caries frequently involves reporting on the mean number of decayed, missing and filled teeth (designated 'dmft' in the deciduous dentition and 'DMFT' in the permanent dentition) for a given age group. While mean scores can neatly summarize a variable of interest a number of issues arise when the sample of scores is appreciably skewed. In this scenario there is a tendency for the 'tails' of a distribution, that is people who have scores at the extremes of a distribution, to be subsumed and effectively hidden. In Australia, the majority of children now present with no caries experience in either the deciduous or permanent dentition. The documented decline in caries in Australia up until the mid 1990s and the subsequent increases at the end of the decade recorded for a number of age groups¹ provides valuable information about shifts in the prevalence of caries experience among the population as a whole but allows no comment on the smaller number of Australian children who carry a significant burden of disease experience. To understand this minority it is necessary to look beyond mean caries scores to the distribution of scores across the population and especially at the 'tail' of the distribution.

Methodology

Data were obtained on 311 346 children in 2000 as part of their regular attendance at state and territory school dental services around Australia. The school dental services provide preventive care and treatment primarily for primary school children from government and non-government schools but also for pre-school and high school children in a number of jurisdictions. The service is generally free but in some areas and for some age-groups a surcharge or co-payment is operative.

All data were collected by dental therapists and dentists and then supplied to the Australian Institute of Health and Welfare's Dental Statistics and Research Unit located in the Australian Research Centre for Population Oral Health at the University of Adelaide for subsequent data analysis. Weighting of the data was necessary since the Australian sample does not contain representative percentages of children from each state and territory.

Within the state and territories, data were also weighted according to sampling frame, region of sampling or time since last dental examination. In 2000 data within Victoria,

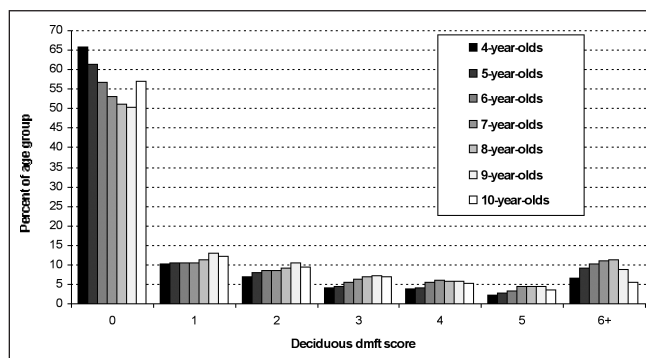


Fig 1. Distribution of deciduous dmft scores by age group, 2000.

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.

Results

The percentage of children presenting with a dmft equal to zero declined from 66 per cent of four-year-olds to 50 per cent for nine-year-olds, indicating the extent of positive skewness in the distribution of caries scores (see Fig 1). Approximately 10 per cent of the child population had six or more decayed, missing and filled deciduous teeth. It should be noted that the decline in the percentage of children with 6+ dmft at ages nine and 10 is primarily driven by the exfoliation of teeth which occurs with increasing age leaving, for example, 10-year-olds with an average of only eight teeth per child.

The permanent dentition shows an even greater degree of positive skew with between 96 per cent and 45 per cent of children aged between six and 15 presenting with a DMFT equal to zero (see Fig 2). Unlike in the deciduous dentition, the percentage of children with a DMFT of 6 or more was low across most age groups only exceeding 10 per cent for 15-year-olds.

In 2000 Bratthall introduced the Significant Caries Index (SiC) in order to bring attention to those individuals with the highest scores in a population.² The SiC is the mean dmft of the 30 per cent of the population with the highest caries

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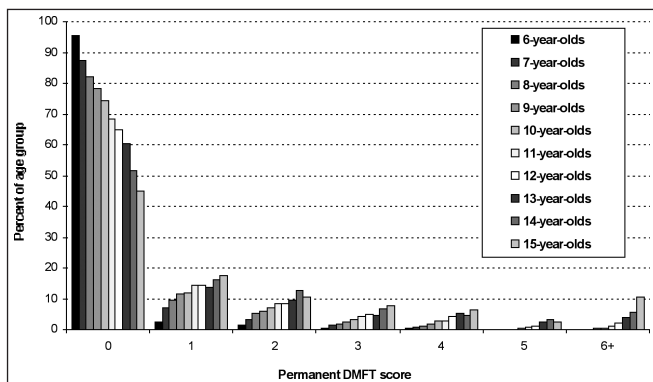


Fig 2. Distribution of permanent DMFT scores by age group, 2000.

scores. A modified index, the SiC^{10} , is the mean dmft or DMFT of the 10 per cent of children with the highest dmft/DMFT scores. The SiC^{10} is a useful index in Australia where the majority of children have no caries experience. Figure 3 shows the SiC and SiC^{10} indices for the deciduous dentition of four-year-olds to 10-year-olds. For those children with the highest 30 per cent of scores, dmft scores are considerably higher than the mean scores for the entire age group, and range between 3.6 and 4.9 dmft. The disproportionate burden of disease is dramatically demonstrated for children with the highest 10 per cent of dmft scores, where scores range from 4 (eight- and nine-year-olds) to over 6 times higher (four-year-olds) than corresponding mean scores for the entire age group. Again it should be noted that the decline in SiC and SiC^{10} from the age of about seven is principally driven by the continued exfoliation of deciduous teeth across these age groups.

Figure 4 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 six and 10 years, children with the highest 10 per cent of DMFT scores (SiC^{10}) had mean scores between six and 10.5 times higher than mean permanent caries experience scores for the corresponding entire age

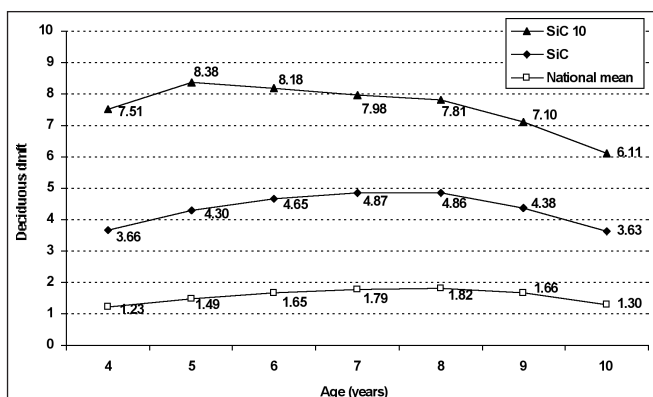


Fig 3. Significant Caries Indices (SiC and SiC^{10}) and mean deciduous dmft scores of 4–10-year-old children, 2000.

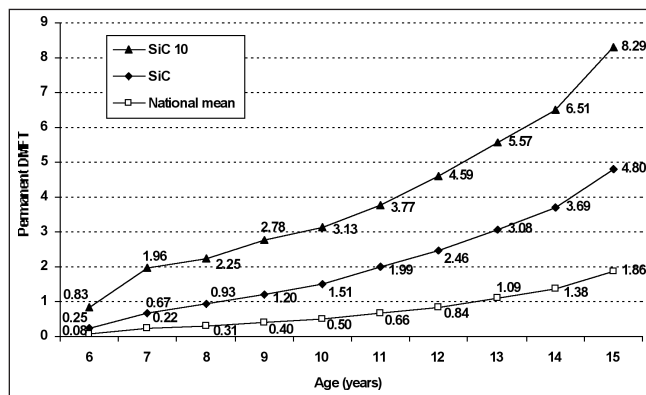


Fig 4. Significant Caries Indices (SiC and SiC^{10}) and mean permanent DMFT scores of 6–15-year-old children, 2000.

group. Scores for children aged between 11 and 15 years were some 4.5 times (15-year-olds) to almost six times (11-year-olds) higher for children with the highest 10 per cent of scores in each age group than mean scores for the entire age group. The SiC Index increased from 0.67 DMFT units for seven-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.

Bratthall has proposed that, following the WHO Year 2000 oral health targets, the new goal for oral health should be an SiC of less than 3 DMFT for 12-year-olds by 2015.² Figure 4 shows that in Australia this has already occurred with an SiC for 12-year-olds of 2.46 DMFT.

Another way to think about the tail end of the caries distribution is to relate the percentage of all caries to the percentage of the child population who experience it. For instance, we might ask what is the percentage of children who account for 50 per cent of the total disease experience? Table 1 provides this information, by examining in both the deciduous and permanent dentition the percentage of children in each age group who account for 50 per cent, 75 per cent and 90 per cent of the total caries experience in that age group. In the deciduous dentition, 50 per cent of the total caries experience was accounted for by between 11 and 17 per cent of any age group, 75 per cent of the total caries experience was accounted for by between 15 per cent and 21 per cent of any age group, while 90 per cent of all caries experience was accounted for by between 19 per cent and 26 per cent of any age group.

In the permanent dentition there is a readily observable trend for the ‘tail’ of the distribution to include an increasingly larger percentage of the age-group between six and eight years (Table 1). Between the ages of eight and 15, however, the opposite of this trend occurred with the majority of caries experience increasingly confined to smaller percentages of children in their respective age groups. Approximately 35 per cent of eight-year-old children accounted for 50 per cent of the permanent disease experience. However, this fell to only 13 per cent of 15-year-olds. Similarly, while 75 per cent of permanent caries experience was accounted for by 44 per cent of eight-year-olds, it was accounted for by less than 18 per cent of 15-year-olds. Finally, about 54 per cent of eight-year-olds accounted for 90

Table 1. Percentage of children from different age groups who account for 50 per cent, 75 per cent and 90 per cent of all caries experience for the age group

Age	n	Total dmft/DMFT	Percentage of all caries		
			50 per cent	75 per cent	90 per cent
Deciduous					
4	16,560	23,692	11.9	16.4	21.1
5	26,916	39,876	11.2	15.1	19.6
6	23,524	38,650	12.4	16.2	20.3
7	27,892	49,725	13.2	16.6	20.4
8	28,473	51,578	13.6	17.0	20.9
9	28,880	47,676	15.0	19.2	23.5
10	28,424	37,042	17.0	21.3	25.8
Permanent					
6	23,525	1,961	31.9	42.4	52.0
7	27,899	6,186	32.7	42.6	52.1
8	28,479	8,752	35.2	44.2	53.5
9	28,899	11,596	30.5	39.4	49.5
10	28,423	14,308	27.7	35.1	45.1
11	28,481	18,719	25.0	32.7	42.3
12	24,063	20,184	20.7	27.7	35.3
13	29,326	31,935	17.8	23.3	29.2
14	30,083	41,556	15.9	22.3	27.8
15	15,671	29,031	12.9	17.6	22.3

per cent of the caries in that age group but in the 15-year-old age group only 22 per cent of children accounted for 90 per cent of total caries experience.

Discussion

By examining the distribution of caries experience it is evident that a minority of children carry a disproportionate burden of the disease experience. The SiC for the deciduous and permanent dentition of children is about three times higher than the mean caries score while the dmft or DMFT of the 10 per cent of children with the most caries experience was up to six times higher than the mean dmft or DMFT respectively. Among younger children, 90 per cent of the caries experience is found in about one-fifth of the children and this figure is similar to that of permanent caries experience of 15-year-olds. There was a strong trend for the majority of permanent caries experience to become increasingly concentrated in a smaller minority of children across older age groups.

While Australian children have low levels of dental caries relative to many other countries³ there remains a minority of children with substantial levels of disease experience. More

should be done to assist those children afflicted with a disproportionate burden of dental disease.

References

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