

The New South Wales Child Dental Health Survey 2007



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Foreword

Oral health services are an integral part of the New South Wales health care system. Epidemiological surveys are vital to inform population health planning and to facilitate ongoing surveillance of populations of interest.

The New South Wales Child Dental Health Survey 2007 marks the beginning of a more systematic approach to oral health data collections in New South Wales. It provides an accurate picture of the oral health status of primary school aged children in New South Wales that can be used to establish future goals for state and area oral health services.

I commend the efforts of the Centre for Oral Health Strategy, the Area Health Services, the Australian Research Centre for Population Oral Health, Population Oral Health University of Sydney, the Survey teams and schools for participating so cooperatively in this important project.

The survey has established baseline data that will be comparable with data to be collected by the National Child Dental Health Survey planned by the Australian Research Centre for Population Oral Health for 2011 and 2012.

A handwritten signature in black ink, appearing to read 'K Chant'.

Dr Kerry Chant
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November 2009

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Abbreviations

d	deciduous decayed teeth or surfaces
D	permanent decayed teeth or surfaces
dmfs	deciduous decayed, missing and filled tooth surfaces
dmft	deciduous decayed, missing and filled teeth
DMFS	permanent decayed, missing and filled surfaces
DMFT	permanent decayed, missing and filled teeth
m	deciduous missing teeth or surfaces
M	permanent missing teeth or surfaces
f	deciduous filled teeth or surfaces
F	permanent filled teeth or surfaces
FS	fissure sealant
SD	standard deviation
SEIFA	Socio-economic indices for areas
SEM	standard error of the mean
SiC	Significant Caries Index (mean of top 30% of dmft and/or DMFT scores)
SiC ¹⁰	Significant Caries Index (mean of top 10% of dmft and/or DMFT scores)

Place abbreviations

SSWAHS	Sydney South West Area Health Service
SESAHS	South Eastern Sydney and Illawarra Area Health Service
SWAHS	Sydney West Area Health Service
NSCCAHS	Northern Sydney and Central Coast Area Health Service
HNEAHS	Hunter New England Area Health Service
NCAHS	North Coast Area Health Service
GSAHS	Greater Southern Area Health Service
GWAHS	Greater Western Area Health Service

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Executive summary

The New South Wales Child Dental Health Survey 2007 was a complex and collaborative project between the Centre for Oral Health Strategy, Area Health Services, Population Oral Health University of Sydney and the Australian Research Centre for Population Oral Health, University of Adelaide. It is the first survey in 20 years to use a random sample selection to investigate and report on various groups within the New South Wales child population.

This report provides Area Health Services with reliable oral health status data on which key preventive performance and outcome indicators should be based. Key findings include:

For children aged 5 and 6 years:

- Over 60% have never experienced decay in their deciduous (baby) teeth
- On average there was one untreated decayed deciduous tooth per child
- Those children with the poorest dental health had on average five teeth that were affected by decay, more than three times the average for the age group as a whole
- Those children from the lowest socioeconomic group had almost 1.5 times more decayed, missing and filled deciduous teeth than those from the highest socioeconomic group
- Those children from remote and very remote areas of New South Wales had more than twice the number of decayed, missing and filled teeth than those living in major cities.

For children aged 11 and 12 years:

- Over 65% have never experienced decay in their permanent teeth
- On average there was only 0.4 untreated decayed permanent teeth per child
- Those children with the poorest dental health had on average 2.42 teeth that were affected by decay, more than three times the average for the age group.

For all children aged 5 to 12 years:

- Aboriginal children experienced a significantly higher burden of dental decay in both deciduous and permanent teeth than non-Aboriginal children
- Dependents of Centrelink concession cardholders experienced significantly more dental decay in both deciduous and permanent teeth than children of non-cardholders
- Children whose mothers were born in a country with an official language other than English experienced significantly more dental decay than those whose mothers were born in a country where the official language is English
- Children whose residential postcodes were within a non-fluoridated area of New South Wales had significantly more decayed, missing and filled teeth than children from fluoridated areas

Key conclusions:

- Evidence based preventive and early intervention programs should be implemented, monitored and evaluated by Area Health Services
- Dental services should be accessible to all children, with priority given to groups with identified high oral health needs
- Area Health Services must work with Aboriginal communities to adapt clinical and preventive services and oral health promotion to address their specific needs
- Efforts to extend water fluoridation and promote the use of topical fluorides should continue, with greater consideration given to communities with populations of less than 1000.

1. Introduction

The New South Wales Child Dental Health Survey 2007, henceforth referred to in this publication as ‘the Survey’, was a collaborative partnership between the Centre for Oral Health Strategy, Area Health Services, the Australian Research Centre for Population Oral Health, University of Adelaide and Population Oral Health, University of Sydney. It utilised robust sampling methodology and standardised dental examinations and data collection to estimate the oral health status of children.

The Survey represents a more systematic approach to population oral health data collections than those available through public dental service collections or previous risk assessment programs undertaken in New South Wales. Between 1996 and 2000 New South Wales adopted a school screening approach to reporting the prevalence and severity of dental caries in children (NSW Department of Health, 2001). The key criticism of this Save Our Kids Smiles (SOKS) Program was its systematic underreporting of the extent of dental caries due to the non-clinical conditions under which data were collected. Further, from 2001 to 2007 New South Wales reporting relied on routine data collection from an increasingly biased sample of public dental service users. Summary data from the New South Wales Child Oral Health Survey 2000 (AIHW, 2003) and the dmft/DMFT component of the New South Wales Oral Health Data Collection clearly demonstrated that the shift in collecting data from the school setting to the clinical setting resulted in a substantial increase in mean dmft/DMFT that was not necessarily representative of the child population in New South Wales.

The Survey aligns with New South Wales Strategic Directions, specifically making smart choices about the costs and benefits of health services and building a sustainable workforce. It also supports the National Oral Health Plan imperatives to base actions on the best available evidence and to build strong partnerships across the health and community service sectors to address the social factors that determine general and oral health.

Children aged 5 and 6 years and 11 and 12 years were the focus for regional data collection in this Survey, in support of state and Area Health Services’ planning, reporting and performance indicators. Data were also collected on children in the age ranges 7, 8, 9, and 10 for national reporting purposes. The Survey aimed to identify groups of children who are most in need of dental health care services. Funding for this project, and on-going surveillance of child oral health, was part of the June 2006 New South Wales State Oral Health Budget Enhancements.

The purpose of this report is to describe the oral health of children aged 5 to 12 years in New South Wales. The Centre for Oral Health Strategy will use the results of this and any future surveys to better inform Area Health Services and the community about risks to and improvements in oral health and to help to build an accurate national picture of Australia’s oral health.

Data will be used to:

- Improve care for populations with high needs, such as Aboriginal children
- Advocate for prevention strategies that have the maximum population benefit, such as fluoridation of community water supplies
- Evaluate early intervention and prevention efforts, such as the New South Wales Early Childhood Oral Health Program
- Support the delivery of appropriate and affordable oral health services, especially for rural and remote populations
- Monitor oral health outcomes at Area Health Service and state levels
- Drive state decision making processes and contribute to discussions on National Health Priority Areas.

2. Survey methods

The main data requirement for the Survey was to obtain accurate estimates for each Area Health Service region (8 regions) for:

- dmft of 5 and 6 year old children
- DMFT of 11 and 12 year old children

and accurate state level estimates for:

- dmft of 5 to 10 year old children
- DMFT of 7 to 12 year old children.

The Survey design was a cross-sectional representative survey. To calculate the required sample sizes national level estimates of mean and standard deviation of dmft and DMFT were used. To ensure accurate regional estimates for 5 and 6 year old and 11 and 12 year old children there was a need to select more children of these age groups per school. The period for data collection was from July to December 2007.

2.1 Sampling strategy

The sampling strategy was a stratified 2-stage clustered random sample. The strata were defined as the 8 Area Health Service regions in New South Wales. A sampling frame containing all Public, Catholic and Independent primary schools was compiled with special needs schools excluded from this frame. Children who were not enrolled in schools were also excluded; however this represents an inconsequential proportion of the New South Wales child population. To ensure an efficient sample design it was important to select a large number of schools across New South Wales and a small number of children of a particular age per school.

Within each Area Health Service region a sample of schools was selected with probability proportional to the schools' total age 5 to 12 years enrolment. Prior to selection, schools were sorted by the Socio-economic Index for Areas (SEIFA) to ensure a range of schools from different socio-economic areas were selected within each Area Health Service region. In total, 107 primary schools were sampled across New South Wales. A total of 19 (18%) selected schools across Area Health Service regions declined to participate so substitute schools with similar SEIFA index were selected using the same method as the original selection.

In the second stage of selection approximately 76 children aged 5 to 12 years were sampled from each selected school with a minimum of 8 children and a maximum of 12 children sampled of a particular age per school. Only children with returned consent forms were eligible for selection within a school. Prior to selection, consent forms were sorted by birth date and separated into individual age years. A systematic sample of children was then selected within each age year.

2.2 Survey weighting

A child's probability of selection in the survey was determined by the Area Health Service region they were selected in, the schools' total age 5 to 12 years enrolment size as defined on the frame and the number of children of a particular age enrolled in the school. Initial weights were calculated for each child to reflect their probability of selection in the survey. These weights were then adjusted to ensure that estimates derived from the survey were consistent with the Australian Bureau of Statistics Estimated Residential Population (ERP) counts for each NSW AHS region. The ERP counts were single year age by sex population counts as at 30th June 2007.

2.3 Oral epidemiological examinations

Standardised oral examinations were conducted by teams of trained examiners. Examinations took place in schools using standard portable dental equipment such as chairs, lights and compressed air equipment. The examination was a visual assessment only using a mirror, a blunt probe and compressed air.

The examination protocol was developed at the Australian Research Centre for Population Oral Health and has been used in a number of oral epidemiological studies in Australia. Sources of reference of the protocol are the US National Health and Nutrition Examination Survey 2002, the UK Dental Health Survey of Children and Young People 2003, the University of Michigan caries assessment protocol and the Australian National Survey of Adult Oral Health conducted by the Australian Research Centre for Population Oral Health (Centers for Disease Control 2002, Ismail et al 2007, Office for National Statistics UK 2003, Slade et al 2007).

The protocol measured:

- decayed, missing and filled surfaces of all primary and permanent teeth, including non-cavitated lesions
- dental fluorosis of upper central incisors, using the Thylstrup-Fejerskov (TF) index
- dental trauma (chipped teeth).

Examiners and recorders were trained in a two-day training and calibration program prior to beginning their field work. The first session was undertaken in Sydney by Dr Kaye Roberts-Thomson and Dr Loc Do from the Australian Research Centre for Population Oral Health. The designated 'gold standard' examiner Dr Sandra Meihubers participated in that first session. The second training session was run by Dr Do and Dr Meihubers and later sessions by Dr Meihubers. All examiners were provided with a manual written by staff at the Australian Research Centre for Population Oral Health and the calibration programs included didactic sessions as well as supervised clinical examinations on volunteers. Dr Meihubers subsequently conducted replicate examinations with examiners in the field for reliability testing.

2.4 Social gradients in child oral health status and access to services

The Survey had a linked project entitled '*Social gradients in child oral health status and access to services*' with the University of Adelaide. This nested study was a separate hypothesis driven investigation that was coordinated by the Centre for Oral Health Strategy and the Australian Research Centre for Population Oral Health. The study used some of the data from the Survey as well as a social survey to elicit more detailed individual, school and area information about socio-economic variation in oral health among children aged 5 to 12 years in New South Wales and how this is modified by the use of dental services.

The Australian Research Centre Population Oral Health and the Centre for Oral Health Strategy will collaborate on a publication plan to utilise the examination data and social survey where oral health data (dmfs and DMFS) will be used to analyse associations with individual, school and area characteristics and oral health status.

2.5 Caries measurement

Caries experience was measured by calculating how many teeth have carious lesions, how many have been extracted and how many have fillings. Results were obtained by calculating the number of decayed, missing and filled deciduous (dmf) and permanent (DMF) teeth (t/T) or tooth surfaces (s/S). Calculating how many tooth surfaces are affected, rather than how many teeth, gives a more detailed index and is useful to observe differences in dental status where the majority of the population have a low dmft/DMFT rate (World Health Organisation 2009).

2.6 Data preparation

Data were recorded on optical mark recognition forms developed by the Australian Research Centre for Population Oral Health. These forms were retrofitted to TeleForm version 10 for scanning and verification. Data were then exported to Microsoft Access for cleaning and for checks to be made on missing, erroneous or duplicate data. Erroneous data and subjects who did not reside within New South Wales were eliminated from the dataset.

2.7 Data analysis

The aim of data analysis was to generate summary statistics descriptive of the oral health for children aged 5 to 12 years and to provide regional statistics for key age groups 5 and 6 and 11 and 12 year olds. Survey data were managed and summary statistics were computed using SAS for Windows version 9.1.3.

The postcode of residence was used to determine the Area Health Service of residence; this involved mapping residential postcodes to New South Wales Local Government Areas (LGAs). Postcodes were also mapped to Statistical Local Areas (SLAs) that were then grouped according to Australian Standard Geographical Classification (ASGC) Remoteness categories on the basis of Accessibility/Remoteness Index of Australia (ARIA+ version) score. ASGC Remoteness categorises areas as: major cities; inner regional; outer regional; remote; and very remote (Australian Institute for Health and Welfare, 2008).

SLAs were also used to assign survey participants to area socioeconomic quintiles, using the Index of Relative Socioeconomic Disadvantage (IRSD), one of the four Socioeconomic Indices for Areas (SEIFA) produced by the Australian Bureau of Statistics. IRSD scores were calculated for SLAs based on the estimated population for 30th June 2006.

Survey data were also weighted to reflect the Estimated Resident Population (ERP) of children aged 5 to 12 years according to Area Health Service regions of New South Wales at 30th June 2007, as estimated by the Australian Bureau of Statistics. Weights were applied to all statistics and weighted numbers were rounded to the nearest whole number for ease of interpretation. Sampling weights were provided by Anne Ellershaw at the Australian Research Centre for Population Oral Health to determine regional and state estimates representative of the New South Wales child population from which the Survey participants were selected.

Formats for tables and graphs in this report are based on those in National Child Dental Health Survey Reports generated by the Australian Research Centre for Population Oral Health to permit clear comparisons of state and national data.

For Tables 16 to 23, 95% confidence intervals (95% CIs) were calculated with the school defined as the primary sampling unit (cluster variable) and the Area Health Service as the stratification variable. This follows the approach taken in the National Survey of Adult Oral Health 2004-06 (Slade et al 2007). The 95% CIs signify the likely lower and upper bounds of the true population value. In interpreting these statistics, when the 95% CIs of two estimates do not overlap we can conclude there is a statistically significant difference between the two groups compared. However, in cases where there is only a small overlap in the 95% CIs between groups, formal hypothesis testing may show that differences between groups are statistically significant.

2.8 Ethics Approval

Ethics approval for the Survey was granted by the New South Wales Population and Health Services Research Committee {Reference 2007/04/026} and through the State Education Research Process of the New South Wales Department of Education and Training. The Catholic Education Commission and Association of Independent Schools also gave their permission to involve schools within their jurisdiction.

3. Results

3.1 Assessment of inter-examiner reliability

To assess the reliability of clinical measurements between examiners, replicate pairs of examinations were conducted. Of the 25 calibrated examiners, 20 examiners participated in reliability testing. 131 children were examined by the principal survey examiner and by one of 20 clinical examiners. The number of replicate pairs for each examiner ranged from 5 to 8 and examinations were conducted at 9 different schools, with the number of examiners per school ranging from 1 to 6.

A total of 3,668 teeth and 13,624 tooth surfaces were examined for coding of sound, precavitated lesion, decayed, missing or filled. Each child was assessed for dental fluorosis using six categories of the Thyrsrup and Fejerskov (T-F) index for a permanent upper central (front) incisor tooth.

Reliability of each of the examiners relative to the principal survey examiner was determined by calculating the intra-class correlation coefficient (ICC) of count data for each replicate pair (Table 1) and the Kappa values for categorical coding of individual tooth and surface status (Table 2). The ICC was calculated using the method of Shrout and Fleiss (1979) and is a measure of correlation, consistency or conformity of the data between examiners. ICC values range from negative 1.0 to a maximum of 1.0 with higher values representing greater agreement.

Kappa statistics were calculated using the method of Cohen (1960), which is a measure of inter-rater agreement that takes into account the agreement occurring by chance. Kappa values range from negative values to a maximum value of 1.0 when examiners are in complete agreement. As a guide, Landis and Koch (1977) proposed the following values for interpreting Kappa values; < 0 no agreement, 0.0-0.2 slight agreement, 0.2-0.4 fair agreement, 0.4-0.6 moderate agreement, 0.6-0.8 substantial agreement, 0.8-1.0 almost perfect agreement.

Table 1: Intra-class correlations for assessment of inter-rater reliability

Index	No. of examiners	No. of children	ICC
Number of teeth present per child	20	131	1.00
Number of teeth missing due to pathology per child	4	6	0.96
Number of precavitated lesions per child	20	53	0.83
Number of decayed teeth per child	20	70	0.97
Number of filled teeth per child	19	46	0.89
Number of decayed, missing, filled or precavitated teeth per child	20	93	0.97
Number of decayed, missing or filled teeth per child	20	82	0.99
Number of decayed, missing, filled or precavitated surface per child	20	93	0.99
Number of decayed, missing or filled surface per child	20	82	0.99

Table 2: Kappa statistics for assessment of inter-rater reliability

Index	No. of examiners	No. of children	% agreement	Kappa	Weighted Kappa
Fluorosis category *	19	66	81.8	0.67	0.70
Decayed, missing, filled or precavitated lesion category of individual teeth	20	93	89.8	0.84	NA [#]
Decayed, missing or filled category of individual teeth	20	82	93.0	0.86	NA
Decayed, filled or precavitated lesion category of individual surface	20	93	93.0	0.88	NA
Decayed or filled category of individual surface	20	80	94.7	0.89	NA

* Children were excluded if a non-fluorotic lesion was observed on the buccal surface or if a restoration of fixed orthodontic appliance was present on the labial coronal surface

[#] NA – not applicable. Weighted Kappa values were only calculated for fluorosis index where the categories are ordinal

3.2 Demographic composition of the Survey population

A total of 7,975 children aged 5 to 12 years were examined in the Survey. This represents 98% of the expected sample size of 8,000 children. The Survey population comprised 4,052 females (50.8%) and 3,923 males (49.2%). Table 3 lists the unweighted number of children aged 5 to 12 years of age who were sampled in the Survey, sorted by age group, Area Health Service of residence and sex. Because the postcode of residence was used to determine the Area Health Service of the survey participants, the number of children in each age group and Area Health Service was rounded to the nearest whole integer for ease of interpretation. Hence, the sum may not equal the total.

Children in the two key age groups of 5 and 6 years and 11 and 12 years were over-sampled in the Survey, with 2,095 (26.3%) and 2,418 (30.3%) children in the two age groups, respectively.

The Survey excluded children not enrolled in primary schools and children who reside interstate but attend a primary school in New South Wales. Although they may differ on key characteristics, they represent only a very small proportion of the New South Wales child population, and therefore are less likely to be representative of their respective age groups.

Table 3: Number of children surveyed by Area Health Service of residence

Age (years)	Area Health Service (AHS)								New South Wales (NSW)		
	SSW AHS	SESI AHS	SW AHS	NSCC AHS	HNE AHS	NC AHS	GS AHS	GW AHS	Gender		Total
									Male	Female	
5	151	123	163	143	110	100	107	83	464	517	981
6	162	134	160	161	145	115	129	109	573	541	1,114
7	135	108	131	121	109	88	94	77	419	444	863
8	136	110	127	127	110	86	105	78	399	480	879
9	128	107	129	121	104	87	103	82	423	438	861
10	123	106	124	125	114	90	99	78	418	441	859
11	227	185	216	202	169	135	148	131	713	700	1,413
12	118	114	165	162	123	119	115	89	514	491	1,005
Total	1,180	987	1,214	1,162	985	820	901	726	3,923	4,052	7,975

3.2.1 Mother's country of birth

The mother's country of birth for the majority of children in the Survey was reported as Australia (73.4%), with 26.6% of mothers born overseas (Table 4). The most common overseas maternal countries of birth were the United Kingdom (3.6%), China (2.3%), New Zealand (1.9%) and Vietnam (1.9%).

Analysis of children's dental status by mother's country of birth provided a reasonable surrogate for language as a potential indicator for higher burden of dental disease (Table 23).

Table 4: Survey population by mother's country of birth

Country	Number of children	Percentage (%)
Australia	5856	73.4
United Kingdom	288	3.6
China	186	2.3
New Zealand	153	1.9
Vietnam	148	1.9
Lebanon	134	1.7
Philippines	112	1.4
India	87	1.1
South Africa	41	0.5
Hong Kong	40	0.5
Germany	30	0.4
USA	30	0.4
Italy	23	0.3
Netherlands	13	0.2
Greece	10	0.1
Other	772	9.7
Unknown	52	0.7
Total	7975	100

3.2.2 Aboriginality

Slightly fewer than 6% of the survey population were designated as Aboriginal on the consent form (Table 5). Of these 93.4% were Aboriginal only, 4.4% were Torres Strait Islander only and 2.2% were both Aboriginal and Torres Strait Islander. In this report the term 'Aboriginal' is used throughout in preference to 'Aboriginal and Torres Strait Islander' in recognition that Aboriginal people are the original inhabitants of New South Wales.

In New South Wales, Aboriginal people comprise 2.2% of the total population (New South Wales Department of Health, 2006); with Aboriginal children aged 5 to 14 years comprising 4.2% of their respective age group. Although the proportion of children identified in the Survey as Aboriginal is higher than the proportion for New South Wales, it should be recognised that the Aboriginal population is generally under-identified, mainly due to incomplete and differential identification of Aboriginal people in administrative data collections (Report of the Chief Health Officer New South Wales 2008).

Table 5: Number of children surveyed by Aboriginality

Age (years)	Aboriginal	Non-Aboriginal	Unknown	Total	Percentage of survey (%)
5	53	826	102	981	5.4
6	67	929	118	1,114	6.0
7	39	721	103	863	4.5
8	49	741	89	879	5.6
9	51	719	91	861	5.9
10	52	708	99	859	6.1
11	79	1,154	180	1,413	5.6
12	68	793	144	1,005	6.8
Total	458	6,591	926	7,975	5.7

3.3 Deciduous (baby) teeth

3.3.1 Dental caries experience (dmft and components)

Age-specific decay experience in deciduous teeth is expressed as the mean number of decayed, missing (due to caries) and filled teeth (Table 6). In any given age group only a few teeth were indicated as missing due to caries, the highest being among 8 year olds who had an average of 0.13 missing teeth per child. The mean number of filled teeth showed a consistent increase from an average of 0.32 teeth per child among 5 year olds to 0.65 teeth per child among 8 year olds, before declining to 0.55 teeth per child among 10 year olds. As can be seen in Table 6, from the age of 5 years children shed on average two to three deciduous teeth per year, declining from an average of 19.1 teeth per child among 5 year olds to 7.2 teeth per child among 10 year olds. The fluctuating mean values for dmft across age groups are the result of the dynamics of exfoliating deciduous teeth and their replacement by permanent teeth.

Table 6: Deciduous teeth – decayed, missing and filled teeth and dmft index by age

Age (years)	Teeth present	Decayed (d)		Missing (m)		Filled (f)		dmft	
		Mean	SEM*	Mean	SEM	Mean	SEM	Mean	SEM
5	19.1	1.18	0.07	0.12	0.03	0.32	0.03	1.62	0.09
6	17.4	1.01	0.06	0.07	0.02	0.36	0.03	1.44	0.08
7	14.2	0.91	0.06	0.11	0.02	0.47	0.04	1.49	0.08
8	11.9	0.90	0.06	0.13	0.02	0.65	0.05	1.68	0.08
9	10.0	0.87	0.05	0.08	0.02	0.60	0.04	1.55	0.07
10	7.2	0.58	0.04	0.07	0.02	0.55	0.04	1.20	0.06

* Standard error of the mean

The decayed, missing and filled teeth components as a percentage of dmft are shown in Figure 1 (below) and refer to the proportion of teeth with caries experience in the population having either decay, being missing due to caries or filled. For 5 and 6 year old children the proportion of dmft comprised of clinically detectable untreated decay (d/dmft) is 72.8% and 70.1%, respectively (Table 7). The proportion that is attributable to untreated decay declines with age with the accumulation of restorations placed over time, increasing from a percentage of 19.8% at age 5 to 45.8% at age 10.

The percentage of decayed, missing and filled deciduous teeth and the mean dmft index, after controlling for the number of deciduous teeth present, is shown in Figure 2. The average number of decayed teeth per 100 teeth increased slightly from 5.80 per 100 teeth at age 6 years and peaked at 8.70 per 100 teeth at age 9 years. The percentage of filled deciduous teeth increased with the accumulation of restorations across older age groups. Similarly, the percentage of deciduous teeth that were decayed, missing or filled increased from 8.48 per 100 teeth at age 5 years to 16.67 per 100 teeth at age 10 years.

Figure 1: Deciduous teeth – decayed, missing and filled components as a percentage of dmft index by age

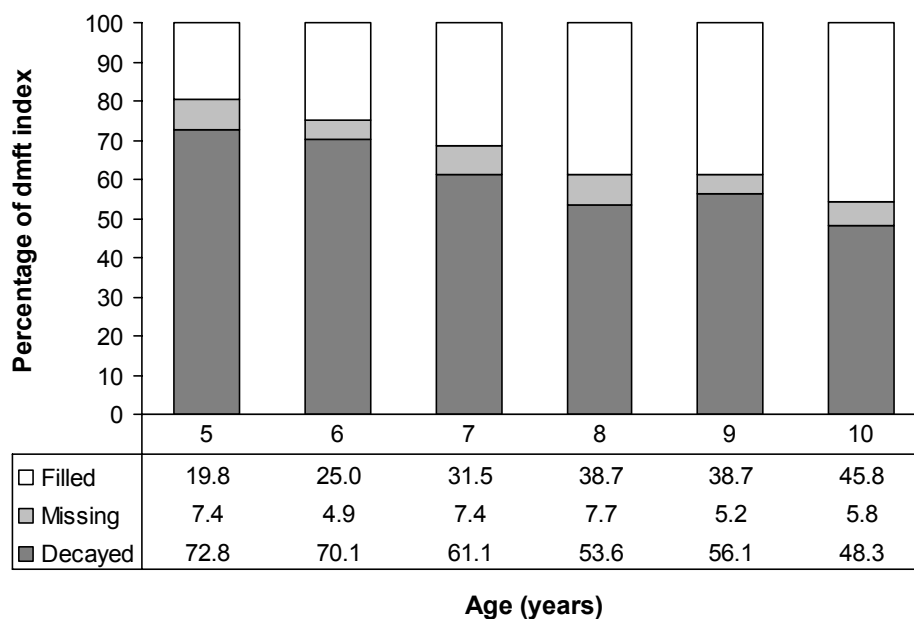
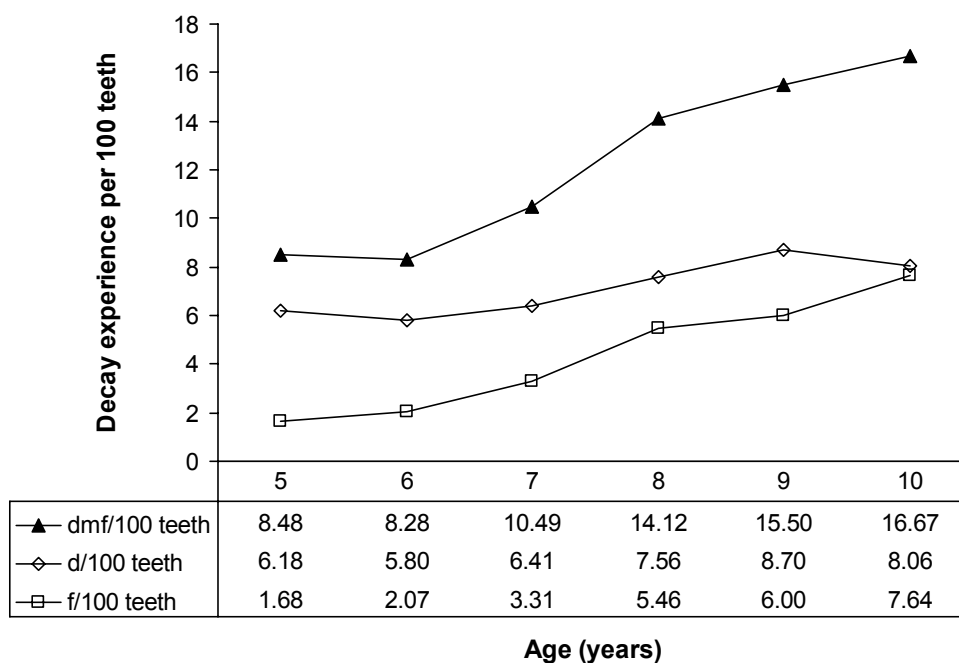


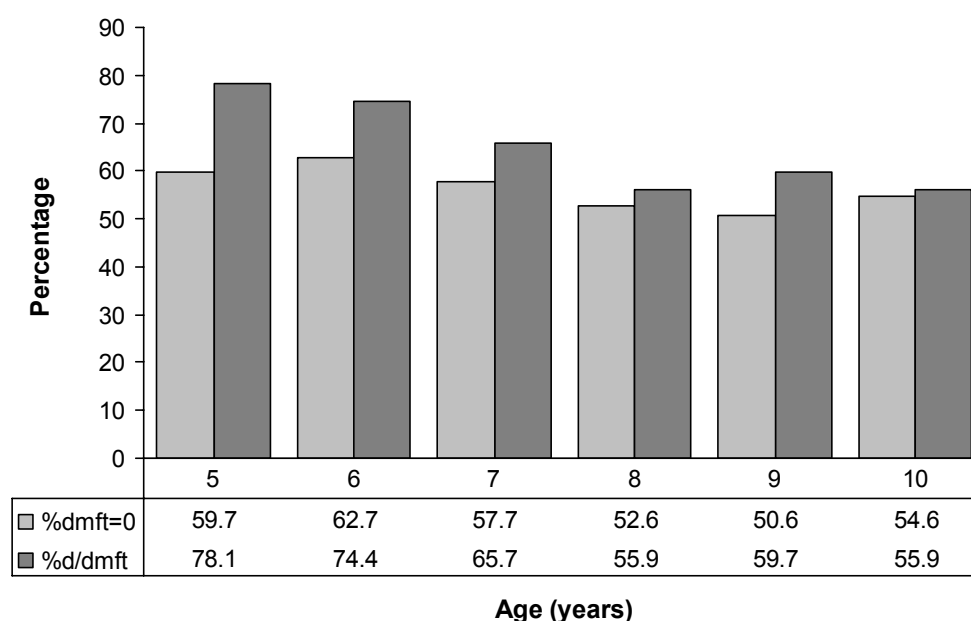
Figure 2: Deciduous teeth – Tooth-level decay experience per 100 deciduous teeth by age



The percentage of children who have never experienced clinically detectable decay in their deciduous teeth (dmft = 0) showed a general decline from 62.7% of children age 6 years to 50.6% of children aged 9 years (Figure 3). However, the percentage of children who have never experienced caries in their deciduous teeth increased to 54.6% of children aged 10 years, primarily due to shedding of deciduous teeth that may have had decay or restorations and the eruption of permanent teeth.

The mean proportion of untreated decayed teeth to the total count of decayed, missing, and filled teeth in each child (d/dmft) is an indication of the child's unmet need for dental treatment (Figure 3). The percentage of decay experience represented as untreated decayed teeth showed a steady decline across older age groups, reducing from 78.1% among 5 year olds to 55.9% among 8 year olds. The d/dmft percentage remained steady from the age of 8 years, reflecting the changing distribution of decayed and filled teeth by age.

Figure 3: Deciduous teeth – Proportion of children with no decayed, missing or filled deciduous teeth (dmft = 0) and d/dmft percent by age



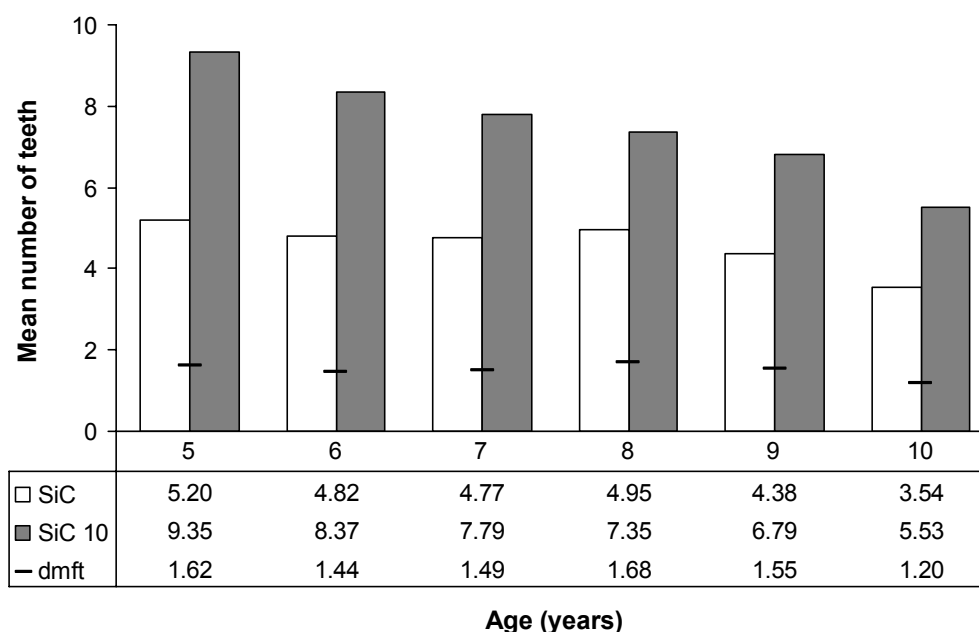
3.3.2 Significant Caries Indices

The significant caries indices for deciduous teeth, SiC and SiC¹⁰, is the mean dmft per child for the 30 and 10 per cent of children with the most decay (caries) experience for their age group, respectively (Figure 4, below). These indices are used to describe those children with the greatest burden of dental disease and thus the poorest dental health. The calculation of the indices takes into account the skewed distribution of decay prevalence among children to provide a better measure of the decay experience in populations where the majority of children have never experienced decay.

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. For example, 5.20 compared with 1.62 at age 5 years and 3.54 compared with 1.20 at age 10 years. This increase was on average 3 times the mean dmft score across the 5 to 10 year age groups.

The disproportionate distribution of decay prevalence is more evident for children with the highest 10 per cent of dmft scores. For example, 9.35 compared with 1.62 at age 5 years and 5.53 compared with 1.20 at age 10 years. This increase was on average 5 times the mean dmft score across the 5 to 10 year age groups (Figure 4).

Figure 4: Deciduous teeth – Significant Caries indices (SiC and SiC¹⁰) by age



3.3.3 Surface level dental caries experience (dmfs and components)

Decay experience in deciduous teeth expressed as decayed, missing and filled tooth surfaces (dmfs) is shown in Table 7. The mean dmfs ranged from 2.44 surfaces among 10 year olds to 3.73 surfaces among 8 year olds. The pattern for dmfs scores among 5 to 10 year olds is similar to those observed for dmft scores.

Table 7: Deciduous teeth – decayed, missing and filled surfaces by age

Age (years)	Teeth present	Decayed (d)		Missing (m)		Filled (f)		dmfs	
		Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
5	19.1	2.07	0.16	0.57	0.12	0.78	0.09	3.41	0.25
6	17.4	1.80	0.14	0.32	0.09	0.89	0.09	3.01	0.21
7	14.2	1.63	0.13	0.54	0.10	1.08	0.10	3.25	0.22
8	11.9	1.69	0.13	0.63	0.10	1.41	0.10	3.73	0.21
9	10.0	1.54	0.11	0.4	0.08	1.39	0.11	3.33	0.19
10	7.2	0.96	0.07	0.34	0.08	1.14	0.09	2.44	0.16

3.3.4. Dental caries experience of 5 and 6 year old children by Area Health Service

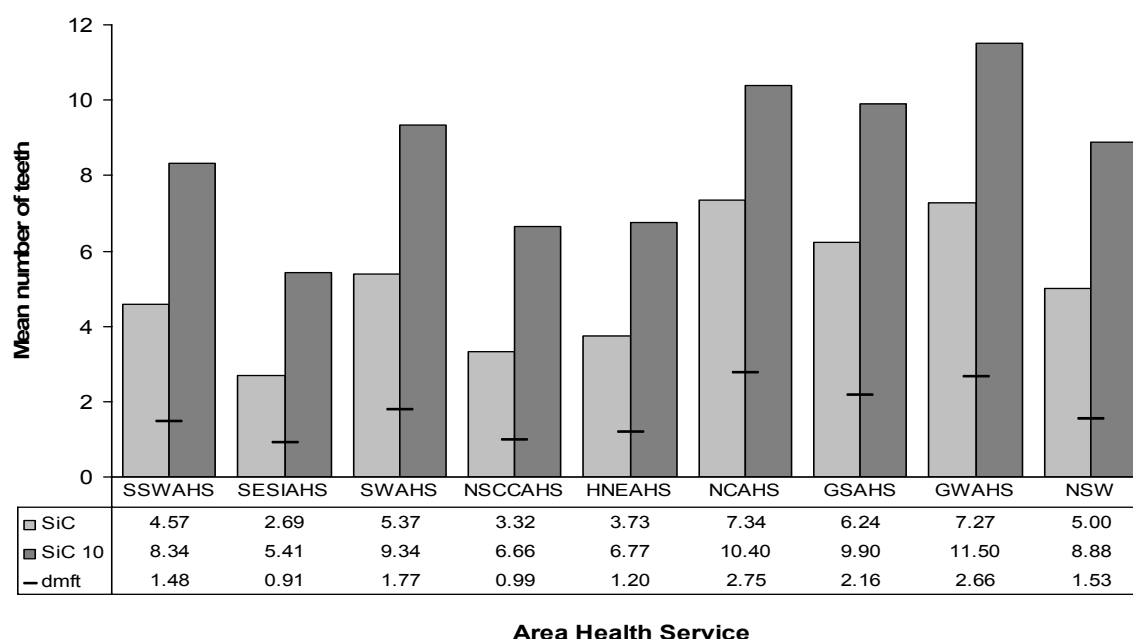
Deciduous decay experience in the key age group of children aged 5 and 6 years for the 8 Area Health Service regions of New South Wales is shown in Table 8 and in Figures 5 and 6. Considerable variation exists in decay experience across the different Area Health Services. The New South Wales average dmft score was 1.53 teeth but Area Health Services scores ranged from 0.91 teeth per child in SESIAHS to 2.75 teeth per child in NCAHS. The mean number of clinically detectable untreated decayed teeth also varied across New South Wales, from an average of 0.51 teeth per child in SESIAHS to 1.81 and 1.94 teeth per child in GWAHS and NCAHS, respectively. There were on average 1.09 decayed teeth per child for 5 and 6 year old children across New South Wales (Table 8).

Table 8: 5 and 6 year old children - decayed, missing and filled teeth and dmft index by Area Health Service

AHS	Number of children	Decayed (d)		Missing (m)		Filled (f)		dmft	
		Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
SSWAHS	313	1.08	0.10	0.06	0.03	0.34	0.05	1.48	0.13
SESAHS	257	0.51	0.07	0.03	0.03	0.37	0.06	0.91	0.10
SWAHS	323	1.36	0.11	0.11	0.04	0.30	0.04	1.77	0.13
NSCCAHS	304	0.70	0.08	0.02	0.01	0.27	0.04	0.99	0.10
HNEAHS	255	0.93	0.10	0.06	0.01	0.21	0.04	1.20	0.11
NCAHS	215	1.94	0.15	0.17	0.04	0.64	0.09	2.75	0.19
GSAHS	236	1.56	0.11	0.31	0.07	0.29	0.04	2.16	0.14
GWAHS	192	1.81	0.12	0.33	0.06	0.52	0.06	2.66	0.16
NSW	2,095	1.09	0.04	0.10	0.01	0.34	0.02	1.53	0.05

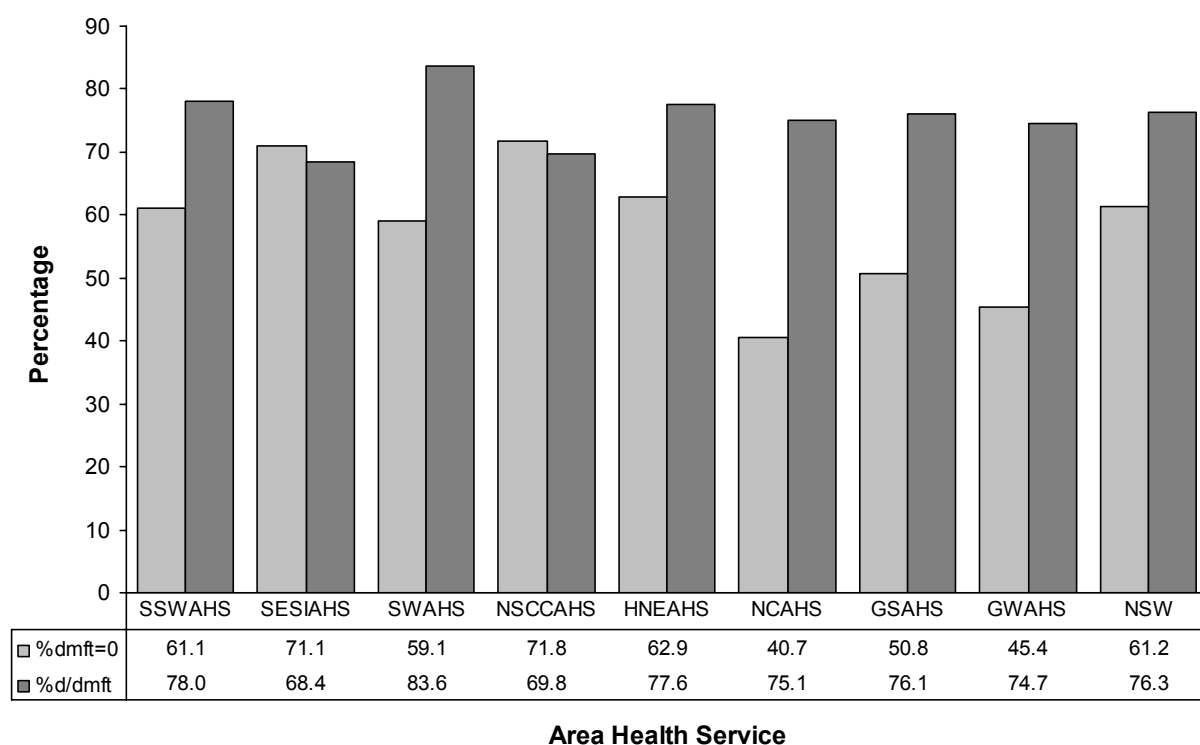
The variation in decay experience across New South Wales among children aged 5 and 6 years is clearly demonstrated for those with the highest 30 percent of dmft scores (Figure 5), with a low of 2.69 teeth per child in SESIAHS and a high of 7.27 and 7.34 teeth per child in GWAHS and NCAHS, respectively. Further disparities in decay experience are shown for children with the highest 10 percent of dmft values, ranging from 5.41 teeth per child in SESIAHS to 10.40 and 11.50 teeth per child in NCAHS and GWAHS, respectively. Across New South Wales average SiC and SiC¹⁰ values for children in the 5 and 6 year age group were 5.00 and 8.88 teeth per child, respectively (Figure 5).

Figure 5: 5 and 6 year old children - dmft and Significant Caries indices (SiC and SiC¹⁰) by Area Health Service



The percentage of children in the 5 and 6 year age group who have never experienced decay in their deciduous teeth ranged from 71.8% and 71.1% in NSCCAHS and SESIAHS, respectively, to 40.7% in NCAHS, with an average of 61.2% of children across New South Wales (Figure 6). The percentage of decay experience represented as untreated decayed teeth in each child varied across the Area Health Service regions, ranging from 68.4% in SESIAHS to 83.6% in SWAHS. The d/dmft proportion in the 5 and 6 year age group for New South Wales averaged 76.3%.

Figure 6: 5 and 6 year old children – Percentage of children with no decayed, missing or filled deciduous teeth (dmft = 0) and d/dmft percentage by Area Health Service



3.4 Permanent teeth

3.4.1. Dental caries experience (DMFT and components)

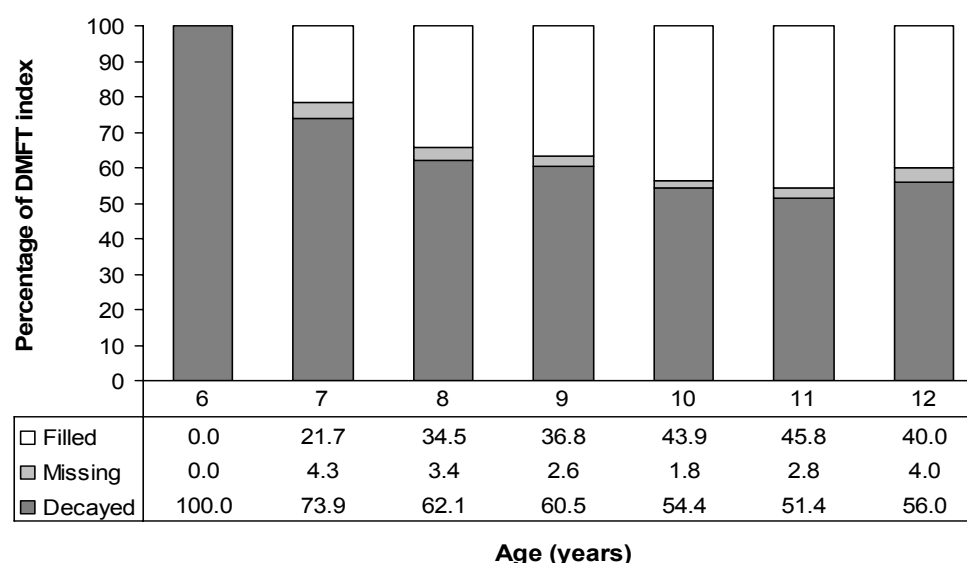
Age-specific decay experience in permanent teeth, expressed as the mean number of Decayed, Missing (due to caries) and Filled teeth, is shown in Table 9. The mean number of clinically detectable decayed permanent teeth was consistently smaller than the mean number of decayed deciduous teeth for children aged up to 12 years and ranged from an average of 0.08 for 6 year old children to 0.42 for 12 year old children. The low number of decayed teeth (D) in children up to the age of 8 years can be accounted for by the small number of permanent teeth present. The mean number of teeth missing due to caries (M) was low for all age groups while the mean number of filled teeth (F) increased across age groups from 0.00 among 6 year old children to 0.30 among 12 year old children. The mean DMFT increased across age groups from a low of 0.08 among 6 year old children to 0.75 among 12 year old children.

Table 9: Permanent teeth – decayed, missing and filled teeth by age

Age (years)	Teeth present	Decayed (D)		Missing (M)		Filled (F)		DMFT	
		Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
6	4.5	0.08	0.01	0.00	0.00	0.00	0.00	0.08	0.01
7	8.7	0.17	0.02	0.01	0.00	0.05	0.01	0.23	0.02
8	11.4	0.18	0.02	0.01	0.00	0.10	0.02	0.29	0.03
9	13.6	0.23	0.02	0.01	0.01	0.14	0.02	0.38	0.03
10	16.8	0.31	0.03	0.01	0.01	0.25	0.02	0.57	0.03
11	21.0	0.37	0.02	0.02	0.01	0.33	0.02	0.72	0.03
12	24.3	0.42	0.03	0.03	0.01	0.30	0.02	0.75	0.04

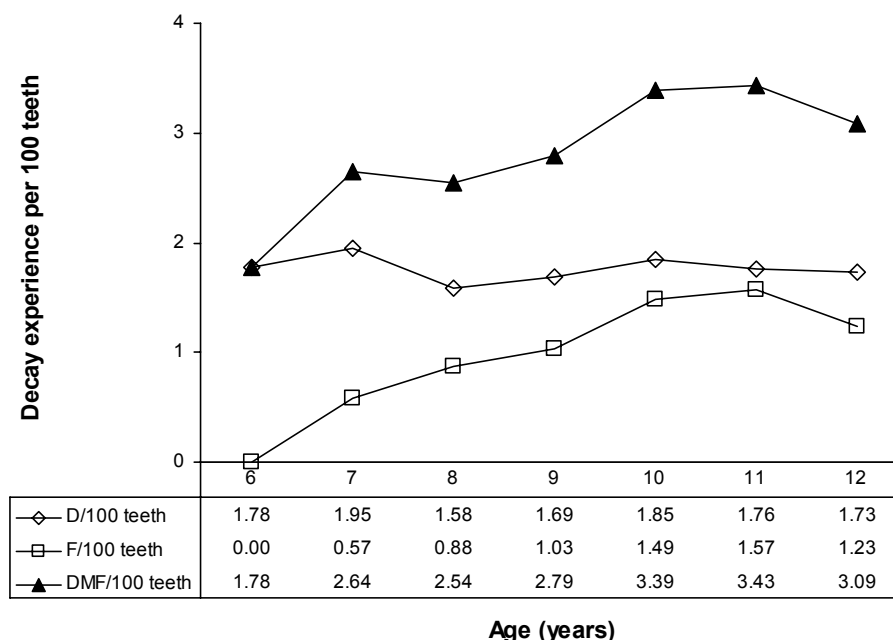
The mean number of Decayed, Missing and Filled teeth as a percentage of DMFT is shown in Figure 7. The proportions attributable to untreated decay follow a similar pattern to that shown in deciduous teeth, with an accumulation of restorations over time. For younger children, caries experience is mainly composed of clinically detectable untreated decay (73.9% for 7 year olds), which declines to 51.4% among children aged 11 years.

Figure 7: Permanent teeth – Percentage of DMFT index represented by decayed, missing and filled components



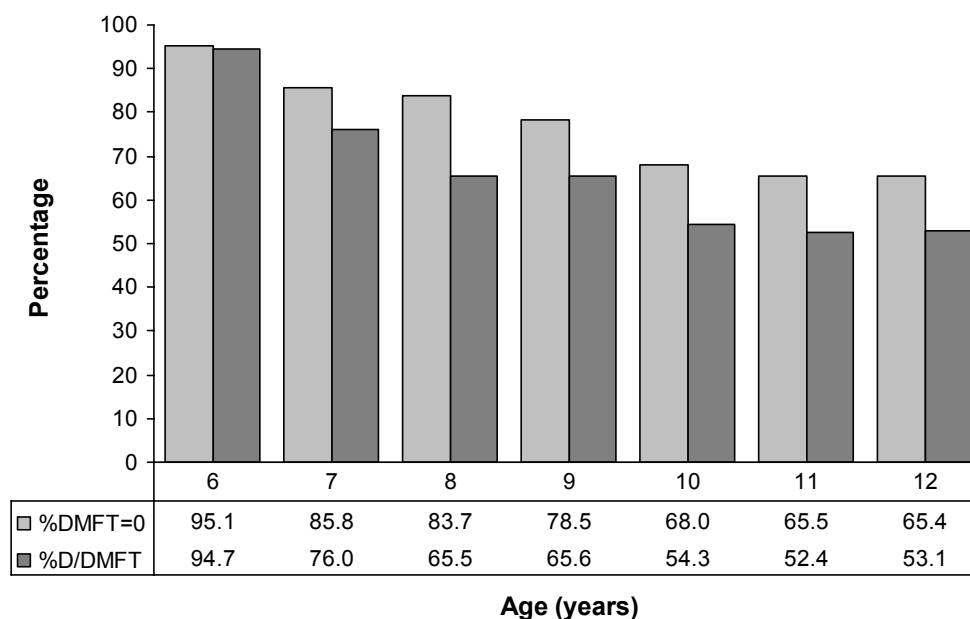
Decay experience, after controlling for the number of permanent teeth present, is shown in Figure 8. The mean number of decayed teeth per 100 teeth remained relatively steady between the ages of 6 and 12 years, peaking at a rate of 1.95 per 100 teeth for 7 year old children. With a steady rise in the rate of filled permanent teeth across age groups, the percentage of permanent teeth that were Decayed, Missing or Filled increased from 1.78 per 100 teeth at age 6 years to peak at 3.43 at age 11 years.

Figure 8: Permanent teeth – Tooth-level decay experience per 100 permanent teeth by age.



The percentage of children with no decay experience in their permanent dentition declined across older age groups, reducing from 95.1% for 6 year olds to 65.4% for 12 year olds (Figure 9). The mean D/DMFT index also declined across older age groups, reducing from 94.7% for 6 year olds to 52.4% for 11 year old children.

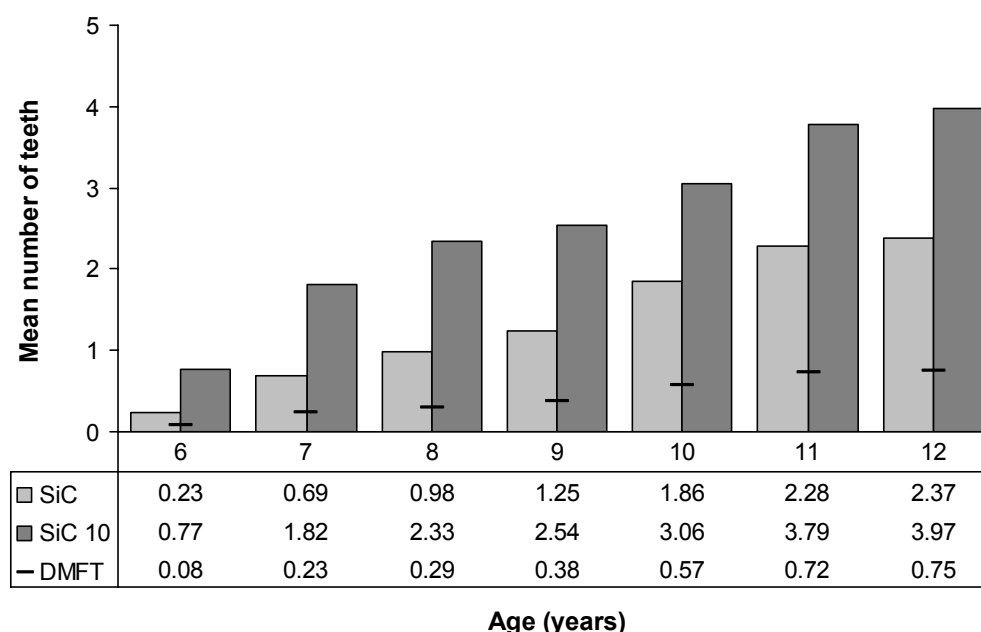
Figure 9: Permanent teeth – Percentage of children with DMFT=0 and D/DMFT percent by age



3.4.2 Significant caries experience indices

The significant caries indices for children most affected by decay experience are shown in Figure 10. For those children with the highest 30% of DMFT scores (SiC), mean DMFT scores ranged between 0.23 teeth per child for 6 year old children and 2.37 teeth per child for 12 year olds. These scores were approximately 3 times higher than the average DMFT for the entire age group. Children with the highest 10% of DMFT values (SiC¹⁰) had DMFT scores that ranged from 0.77 teeth per child (6 years old) and 3.97 teeth per child (12 years old) and were between 5.3 times (11 and 12 year olds) and 9.7 times (6 year olds) greater than the mean DMFT value for the entire age group.

Figure 10: Permanent teeth – DMFT and Significant Caries indices (SiC and SiC¹⁰) by age



3.4.3 Surface level caries experience (DMFS and components)

The mean number of permanent tooth surfaces with decay experience (DMFS) ranged from 0.11 surfaces per child for 6 year olds to 1.13 surfaces per child for 12 year olds (Table 10). The mean DMFS was approximately 27 to 36% greater than mean DMFT scores (Table 9) and there were approximately 24 to 30% more clinically decayed surfaces than there were clinically detectable decayed teeth.

Table 10: Permanent teeth – Surface level caries experience by age

Age (years)	Teeth present	Decayed (D)		Missing (M)		Filled (F)		DMFS	
		Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
6	4.5	0.10	0.02	0.00	0.00	0.01	0.00	0.11	0.02
7	8.7	0.21	0.02	0.05	0.02	0.07	0.02	0.33	0.04
8	11.4	0.23	0.03	0.04	0.02	0.15	0.02	0.42	0.05
9	13.6	0.30	0.03	0.05	0.02	0.21	0.03	0.56	0.05
10	16.8	0.40	0.04	0.07	0.03	0.41	0.04	0.89	0.06
11	21.0	0.47	0.03	0.10	0.03	0.53	0.04	1.10	0.06
12	24.3	0.54	0.05	0.14	0.04	0.45	0.04	1.13	0.08

3.4.4. Dental caries experience in 11 and 12 year old children by Area Health Service

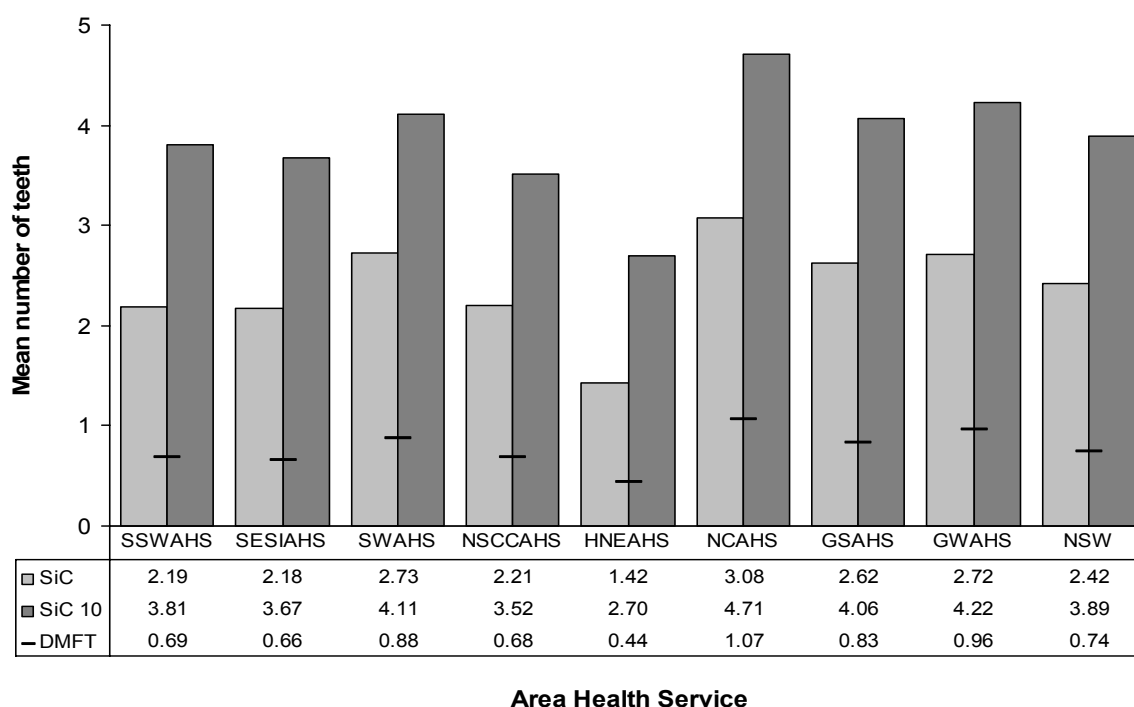
Decay experience in permanent teeth of children in the key age group of 11 and 12 years, for the eight Area Health Service regions of New South Wales, is shown in Table 11. It varied between the different Area Health Services with mean DMFT ranging from 0.44 teeth per child in HNEAHS to 1.07 teeth per child in NCAHS. Among 11 and 12 year old children in New South Wales mean DMFT was 0.74 teeth per child. The mean number of detectable decayed permanent teeth was highest in NCAHS (0.66 teeth) and lowest in HNEAHS (0.20 teeth).

Table 11: 11 and 12 year old children – decayed, missing and filled teeth and DMFT index by Area Health Service

AHS	Number of children	Decayed (D)		Missing (M)		Filled (F)		DMFT	
		Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
SSWAHS	345	0.46	0.05	0.03	0.01	0.19	0.03	0.69	0.06
SESAHS	299	0.29	0.04	0.00	0.00	0.37	0.04	0.66	0.06
SWAHS	381	0.54	0.04	0.03	0.01	0.31	0.03	0.88	0.05
NSCCAHS	364	0.31	0.04	0.02	0.01	0.34	0.04	0.68	0.05
HNEAHS	292	0.20	0.03	0.04	0.01	0.20	0.03	0.44	0.04
NCAHS	254	0.66	0.06	0.04	0.01	0.38	0.05	1.07	0.08
GSAHS	263	0.34	0.04	0.02	0.01	0.48	0.04	0.83	0.06
GWAHS	220	0.49	0.04	0.02	0.01	0.46	0.04	0.96	0.06
NSW	2,418	0.40	0.02	0.02	0.00	0.31	0.01	0.74	0.02

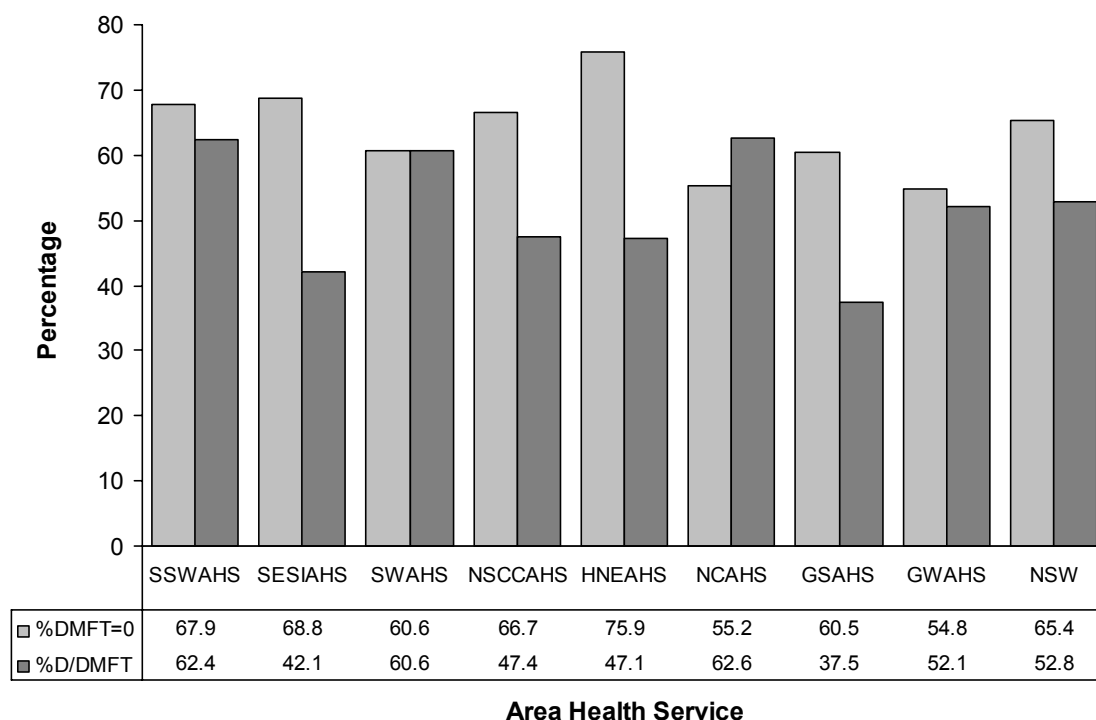
The variation in decay experience among 11 and 12 year old children across New South Wales is also evident for those with the highest 30% of DMFT values, with a low of 1.42 teeth per child in HNEAHS to a high of 3.08 teeth per child in NCAHS (Figure 11). Decay experience among children with the highest 10% of DMFT values showed further disparities ranging from 2.70 teeth per child in HNEAHS to 4.71 teeth per child in NCAHS. For New South Wales, SiC and SiC¹⁰ values in permanent teeth for the 11 and 12 year age group were on average 2.42 and 3.89 teeth per child, respectively.

Figure 11: 11 and 12 year old children – DMFT, Significant Caries indices (SiC and SiC¹⁰) by Area Health Service



The percentage of children in the 11 and 12 year age group who have never experienced decay in their permanent teeth ranged from a high of 75.9% in HNEAHS to a low of 55.2% in NCAHS with a mean of 65.4% of children across New South Wales (Figure 12). The percentage of decay experience represented as untreated decayed permanent teeth in each child varied across the Area Health Service regions, ranging from 37.5% in GSAHS to 62.4% and 62.6% in SSWAHS and NCAHS, respectively. In New South Wales the D/DMFT proportion in the 11 and 12 year age group averaged 52.8%.

Figure 12: 11 and 12 year old children – Percentage of children with DMFT=0 and D/DMFT percent by Area Health Service



3.5. Presence of fissure sealants (S) on permanent teeth

The presence of at least one fissure sealant placed on a permanent tooth by age group is shown in Table 12. Although relatively few, the mean number of fissure sealants per child increased consistently across older age groups with a mean of 0.53 sealants per child among 12 year olds. Fissure sealants were less common among children aged 8 to 12 years who had no permanent caries experience (DMFT=0) than amongst those with some caries experience (DMFT>1). This observation reflects the use of fissure sealants in children who are at high risk for dental caries.

Table 12: Fissure sealants in permanent teeth by age

Age (years)	Weighted number of children*	Mean S	Percent with S (%)	DMFT=0		DMFT≥1	
				Weighted number of children	Percent with S (%)	Weighted number of children	Percent with S (%)
5	86,880	0.01	0.4	86,072	0.4	808	0.0
6	88,156	0.03	1.3	83,789	1.3	4,367	0.0
7	87,158	0.15	5.8	74,738	5.9	12,420	5.0
8	87,269	0.34	11.3	73,036	9.8	14,233	18.9
9	88,098	0.35	12.8	69,148	11.9	18,950	16.3
10	88,711	0.40	15.4	60,351	12.3	28,360	21.8
11	90,902	0.51	17.8	59,492	15.1	31,410	22.9
12	90,477	0.53	17.9	59,125	15.3	31,352	22.9
Total	707,650	0.29	10.4	565,750	8.3	141,900	19.0

* Weighted number of children relates to the number of children sampled multiplied by their sample weight, hence it corresponds to the age specific population size for New South Wales.

For children between the ages of 5 and 12 years, there is considerable variation across New South Wales in the proportion of children who have at least one fissure sealant placed on a permanent tooth (Table 13). These proportions were between 1.5 times (SSWAHS) and 4.5 times (HNEAHS) higher among children with permanent decay experience.

Table 13: Fissure sealants (S) in permanent teeth by Area Health Service

AHS	Weighted number of children	Mean S per child	Percent with S (%)	DMFT=0		DMFT≥1	
				Weighted number of children	Percent with S (%)	Weighted number of children	Percent with S (%)
SSWAHS	135,084	0.21	7.1	108,326	6.5	26,758	9.5
SESAHS	107,020	0.19	7.0	89,266	6.3	17,754	10.5
SWAHS	125,517	0.26	9.7	95,592	7.7	29,925	16.2
NSCCAHS	108,289	0.55	18.6	88,898	15.0	19,391	35.1
HNEAHS	90,894	0.11	4.3	78,777	3.0	12,116	13.4
NCAHS	51,238	0.49	18.4	37,575	13.9	13,662	30.7
GSAHS	55,570	0.28	10.1	41,810	6.9	13,760	19.7
GWAHS	34,038	0.41	15.6	25,506	11.5	8,533	27.8
NSW	707,650	0.29	10.4	565,750	8.3	141,900	19.0

Data provided in Table 15 related to tooth-surface-type should be read in conjunction with the fissure sealant information in Table 13.

Table 14: 5 and 6 year old children – decayed and filled components by surface type and dmfs by Area Health Service

AHS	Smooth		Approximal		Occlusal		dmfs	
	d	f	d	f	d	f	Mean	SEM
SSWAHS	0.63	0.24	0.83	0.24	0.59	0.34	3.15	0.33
SESIAHS	0.18	0.25	0.34	0.31	0.35	0.38	1.95	0.27
SWAHS	0.88	0.27	0.98	0.27	0.79	0.31	4.01	0.37
NSCCAHS	0.17	0.13	0.49	0.12	0.41	0.25	1.69	0.21
HNEAHS	0.44	0.08	0.66	0.10	0.60	0.21	2.40	0.30
NCAHS	0.78	0.39	1.33	0.54	0.93	0.60	5.36	0.47
GSAHS	0.71	0.22	1.11	0.18	0.82	0.27	4.68	0.42
GWAHS	1.09	0.37	1.33	0.36	1.07	0.52	6.20	0.47
NSW	0.55	0.23	0.79	0.24	0.63	0.33	3.21	0.12

Table 15: 11 and 12 year old children – decayed and filled components by surface type and DMFS by Area Health Service

AHS	Smooth		Approximal		Occlusal		DMFS	
	D	F	D	F	D	F	Mean	SEM
SSWAHS	0.21	0.04	0.06	0.04	0.95	0.16	1.08	0.11
SESIAHS	0.12	0.07	0.09	0.04	0.61	0.36	0.99	0.10
SWAHS	0.25	0.07	0.06	0.06	1.10	0.26	1.36	0.10
NSCCAHS	0.08	0.03	0.06	0.06	0.55	0.29	0.91	0.08
HNEAHS	0.07	0.02	0.03	0.05	0.39	0.18	0.72	0.10
NCAHS	0.21	0.12	0.18	0.08	1.20	0.35	1.68	0.15
GSAHS	0.12	0.07	0.10	0.09	0.67	0.44	1.23	0.10
GWAHS	0.21	0.10	0.11	0.05	1.01	0.42	1.42	0.10
NSW	0.16	0.06	0.07	0.06	0.79	0.28	1.12	0.04

3.6. Decay experience by Aboriginality

Parents and guardians of Survey participants were asked to classify their Aboriginal status on the consent form. 5.7% of the children examined identified themselves as Aboriginal. The decay experience in the two key age groups, 5 and 6 year old and 11 and 12 year old children by Aboriginality is presented in Table 16.

Table 16: Age-specific decay experience by Aboriginality

Oral Health Indicator		Age groups (years)		
		5-6	11-12	5-12
Number of children				
Aboriginal	N	120	147	458
Non-Aboriginal	N	1,755	1,947	6,591
Percent of survey Aboriginal	%	5.7	6.1	5.7
NSW	N	2,095	2,418	7,975
Decayed, missing and filled teeth		dmft	DMFT	dmft+DMFT
Aboriginal	Mean	3.04	1.17	2.64
	95% CI	2.34 - 3.73	0.85 - 1.50	2.29 - 3.00
Non-Aboriginal	Mean	1.44	0.68	1.54
	95% CI	1.27 - 1.61	0.60 - 0.76	1.45 - 1.64
NSW	Mean	1.53	0.74	1.61
	95% CI	1.36 – 1.70	0.66 – 0.81	1.51 – 1.72
Decayed teeth		d	D	d+D
Aboriginal	Mean	2.22	0.67	1.76
	95% CI	1.59 - 2.85	0.42 - 0.92	1.44 - 2.07
Non-Aboriginal	Mean	1.03	0.36	0.92
	95% CI	0.90 - 1.16	0.31 - 0.42	0.84 – 0.99
NSW	Mean	1.09	0.40	0.96
	95% CI	0.96 – 1.23	0.35 – 0.45	0.88 – 1.05
Percent dmft/DMFT=0		dmft=0	DMFT=0	dmft+DMFT=0
Aboriginal	Prevalence (%)	35.2	53.6	36.2
	95% CI	24.0 – 46.4	43.5 – 63.6	29.4 – 42.9
Non-Aboriginal	Prevalence (%)	62.4	67.2	52.8
	95% CI	59.4 – 65.4	64.3 – 70.0	50.9 – 54.7
NSW	Prevalence (%)	61.2	65.4	51.8
	95% CI	58.3 – 64.1	62.8 – 68.0	49.8 – 53.7

Among children aged 5 and 6 years the mean dmft for Aboriginal children was 3.04, more than twice the mean dmft of 1.44 for non-Aboriginal participants (Table 16). The d component of the index, indicating untreated dental caries, was the main reason for this disparity in oral health. Table 16 shows that the mean d component for Aboriginal 5-6 year old children was 2.22 compared with 1.03 for other participants.

This inequality in oral health was mirrored in 11 and 12 year old children with Aboriginal children having almost twice the decay experience (0.67) when compared with non-Aboriginal children (0.36).

The proportions of children with no history of dental decay also showed considerable differences. Only 35.2% of Aboriginal 5 and 6 year olds and 53.6% of 11 and 12 year olds had never suffered dental decay. The comparable proportions for non-Aboriginal children were 62.4% and 67.2%, respectively.

3.7. Decay experience by cardholder status

The Survey asked parents and guardians of survey participants whether they held a Centrelink concession card (Health Care Card, Pensioner Concession Card or Commonwealth Seniors Health Card).

Of the total sample of children examined, 35.2% were dependents of an individual holding a Centrelink concession card. Table 17 details the dental health of the two key age groups 5 and 6 and 11 and 12 year olds, together with composite data for the whole sample.

It can be seen in Table 17 that the mean dmft of cardholder children aged 5 and 6 years was 2.11 compared with 1.19 for non-cardholders; a difference of 44 %. The untreated component was the reason for the major difference in oral health amongst these young children. For cardholders the d component was 1.59 compared with 0.80 for non-cardholders.

The older group of 11 and 12 year old children also had major differences in oral health when compared by cardholder status. Mean DMFT for cardholders was 0.98 compared with non-cardholders of 0.61, a 38% difference.

Table 17 shows there was considerable variation in the proportions of children who were free of any dental disease.

Table 17: Age-specific decay experience by Centrelink concession cardholder status

Oral Health Indicator		Age groups (years)		
		5-6	11-12	5-12
Number of children				
Cardholder	N	773	856	2,807
Non-cardholder	N	1,262	1,493	4,959
Percent of survey cardholder	%	36.9	35.4	35.2
NSW	N	2,095	2,418	7,975
Decayed, missing and filled teeth		dmft	DMFT	dmft+DMFT
Cardholder	Mean	2.11	0.98	2.14
	95% CI	1.83 – 2.39	0.86 – 1.10	1.98 – 2.29
Non-cardholder	Mean	1.19	0.61	1.34
	95% CI	1.03 – 1.35	0.53 – 0.68	1.25 – 1.42
NSW	Mean	1.53	0.74	1.61
	95% CI	1.36 – 1.70	0.66 – 0.81	1.51 – 1.72
Decayed teeth		d	D	d+D
Cardholder	Mean	1.59	0.60	1.40
	95% CI	1.37 – 1.81	0.50 – 0.71	1.26 – 1.54
Non-cardholder	Mean	0.80	0.29	0.73
	95% CI	0.69 – 0.91	0.24 – 0.33	0.67 – 0.79
NSW	Mean	1.09	0.40	0.96
	95% CI	0.96 – 1.23	0.35 – 0.45	0.88 – 1.05
Percent dmft/DMFT=0		dmft=0	DMFT=0	dmft+DMFT=0
Cardholder	Prevalence (%)	51.7	57.8	42.5
	95% CI	47.6 – 55.8	53.8 – 61.9	40.1 – 44.9
Non-cardholder	Prevalence (%)	66.6	69.8	56.6
	95% CI	63.5 – 69.6	66.7 – 72.9	54.7 – 58.5
NSW	Prevalence (%)	61.2	65.4	51.8
	95% CI	58.3 – 64.1	62.8 – 68.0	49.8 – 53.7

3.8. Dental health status of children designated as in need of immediate treatment

The Survey recorded the immediate treatment need status of the participants. The conditions that triggered this designation are detailed in Figure 13.

Figure 13: Immediate treatment need categories

Common conditions

- Existing pain
- Abscessed teeth
- Grossly decayed teeth with obvious pulpal involvement
- Avulsed teeth or fractured teeth requiring immediate treatment of pain or infection.

Rarer conditions

- Primary oral herpes
 - Other severe conditions with oral manifestations (e.g. acute necrotising gingivitis, intra-oral swelling)
-

5.2% of the total sample examined were recorded as having an immediate treatment need. The oral health status of 5 and 6 and 11 and 12 year old children according to immediate treatment need status is presented in Table 18 where it can be seen that those 5 and 6 year old children with an immediate treatment need had a mean dmft of 6.24, almost 5 times higher than other children who had a mean dmft of 1.27. The mean d component of the immediate treatment group was 5.32, which is 6 times higher than the other 5 and 6 year old participants ($d = 0.86$).

Similar findings for 11 and 12 year old children are detailed in Table 18. A three-fold difference in DMFT scores was noted by immediacy of dental needs, DMFT 2.32 versus 0.69. This difference in the two groups was also observed in the D component, untreated permanent tooth decay. For the immediate treatment need group $D = 1.95$ and for the others $D = 0.35$; a five-fold difference.

As one would expect, dramatic differences were observed in the proportions of children with no dental disease ($dmft$ and $DMFT = 0$) experience (Table 18). Only 6.8% of 5 and 6 year olds and 20.9% of 11 and 12 year old children in the immediate treatment need group had no history of dental disease. The comparable proportions in the two age groups who had no immediate treatment need were 64.3% and 66.7%, respectively.

Table 18: Age-specific decay experience by immediate treatment need status

Oral Health Indicator		Age groups (years)		
		5-6	11-12	5-12
Number of children				
Immediate treatment needed	N	112	83	414
No immediate treatment needed	N	1,964	2,305	7,470
<i>Percent of survey require immediate treatment</i>	%	5.3	3.4	5.2
NSW	N	2,095	2,418	7,975
Decayed, missing and filled teeth		dmft	DMFT	dmft+DMFT
Immediate treatment needed	Mean	6.24	2.32	5.11
	95% CI	5.43 – 7.04	1.81 – 2.84	4.76 – 5.46
No immediate treatment needed	Mean	1.27	0.69	1.43
	95% CI	1.12 – 1.42	0.62 – 0.76	1.34 – 1.52
NSW	Mean	1.53	0.74	1.61
	95% CI	1.36 – 1.70	0.66 – 0.81	1.51 – 1.72
Decayed teeth		d	D	d+D
Immediate treatment needed	Mean	5.32	1.95	4.13
	95% CI	4.54 – 6.10	1.46 – 2.43	3.81 – 4.46
No immediate treatment needed	Mean	0.86	0.35	0.80
	95% CI	0.75 – 0.97	0.30 – 0.40	0.72 – 0.87
NSW	Mean	1.09	0.40	0.96
	95% CI	0.96 – 1.23	0.35 – 0.45	0.88 – 1.05
Percent dmft/DMFT=0		dmft=0	DMFT=0	dmft+DMFT=0
Immediate treatment needed	Prevalence (%)	6.8	20.9	3.6
	95% CI	1.5 – 2.2	11.3 – 30.4	1.8 – 5.4
No immediate treatment needed	Prevalence (%)	64.3	66.7	54.3
	95% CI	61.5 – 67.1	64.2 – 69.2	52.4 – 56.2
NSW	Prevalence (%)	61.2	65.4	51.8
	95% CI	58.3 – 64.1	62.8 – 68.0	49.8 – 53.7

3.9. Decay experience according to fluoridation status

Fluoridation of community water supplies involves adjusting the level of fluoride in the water to achieve a concentration of approximately 1 ppm.

The Survey mapped the postcode of residence of survey participants to fluoridated and non-fluoridated areas according to the databases maintained by the Centre for Oral Health Strategy and the Australian Research Centre for Population Oral Health. Almost 85% of children had access to fluoridated water at the time the Survey was undertaken. The decay experience in the two key age groups of 5 and 6 years and 11 and 12 years by fluoridated areas is presented in Table 19.

In the 5 and 6 year old age group, children with access to fluoridated water had significantly lower dental decay, with a mean dmft of 1.40 and a mean d (untreated decay) score of 1.00. The mean dmft and d components for children without access to fluoridated water were 2.62 and 1.82, almost twice that of children in fluoridated areas.

In children aged 11 and 12 years, the overall caries experience in permanent teeth was 0.98 for those from non-fluoridated areas and 0.71 teeth from those in fluoridated areas, an average per capita difference of 0.27 fewer affected teeth.

For all ages, only 40% of children from non-fluoridated areas, compared with 53% of children from fluoridated areas were caries free (dmft+DMFT=0).

Table 19: Age-specific decay experience by fluoridation status

Oral Health Indicator		Age groups (years)		
		5-6	11-12	5-12
Number of children				
Fluoridated	N	1,736	2,018	6,612
Non-fluoridated	N	317	355	1,193
Percent of survey fluoridated	%	84.6	85.0	84.7
NSW	N	2,053	2,373	7,805
Decayed, missing and filled teeth		dmft	DMFT	dmft+DMFT
Fluoridated	Mean	1.40	0.71	1.52
	95% CI	1.22 – 1.58	0.63 – 0.79	1.41 – 1.63
Non-fluoridated	Mean	2.62	0.98	2.37
	95% CI	1.89 – 3.36	0.75 – 1.21	1.97 – 2.76
NSW	Mean	1.53	0.74	1.61
	95% CI	1.36 – 1.70	0.66 – 0.81	1.51 – 1.72
Decayed teeth		d	D	d+D
Fluoridated	Mean	1.00	0.38	0.90
	95% CI	0.87 – 1.15	0.32 – 0.44	0.81 – 1.00
Non-fluoridated	Mean	1.82	0.52	1.39
	95% CI	1.28 – 2.37	0.36 – 0.67	1.14 – 1.64
NSW	Mean	1.09	0.40	0.96
	95% CI	0.96 – 1.23	0.35 – 0.45	0.88 – 1.05
Percent dmft/DMFT=0		dmft=0	DMFT=0	dmft+DMFT=0
Fluoridated	Prevalence (%)	63.2	66.5	53.3
	95% CI	60.0 – 66.3	63.7 – 69.4	51.1 – 55.5
Non-fluoridated	Prevalence (%)	45.9	56.4	40.3
	95% CI	35.0 – 56.7	48.8 – 64.0	33.6 – 47.0
NSW	Prevalence (%)	61.2	65.4	51.8
	95% CI	58.3 – 64.1	62.8 – 68.0	49.8 – 53.7

3.10. Prevalence of fluorosis

Fluoridation of community water supplies at approximately 1 ppm has been proven to be a beneficial level in preventing dental decay while also avoiding an unacceptable risk of dental fluorosis. Fluorosis is a discolouration of the tooth enamel that may appear as white or brown marks and pits on the tooth surface.

The Survey recorded the fluorosis level observed on the right maxillary central permanent incisor (or the left if less than 50% of the right incisor was erupted) using the Thylstrup and Fejerskov (TF) Index (Fejerskov et al. 1988). The presence of moderate (clearly visible) fluorosis is defined as a TF score of 3 or more on incisor teeth.

Children were excluded if a restoration or an orthodontic appliance was evident on the buccal surface, or both maxillary central incisors were only partially erupted. Only children aged 8 to 12 years were included in the analysis as the permanent incisors should be fully erupted to enable a full-crown diagnosis. Non-fluorotic lesions refer to discolourations in the tooth enamel that are not related to fluoride exposure, such as trauma or a high temperature illness at the time of development or demineralisation due to dental caries.

The prevalence of fluorosis in the 11 to 12 year age group and for all children aged 8 to 12 years, by fluoridated areas is presented in Table 20.

The overwhelming majority (97%) of all the children in the study had no discernible fluorosis, with TF scores of 2 and under.

Among children aged 11 to 12 years, 3.8% of children living in fluoridated areas had moderate levels of fluorosis (TF scores of 3 or more), compared with 0.2% of children from non-fluoridated areas who had mild fluorosis. Similarly, for all children examined Table 20 shows that, of those participants living in fluoridated areas, 3% had TF scores greater than or equal to 3, compared with 0.2% in non-fluoridated areas.

More detailed analysis and investigation of the prevalence of fluorosis is being conducted by the Australian Research Centre for Population Oral Health and the Centre for Oral Health Strategy. Results will be published at a later date.

TF values in Table 20 refer to the Thylstrup and Fejerskov index. The classifications for fluorosis categories are:

- TF = 0 Normal or non-fluorotic lesion
- TF = 1 Thin white lines
- TF = 2 Merged white lines / small cloudy areas
- TF = 3 Frequent cloudy areas
- TF = 4 Whole surface opaque

Table 20: Age-specific fluorosis experience by fluoridation status

Fluorosis category		Region		
		Fluoridated	Non-fluoridated	NSW
<u>11 to 12 years</u>				
TF = 0	Prevalence (%)	75.8	81.9	76.6
	95% CI	73.3 – 78.4	77.0 – 86.9	74.2 – 78.9
TF = 1	Prevalence (%)	13.5	14.1	13.5
	95% CI	11.6 – 15.3	8.6 – 19.6	11.8 – 15.3
TF = 2	Prevalence (%)	6.9	3.8	6.5
	95% CI	5.7 – 8.0	2.0 – 5.5	5.5 – 7.5
TF = 3	Prevalence (%)	3.3	0.2	3.0
	95% CI	2.5 – 4.2	0.0 – 0.6	2.2 – 3.7
TF = 4+	Prevalence (%)	0.5	-	0.4
	95% CI	0.0 – 1.0	-	0.0 – 0.9
<u>8 to 12 years</u>				
TF = 0	Prevalence (%)	74.9	83.2	75.8
	95% CI	72.4 – 77.3	79.6 – 86.8	73.5 – 78.0
TF = 1	Prevalence (%)	14.8	13.0	14.6
	95% CI	13.0 – 16.6	9.7 – 16.4	12.9 – 16.3
TF = 2	Prevalence (%)	7.2	3.6	6.8
	95% CI	6.1 – 8.3	2.1 – 5.0	5.8 – 7.8
TF = 3	Prevalence (%)	2.7	0.2	2.5
	95% CI	2.1 – 3.4	0.0 – 0.5	1.9 – 3.0
TF = 4+	Prevalence (%)	0.3	-	0.3
	95% CI	0.1 – 0.6	-	0.1 – 0.5

3.11. Decay experience by socioeconomic status

The Survey used the Index of Relative Socio-Economic Disadvantage (IRSD), one of four Socio-Economic Indexes for Areas (SEIFA) developed by the Australian Bureau of Statistics based on census data, to assign IRSD scores to the Statistical Local Area (SLA) of survey participants. IRSD scores were grouped into quintiles that contain approximately one-fifth of the total population. The decay experience in the two key age groups, 5 and 6 years and 11 and 12 years, by socioeconomic status is presented in Table 21.

Among children aged 5 and 6 years mean dmft scores increased across decreasing socio-economic status, where children from the lowest socioeconomic areas had significantly more decay experience (dmft = 2.11) than children from the highest and second highest socioeconomic areas (dmft = 0.86 and 1.16, respectively). Similarly, children from the lowest socioeconomic areas had significantly more untreated decayed deciduous teeth (mean = 1.57) than children from the highest and second highest socioeconomic areas (mean = 0.55 and 0.79, respectively).

The mean DMFT scores for children aged 11 and 12 years increased with decreasing socio-economic status, where children from the lowest socioeconomic areas had significantly more decay experience (DMFT = 0.93) than children from the highest socioeconomic areas (DMFT = 0.59). Similarly, children from the lowest socioeconomic areas had significantly more untreated decayed permanent teeth (mean = 0.60) than children from the highest and second highest socioeconomic areas (mean = 0.23 and 0.36, respectively).

In the 5 and 6 year age group, those children from the highest and second highest socioeconomic areas were less likely to have had past decay experience in their deciduous teeth (dmft=0) (73.9% and 69.3%, respectively) than children from the lowest socioeconomic areas for their age group (50.5%).

Children in the 11 and 12 year age group from the highest and second highest socioeconomic areas were less likely to have had past decay experience in their permanent teeth (DMFT=0) (69.7% and 68.2%, respectively) than children from the lowest socioeconomic areas for their age group (60.4%).

Over all ages, there is a strong relationship between increase in area social disadvantage and increase in total decay experience.

Table 21: Age-specific decay experience by socioeconomic status

Oral Health Indicator		Age groups (years)		
		5-6	11-12	5-12
Number of children				
Most advantaged	N	300	345	1,132
Second most advantaged	N	352	428	1,375
Middle quintile	N	496	551	1,859
Second most disadvantaged	N	562	652	2,128
Most disadvantaged	N	386	443	1,481
NSW	N	2,095	2,418	7,975
Decayed, missing and filled teeth		dmft	DMFT	dmft+DMFT
Most advantaged	Mean	0.86	0.59	1.09
	95% CI	0.57 – 1.14	0.44 – 0.74	0.96 – 1.22
Second most advantaged	Mean	1.16	0.70	1.37
	95% CI	0.90 – 1.41	0.52 – 0.88	1.20 – 1.54
Middle quintile	Mean	1.79	0.77	1.86
	95% CI	1.43 – 2.15	0.62 – 0.92	1.61 – 2.11
Second most disadvantaged	Mean	1.55	0.70	1.62
	95% CI	1.28 – 1.83	0.57 – 0.83	1.46 – 1.78
Most disadvantaged	Mean	2.11	0.93	2.02
	95% CI	1.72 – 2.50	0.77 – 1.08	1.77 – 2.27
NSW	Mean	1.53	0.74	1.61
	95% CI	1.36 – 1.70	0.66 – 0.81	1.51 – 1.72
Decayed teeth		d	D	d+D
Most advantaged	Mean	0.55	0.23	0.53
	95% CI	0.34 – 0.76	0.17 – 0.29	0.44 – 0.62
Second most advantaged	Mean	0.79	0.36	0.79
	95% CI	0.64 – 0.94	0.25 – 0.46	0.65 – 0.93
Middle quintile	Mean	1.36	0.40	1.12
	95% CI	1.06 – 1.65	0.30 – 0.51	0.92 – 1.32
Second most disadvantaged	Mean	1.07	0.39	0.96
	95% CI	0.85 – 1.29	0.29 – 0.49	0.83 – 1.09
Most disadvantaged	Mean	1.57	0.60	1.34
	95% CI	1.26 – 1.87	0.48 – 0.73	1.15 – 1.53
NSW	Mean	1.09	0.40	0.96
	95% CI	0.96 – 1.23	0.35 – 0.45	0.88 – 1.05
Percent dmft/DMFT=0		dmft=0	DMFT=0	dmft+DMFT=0
Most advantaged	Prevalence (%)	73.9	69.7	61.0
	95% CI	68.9 – 78.9	63.9 – 75.6	57.8 – 64.1
Second most advantaged	Prevalence (%)	69.3	68.2	57.7
	95% CI	64.4 – 74.2	62.8 – 73.5	54.5 – 60.9
Middle quintile	Prevalence (%)	55.6	62.1	46.2
	95% CI	49.9 – 61.3	56.6 – 67.7	42.1 – 50.4
Second most disadvantaged	Prevalence (%)	60.4	66.6	51.7
	95% CI	55.0 – 65.7	62.0 – 71.2	48.4 – 54.9
Most disadvantaged	Prevalence (%)	50.5	60.4	44.3
	95% CI	44.1 – 56.8	54.3 – 66.4	39.6 – 49.0
NSW	Prevalence (%)	61.2	65.4	51.8
	95% CI	58.3 – 64.1	62.8 – 68.0	49.8 – 53.7

3.12. Decay experience by remoteness

The Survey used the Australian Bureau of Statistics endorsed measure of remoteness, the Accessibility/Remoteness Index of Australia Plus (ARIA+), to assign Australian Standard Geographical Classification (ASGC) Remoteness categories to the Statistical Local Area (SLA) of survey participants. The ASGC categorises areas as 'major cities', 'inner regional', 'outer regional' and 'remote and very remote' (AIHW, 2008). The decay experience by remoteness in the two key age groups 5 and 6 years and 11 and 12 years is presented in Table 22.

Among children aged 5 and 6 years, mean dmft scores increased with increasing remoteness, where children from major cities had a mean dmft of 1.33 teeth compared with a mean dmft of 2.67 teeth among children from remote and very remote areas. Differences in mean dmft scores were observed between children from major cities and outer regional areas (dmft = 1.33 and 2.45, respectively). Similarly, children from major cities had on average 0.96 untreated decayed deciduous teeth compared with a mean of 1.82 decayed teeth among children from remote and very remote areas.

The mean DMFT scores for children aged 11 and 12 years increased with increasing remoteness, where children from major cities had a mean DMFT of 0.72 teeth compared with a mean DMFT of 0.99 teeth among children from remote and very remote areas. There was little difference in the number of decayed permanent teeth between areas.

Children in the 5 and 6 year age group from major cities were less likely to have had past decay experience in their deciduous teeth (64.1%) than children from remote and very remote areas (44.9%). Differences in the proportions were also observed between children from major cities (64.1%) and those from outer regional areas (46.3%).

Children in the 11 and 12 year age group from major cities were less likely to have had past decay experience in their permanent teeth (66.1%) than children from remote and very remote areas for their age group (57.3%).

Over all ages there is a linear relationship between proportions of children without past decay experience (dmft/DMFT=0) and remoteness. The gradient moves from major cities, where 54% of all children are without past decay experience, through 48% in inner regional areas, 42% in outer regional areas to 41% in remote/very remote areas.

Table 22: Age-specific decay experience by remoteness

Oral Health Indicator		Age groups (years)		
		5-6	11-12	5-12
Number of children				
Major cities	N	1,320	1,519	4,992
Inner regional	N	553	648	2,136
Outer regional	N	186	211	711
Remote and very remote	N	36	40	137
NSW		2,095	2,418	7,975
Decayed, missing and filled teeth		dmft	DMFT	dmft+DMFT
Major cities	Mean	1.33	0.72	1.48
	95% CI	1.13 – 1.53	0.63 – 0.81	1.35 – 1.61
Inner regional	Mean	1.88	0.73	1.85
	95% CI	1.51 – 2.25	0.59 – 0.87	1.63 – 2.08
Outer regional	Mean	2.45	0.93	2.21
	95% CI	1.79 – 3.11	0.70 – 1.16	1.76 – 2.66
Remote and very remote	Mean	2.67	0.99	2.27
	95% CI	1.22 – 4.12	0.53 – 1.45	1.39 – 3.16
NSW		Mean	1.53	0.74
	95% CI	1.36 – 1.70	0.66 – 0.81	1.51 – 1.72
Decayed teeth		d	D	d+D
Major cities	Mean	0.96	0.39	0.89
	95% CI	0.81 – 1.12	0.33 – 0.46	0.78 – 1.00
Inner regional	Mean	1.27	0.41	1.09
	95% CI	0.99 – 1.56	0.31 – 0.51	0.94 – 1.25
Outer regional	Mean	1.90	0.41	1.28
	95% CI	1.37 – 2.43	0.26 – 0.56	1.02 – 1.55
Remote and very remote	Mean	1.82	0.37	1.38
	95% CI	0.46 – 3.18	0.05 – 0.69	0.85 – 1.92
NSW		Mean	1.09	0.40
	95% CI	0.96 – 1.23	0.35 – 0.45	0.88 – 1.05
Percent dmft/DMFT=0		dmft=0	DMFT=0	dmft+DMFT=0
Major cities	Prevalence (%)	64.1	66.1	53.9
	95% CI	60.6 – 67.7	62.9 – 69.3	51.4 – 56.5
Inner regional	Prevalence (%)	56.3	66.0	48.1
	95% CI	50.5 – 62.2	61.1 – 70.9	43.9 – 52.2
Outer regional	Prevalence (%)	46.3	56.6	42.2
	95% CI	36.9 – 55.7	48.0 – 65.1	35.6 – 48.7
Remote and very remote	Prevalence (%)	44.9	57.3	40.9
	95% CI	26.4 – 63.5	38.1 – 76.5	25.2 – 56.6
NSW		Prevalence (%)	61.2	65.4
	95% CI	58.3 – 64.1	62.8 – 68.0	49.8 – 53.7

3.13. Decay experience by country of birth of mother

The Survey collected information on the mother's country of birth as a measure of cultural and linguistic diversity. Countries were assigned as either English or non-English speaking according to the official languages spoken. The decay experience in the two key age groups 5 and 6 years and 11 and 12 years, by English and non-English speaking country is presented in Table 23.

The majority of children surveyed had a mother who was born in an English speaking country (80.9%), with 73.4% of these born in Australia (Table 23).

Among children aged 5 and 6 years whose mother was born in a non-English speaking country, the mean dmft was significantly higher (dmft = 2.34) than that of children whose mother was born in an English speaking country (dmft = 1.36). Similarly, children whose mother was born in a non-English speaking country had more untreated deciduous decayed teeth (mean = 1.68) than those whose mother was born in an English speaking country (mean = 0.98).

The mean DMFT scores of children aged 11 and 12 years whose mother was born in a non-English speaking country (DMFT = 0.81) were slightly higher than those whose mother was born in an English speaking country (DMFT = 0.72). There was also a slight increase in the number of untreated decayed permanent teeth among children whose mother was born in a non-English speaking country (mean = 0.54) compared with those whose mother was born in an English speaking country (mean = 0.37).

Children aged 5 and 6 years whose mother was born in a non-English speaking country were more likely to have had past decay experience in their deciduous teeth (51.4%) than those whose mother was born in an English speaking country (63.3%).

Children aged 11 and 12 years whose mother was born in a non-English speaking country were more likely to have had past decay experience in their permanent teeth (58.5%) than those whose mother was born in an English speaking country (66.8%).

Over all ages, children whose mothers were born in a non-English speaking country were considerably less likely to have no dental caries experience (dmft/DMFT=0) (42%) compared with children whose mothers were born in an English speaking country (53%).

Table 23: Age-specific decay experience by English and non-English speaking country of birth (mother)

Oral Health Indicator		Age groups (years)		
		5-6	11-12	5-12
Number of children		N	N	N
English speaking		1,706	1,948	6,455
Non-English speaking		187	209	696
Other/Unknown		202	261	824
NSW		2,095	2,418	7,975
Decayed, missing and filled teeth		dmft	DMFT	dmft+DMFT
English speaking	Mean	1.36	0.72	1.51
	95% CI	1.20 – 1.52	0.64 – 0.80	1.42 – 1.60
Non-English speaking	Mean	2.34	0.81	2.17
	95% CI	1.82 – 2.86	0.66 – 0.97	1.86 – 2.48
Other/Unknown	Mean	1.91	0.79	1.82
	95% CI	1.50 – 2.31	0.61 – 0.97	1.57 – 2.07
NSW	Mean	1.53	0.74	1.61
	95% CI	1.36 – 1.70	0.66 – 0.81	1.51 – 1.72
Decayed teeth		D	D	d+D
English speaking	Mean	0.98	0.37	0.89
	95% CI	0.86 – 1.10	0.31 – 0.43	0.81 – 0.96
Non-English speaking	Mean	1.68	0.54	1.38
	95% CI	1.26 – 2.10	0.37 – 0.70	1.14 – 1.62
Other/Unknown	Mean	1.33	0.48	1.12
	95% CI	1.04 – 1.62	0.34 – 0.62	0.92 – 1.33
NSW	Mean	1.09	0.40	0.96
	95% CI	0.96 – 1.23	0.35 – 0.45	0.88 – 1.05
Percent dmft/DMFT=0		dmft=0	DMFT=0	dmft+DMFT=0
English speaking	Prevalence (%)	63.3	66.8	53.4
	95% CI	60.4 – 66.1	64.1 – 69.5	51.6 – 55.2
Non-English speaking	Prevalence (%)	51.4	58.5	41.8
	95% CI	43.3 – 59.6	50.4 – 66.7	37.0 – 46.5
Other/Unknown	Prevalence (%)	56.6	61.5	49.6
	95% CI	48.9 – 64.2	54.8 – 68.1	45.3 – 53.9
NSW	Prevalence (%)	61.2	65.4	51.8
	95% CI	58.3 – 64.1	62.8 – 68.0	49.8 – 53.7

4. Discussion

The estimated population of New South Wales in 2006 was 6.8 million (New South Wales Health 2009). Area Health Service regions differ demographically, each with distinct ethnic, age, sex, population and population density characteristics. In 2006 approximately 73% of the New South Wales population lived in metropolitan areas, 20% lived in inner regional areas and 7% in outer regional and remote areas.



While reporting on the mean number of decayed, missing and filled teeth gives an overall picture of the extent of the disease in the population, dmft/DMFT scores have a skewed distribution. The mean dmft of all 5 year olds in New South Wales is 1.62. This score gives an overall picture of the extent of the disease across the entire population but when the majority of children (60%) have no caries experience, this can mask the true extent of the disease in those children who do have decay. Data from the Survey (Figures 5 and 10) clearly illustrate this issue. Approximately 25% of 5 and 6 year old children, and 16% of 11 and 12 year old children carry the highest burden of dental disease (2 or more decayed teeth).

A national report on Aboriginal and Torres Strait Islander children found that they experience a higher burden of dental disease than non-Aboriginal and Torres Strait Islander children, especially if they also live in socially disadvantaged circumstances and rural or remote areas (Australian Institute of Health and Welfare 2007). The proportion of Aboriginal people in the New South Wales population increases with increasing remoteness. In very remote areas, Aboriginal people comprise almost one-third of the total population. (NSW Department of Health, 2006). Aboriginal children aged 5 to 12 years of age in New South Wales also experience a significantly higher burden of dental disease than non-Aboriginal children. The greatest disparity in the Survey was observed among Aboriginal children aged 5 and 6 years. These children experience on average twice as many decayed, missing and filled teeth than their non-Aboriginal counterparts and have more than twice the number of untreated decay in their deciduous teeth. The high burden of dental disease was also observed in the permanent dentition.

People living in rural and remote areas experience worse general health than people living in metropolitan areas (NSW Department of Health 2006, Australian Institute of Health and Welfare 2008). The National Child Dental Health Survey 2001 showed that children in rural and remote areas have more deciduous and permanent teeth decay experience than those from metropolitan areas

(Australian Institute of Health and Welfare 2006). Reasons for this health disparity include geographic isolation, socioeconomic disadvantage, shortage of health care providers, lower levels of access to health services, less exposure to fluoridated drinking water, greater exposure to injury risks, and poorer health among Aboriginal people (NSW Population Health Division 2008, Australian Institute of Health and Welfare 2008). Among children aged 5 to 12 years in New South Wales there is increasing decay experience with increasing remoteness. This is more markedly observed in the deciduous teeth of 5 and 6 year old children where children in remote and very remote areas experience mean dmft and untreated decay approximately twice the levels experienced by children from major cities. Differences between geographic areas are less evident in the permanent teeth of 11 and 12 year olds, although children in remote and very remote areas experience approximately 38% more decay than children in major cities.

Concession cardholders comprise a proportion of the adult population who are financially disadvantaged and who experience a higher prevalence of dental disease than non-cardholders (Australian Institute of Health and Welfare 2008). New South Wales children who are dependents of Centrelink concession cardholders have significantly higher decay experience than non-cardholder children in their deciduous and permanent teeth. The proportion of children who have never experienced dental decay is significantly lower among children of cardholders than it is for non-cardholders. These differences in decay experience by cardholder status are also reflected in the oral health of adults in New South Wales where cardholders have 1.4 times the prevalence of decay experience compared with non-cardholders (Australian Institute of Health and Welfare 2008).

There is generally an inverse association between socioeconomic status and various health outcomes (NSW Department of Health 2006, Australian Institute of Health and Welfare 2008). The National Child Dental Health Survey in 2001 showed that, for any age, children from lower socioeconomic areas had more deciduous and permanent teeth decay experience than those from higher socioeconomic areas (Australian Institute of Health and Welfare 2006). Across all ages between 5 to 12 years in New South Wales, children in the lowest socioeconomic areas experience more dental decay in their deciduous and permanent teeth than children from the highest socioeconomic areas. Among children aged 5 and 6 years, the average dmft of children in the lowest socioeconomic areas is almost 1.5 times higher than for those in the highest socioeconomic areas. The mean DMFT of 11 and 12 year old children from the lowest socioeconomic areas is almost 60% higher than that of children from the highest socioeconomic areas. Furthermore, children from the highest socioeconomic areas are less likely to have experienced decay in their deciduous or permanent teeth than children from the lowest socioeconomic areas.

In Australia, children with immediate treatment needs have higher decay experience than children who do not require immediate treatment, with dmft +DMFT values approximately 1.7 to 3.0 times higher than the national averages in 2002 (Australian Institute of Health and Welfare 2007). Consistent with the findings of the national survey, children with immediate treatment needs in New South Wales also have significantly higher decay experience than children who do not require immediate treatment. The majority of the dental decay experience observed among children requiring immediate treatment comprises high levels of clinically detectable untreated decayed teeth in both deciduous and permanent dentition.

The 2000 New South Wales Child Dental Health Survey showed considerable differences in decay experience among children born from different regions of the world (Australian Institute of Health and Welfare 2003). For example, among 11 to 12 year olds the mean DMFT score of children born in Southern and Eastern Europe (DMFT = 1.42) is approximately 3.2 times higher than that of children born in Australia (DMFT = 0.44). The 2007 New South Wales Survey also found that children aged 5 to 12 years whose mother was born in a non-English speaking country are more likely to have decay experience than those whose mother was born in an English speaking country. The difference is more evident in the deciduous teeth of 5 and 6 year old children where children whose mother was born in a non-English speaking country had 72% more decayed, missing and filled teeth and 71% more untreated decayed deciduous teeth than those whose mother was born in an English speaking country. These findings are consistent with a New South Wales Department of Health report that found people

born in some overseas countries are more likely to have premature babies, less likely to attend antenatal visits before 20 weeks gestation and have higher hospitalisation rates for certain conditions than people born in Australia (NSW Population Health Division 2008). Language difficulties pose an additional challenge for oral health services in communicating effectively with children and families from culturally and linguistically diverse backgrounds. The use of professional interpreters is critical to the provision of high quality oral health care (American Medical Association 2006).

The placement of sealants is a highly effective means of preventing pit and fissure caries. The National Institutes of Health Consensus Conference on Dental Sealants in 1983 concluded that this preventive strategy is underused in both private and public dental health care delivery systems. In 2007, some 26 years after this very important consensus conference, the use of sealants in New South Wales is disappointingly low. Expanding the use of sealants in New South Wales would substantially reduce the occurrence of dental caries beyond that already achieved by fluorides and other preventive measures and is supported by well established evidence that sealants should be the first choice of treatment for many children (Simonsen 1991).

Water fluoridation is the most cost-effective, socially equitable and safe means of providing protection from tooth decay and was hailed as one of the 'Top 10' Public Health Measures of the Twentieth Century by the US Centers for Disease Control and Prevention in 1999. The 2002 Child Dental Health Survey reported that children from areas with optimally fluoridated public water supplies have fewer decayed, missing and filled teeth, on average, and less untreated dental decay than children from areas without fluoride in drinking water (Australian Institute of Health and Welfare 2007). Consistent with these national findings, New South Wales children aged 5 to 12 years who have access to fluoridated water experience significantly less dental decay than children from non-fluoridated areas. The protective effect of water fluoridation is clearly observed among 5 and 6 year old children in their deciduous teeth and is still evident in the permanent teeth of children aged 11 and 12 years.

The observed differences in decay experience between children with access to fluoridated water supplies and those from areas with no fluoridated water supplies will need to be interpreted carefully due to the limitations in using residential postcodes to determine the water fluoridation status. For example, some postcodes were excluded from the analysis because they included towns with both fluoridation classifications. In addition, some towns have only recently started fluoridating their water supplies thus some children living in fluoridated areas in 2007 have a limited exposure to fluoride. It should be noted that fluoridation status does not include information about proportional lifetime exposure, use of non-fluoridated tap water for drinking or cooking and other risk factors for dental decay, which may contribute to some of the observed differences. However, marked differences in the oral health status of children were observed between fluoridated and non-fluoridated areas.

For all ages of children between 8 to 12 years, there is a small percentage increase in the prevalence of fluorosis among children from fluoridated areas compared with those from non-fluoridated areas.

The Survey provides useful insights into possible areas of investigation for action-based research projects, such as examining rates of decayed teeth and filled teeth per 100 teeth in children aged 9 years compared with children aged 6 years (Figure 2). However, greater priority needs to be given to primary prevention. Area Health Services should work more closely with university researchers to test different clinical and community prevention strategies because variations in the distribution of the burden of dental diseases may require different strategies for prevention and early intervention. Further analysis of the Survey data will assist Area Health Services to meet the needs of children, especially young children, those children who are at risk of dental disease and those children who bear the greatest burden of dental disease.

5. Conclusions

The New South Wales Child Dental Health Survey 2007 provides a detailed picture of the oral health status of primary school children in New South Wales. While epidemiological surveys are limited in their ability to describe health outcome information resulting from a complex interplay of personal, life-style and socio-environmental factors, the methodology employed is consistent with international surveys conducted in the United Kingdom and the United States of America (Blinkhorn 2009). New South Wales Health care planners and policy makers can therefore be confident in the results that have been presented.

Approximately 40% of primary school children in New South Wales have experienced dental caries by 5 years of age. Around 70% of that disease experience is comprised of detectable, untreated, dental decay and the burden of this disease is carried by a significantly smaller proportion of children. Ten percent of the 5 and 6 year old children with dental caries experience have on average 5.8 affected deciduous teeth. Five percent of 5 to 12 year old children require immediate dental attention.

Children whose parents are Centrelink cardholders, those whose mothers were born in a country with an official language other than English and children with immediate treatment needs all have significantly higher dental decay rates and overall prevalence of dental caries experience than the general child population. Area socio-economic status has an almost linear negative relationship with decay experience of 5 to 12 year-old children. Preventive interventions must focus on those in greatest need at a very early age and dental services must be easily and equitably accessible to all children on the basis of their needs.

Further confirmation of national and state priorities for Aboriginal children is evident from the findings of this study. Aboriginal children have more than twice the dental decay rates than non-Aboriginal children. Oral health is a significant issue for Aboriginal people. Area Health Services must work with Aboriginal communities to adapt clinical and preventive services and oral health promotion to address their specific needs.

Exposure to water fluoridation has measurable benefits for New South Wales children and levels of dental fluorosis are within expected prevalences. A low percentage of children in both non-fluoridated and fluoridated areas have clearly visible dental fluorosis. Despite the limitations of this study to identify the personal histories of fluoride experience, children living in fluoridated areas have lower rates of dental caries experience than their peers living in non-fluoridated areas. Fifty-three percent of 5 to 12 year-old children from fluoridated areas, compared with 40% from non-fluoridated areas, are caries free (dmft+DMFT=0). Dental fluorosis is evident in children from both fluoridated and non-fluoridated areas. Although slightly more 11 and 12 year old children from fluoridated areas have mild to moderate fluorosis than their peers from non-fluoridated areas, the prevalence overall is very low. More than 97% of 8 to 12 year old children do not display any discernible signs of fluorosis. Water fluoridation should continue to be expanded to rural population centres and high risk communities with greater consideration given to communities with populations of less than 1000.

Fissure sealants are effective complementary techniques to prevent dental caries, especially in the occlusal surfaces of teeth. The low utilisation of sealants in New South Wales is a population oral health concern, especially when compared with rates of fillings that have been placed in permanent teeth. Over-treatment of occlusal surfaces with restorations is not consistent with current professional standards or the evidence base supporting the effectiveness of sealants. Area Health Services and individual clinicians need to focus their clinical efforts in this area of prevention.

The key findings described in this report support contemporary national and state directions (National Advisory Committee on Oral Health 2004, NSW Department of Health 2008) to prioritise child oral health as a key area for action. Oral health services must develop robust collaborative partnerships with general health, early childhood and community service providers to reduce the inequalities in child oral health in New South Wales.

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7. Appendix

The following tables present dental health data using the old 17 Area Health Service boundaries for the two key age groups and for all children aged between 5 and 12 years. These Area Health Services have been collapsed into to the current 8 Area Health Services (Table A1).

Table A1: Relationship of old Area Health Services to current Area Health Services (small border adjustments not included)

Old Area Health Service (AHS)	Current Area Health Service (AHS)
Central Coast AHS Northern Sydney AHS	North Sydney Central Coast AHS
Western Sydney AHS Wentworth AHS	Sydney West AHS
South Western Sydney AHS Central Sydney AHS	Sydney South West AHS
Hunter AHS New England AHS	Hunter New England AHS
Northern Rivers AHS Mid North Coast AHS	North Coast AHS
Macquarie AHS Mid Western AHS Far West AHS	Greater West AHS
Greater Murray AHS Southern AHS	Greater Southern AHS
Illawarra AHS South Eastern Sydney AHS	South Eastern Sydney Illawarra AHS

Table A2: 5 and 6 year old children – decayed, missing and filled teeth, dmft index and percentage of children with dmft=0 by old Area Health Service boundaries

Old AHS	Number of children	dmft components			dmft	dmft=0 (%)
		d	m	f		
Central Sydney AHS	64	0.80	0.01	0.38	1.18	65.0
Northern Sydney AHS	224	0.57	0.02	0.29	0.89	74.0
Western Sydney AHS	197	1.52	0.17	0.38	2.06	54.7
Wentworth AHS	118	1.06	0.01	0.14	1.21	68.4
South Western Sydney AHS	248	1.17	0.07	0.34	1.58	59.4
Central Coast AHS	78	1.08	0.01	0.22	1.31	65.2
Hunter AHS	188	0.68	0.07	0.24	0.98	66.2
Illawarra AHS	120	0.44	0.03	0.38	0.86	70.7
South Eastern Sydney AHS	145	0.61	0.05	0.36	1.03	70.7
Northern Rivers AHS	151	1.96	0.10	0.66	2.72	41.1
Mid North Coast AHS	92	1.73	0.24	0.35	2.32	49.8
New England AHS	42	1.61	0.06	0.25	1.92	48.2
Macquarie AHS	79	1.52	0.18	0.48	2.17	52.9
Mid Western AHS	87	1.82	0.36	0.55	2.73	43.2
Far West AHS	24	2.27	0.26	0.26	2.80	42.7
Greater Murray AHS	140	1.60	0.16	0.32	2.08	51.2
Southern AHS	98	1.47	0.51	0.28	2.26	50.0
NSW	2,095	1.09	0.10	0.34	1.53	61.2

Table A3: 11 and 12 year old children – decayed, missing and filled teeth, DMFT index and percentage of children with DMFT=0 by old Area Health Service boundaries

Old AHS	Number of children	DMFT components			DMFT	DMFT=0 (%)	FS (%)
		D	M	F			
Central Sydney AHS	54	0.45	0.00	0.14	0.59	74.5	29.9
Northern Sydney AHS	266	0.29	0.02	0.32	0.63	67.5	40.1
Western Sydney AHS	233	0.57	0.04	0.29	0.90	60.0	14.3
Wentworth AHS	138	0.48	0.00	0.34	0.83	62.0	19.1
South Western Sydney AHS	293	0.47	0.04	0.20	0.71	66.6	9.3
Central Coast AHS	95	0.40	0.01	0.42	0.83	63.8	11.2
Hunter AHS	212	0.18	0.03	0.18	0.38	78.0	6.1
Illawarra AHS	140	0.41	0.00	0.17	0.58	73.8	6.8
South Eastern Sydney AHS	164	0.19	0.00	0.55	0.74	63.9	14.7
Northern Rivers AHS	177	0.61	0.02	0.34	0.97	58.1	31.3
Mid North Coast AHS	110	0.64	0.04	0.39	1.07	54.4	19.0
New England AHS	51	0.14	0.11	0.24	0.49	74.5	18.2
Macquarie AHS	92	0.51	0.05	0.42	0.98	57.8	24.7
Mid Western AHS	97	0.51	0.00	0.45	0.96	55.8	23.3
Far West AHS	29	0.36	0.00	0.56	0.92	47.0	33.0
Greater Murray AHS	153	0.23	0.02	0.54	0.79	59.6	20.2
Southern AHS	114	0.47	0.01	0.37	0.85	62.8	12.6
NSW	2,418	0.40	0.02	0.31	0.74	65.4	17.9

Table A4: 5 to 12 year old children – decayed, missing and filled teeth, dmft+DMFT index and percentage of children with dmft+DMFT=0 by old Area Health Service boundaries

Old AHS	Number of children	dmft/DMFT components			dmft+DMFT	dmft+DMFT=0 (%)
		d+D	m+M	f+F		
Central Sydney AHS	231	0.69	0.01	0.49	1.20	59.7
Northern Sydney AHS	856	0.56	0.04	0.55	1.15	59.4
Western Sydney AHS	745	1.38	0.14	0.50	2.02	46.1
Wentworth AHS	441	1.08	0.07	0.51	1.65	51.5
South Western Sydney AHS	949	1.11	0.08	0.46	1.64	50.4
Central Coast AHS	297	1.04	0.07	0.63	1.74	48.6
Hunter AHS	724	0.55	0.06	0.49	1.10	58.8
Illawarra AHS	459	0.67	0.02	0.47	1.16	59.8
South Eastern Sydney AHS	550	0.47	0.02	0.59	1.08	62.4
Northern Rivers AHS	566	1.45	0.11	0.80	2.35	41.1
Mid North Coast AHS	361	1.40	0.14	0.69	2.22	42.5
New England AHS	163	0.82	0.15	0.62	1.59	52.7
Macquarie AHS	302	1.39	0.18	0.66	2.23	41.3
Mid Western AHS	324	1.42	0.24	0.77	2.43	36.4
Far West AHS	93	1.51	0.08	0.58	2.18	39.7
Greater Murray AHS	532	1.25	0.17	0.79	2.20	41.1
Southern AHS	384	1.12	0.23	0.66	2.01	43.1
NSW	7,975	0.96	0.09	0.56	1.61	51.8

