



**T**his report provides dentist labour force projections from 2005 to the year 2020. In 2007 the establishment of three new regionally located dental schools was announced, which will result in a substantial increase in the number of dentist graduates trained in Australia. These latest projections take into account the three new schools and other recent changes in the supply of dental visits and services.

### Summary

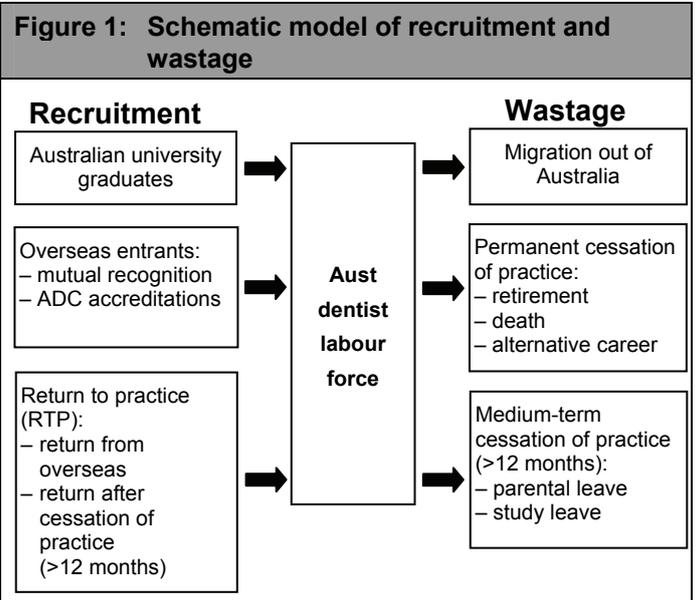
- The annual number of Australian citizen dentist graduates from Australian universities is anticipated to more than double, increasing to approximately 500 graduates by 2014.
- The number of practising dentists is projected to increase by half (49.4%), to over 15,000, by 2020.
- The number of dentists per 100,000 population is also expected to increase by just over one-quarter (27.9%), to 63.2 dentists per 100,000, by 2020.
- Capacity to supply dentist visits is projected to increase by just over one-quarter (28.6%) by 2020 ('medium' supply scenario).
- A comparison of projected supply with projected demand for total aggregate dental visits ('medium' scenarios) estimates approximate shortfall of 800 to 900 dental providers by the year 2020.

### Projection model

The framework underlying the projection of dentists in Australia conceives the labour force as a dynamic system of stocks and flows. The stock of dentists is equivalent to the number of practising dentists. Inflows into the stock of dentists comprise Australian university graduates, migrants to Australia and those who return to practice after an absence. Movement out of the

stock, or wastage, is associated with migration out of Australia and cessation of practice, either permanently or temporarily (Figure 1).

Dentists were categorised by sex and 5-year age groups. Each element of the inflows and outflows were followed through each age and sex group through application of a basic Markov chain model. For full details of methods and inputs, see Teusner et al. 2008.



### Baseline dentist labour force numbers

Projections use the 2005 practising dentist estimates as the baseline stock of dentists; these were the most recent estimates available at the time of publication.

In 2005 there were an estimated 10,067 practising dentists, over one-quarter (28.4%) being female. The age distribution of female dentists differed from the distribution of male dentists; only 16.2% of female dentists were over 50 years of age compared to 43.0% of male dentists (Table 1).

**Table 1: Practising dentists by age group and sex, 2005**

Age group (years)	Number			Percentage		
	Male	Female	Total	Male	Female	Total
20–29	652	660	1,312	9.0	23.1	13.0
30–39	1,498	986	2,484	20.8	34.5	24.7
40–49	1,957	750	2,706	27.1	26.2	26.9
50–59	1,995	389	2,384	27.7	13.6	23.7
60–69	863	63	925	12.0	2.2	9.2
70+	245	10	256	3.4	0.4	2.5
<b>Total</b>	<b>7,210</b>	<b>2,858</b>	<b>10,067</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

## Recruitment

Total recruitment used in the projection model consisted of five separately estimated components, each of which is described below.

### Australian dental graduates

The total number of graduates from Australian dental schools is expected to change dramatically over the first decade of the projection.

The number of graduates included in recruitment for the first 3 years of the projection (2006 to 2008) was estimated by averaging the number of completions (240) for the years 2003 to 2005 (Table 2).

**Table 2: Numbers of dentist graduates from Australian Dental Schools, DEST completions 2003 to 2005, and estimated numbers 2006 to 2020**

University	2003	2004	2005	2006–08	2009–13	2014–20
Melbourne	48	45	49	47	70	70
Sydney	61	96	44	67	75	85
Adelaide	45	34	62	47	58	58
Queensland	47	1	43	45	45	50
Western Australia	26	44	32	34	45	45
Griffith	–	–	–	–	54	70
James Cook	–	–	–	–	–	50
La Trobe	–	–	–	–	–	30
Charles Sturt	–	–	–	–	–	40
<b>Total</b>	<b>227</b>	<b>220</b>	<b>230</b>	<b>240</b>	<b>347</b>	<b>498</b>

Source: Numbers of graduates for 2003–05 sourced from the Department of Education, Science and Technology (DEST) submissions.

#### Notes

1. Estimates for 2009–2013 and 2014–2020 based on estimates provided though consultation with Council of Heads and Deans of Dental Schools (CHADDS) members.
2. There was only one graduate from The University of Queensland in 2004 as a result of the changeover to graduate entry. The 2006–08 estimate for Queensland is the average of 2003 and 2005.

In 2009 there will be an increase in the number of graduates as the first cohort of students will graduate from Griffith University (the first intake of students was in 2005). The three new dental schools, James Cook, Charles Sturt and La Trobe, are expected to graduate their first intakes by 2013–14.

In addition, further increases can be expected as a result of recent incremental increases in the number of enrolments in most of the existing schools. In total, by the year 2014, it is anticipated that Australian dental schools will be graduating approximately 500 dentists, more than double the number that graduated in 2005 (Table 2).

Although it is anecdotally known that international students graduating from Australian universities continue to work and live in Australia, for several reasons, only Australian citizen graduates are included in this component of recruitment. First, exact numbers of international graduates remaining in Australia are not known. Second, as it is suspected that some international graduates may already be included in the 'return from overseas' recruitment component, including them in this component may lead to overestimation of total recruitment.

### Overseas trained dentists (OTDs)

Currently, there are two pathways for OTDs to gain registration to practise in Australia. Dentists who trained in other countries must pass a series of written and practical assessments administered by the Australian Dental Council (ADC). Dentists who obtained their qualifications in the United Kingdom (UK), Ireland (Eire) or New Zealand (NZ) are recognised by Australian Dental Boards and are automatically eligible for registration.

### ADC-assessed dentists

During the 1990s the number of successful ADC candidates remained stable, averaging around 35 candidates per year. Since then the number of applications has dramatically increased, with numbers of OTDs sitting final clinical exams increasing from 50–60 per year in 2000 to 299 in 2006. Consequently, the number of successful candidates has progressively increased, from 37 candidates in 2002 to 158 in 2006 (ADC, pers. comm. 2008).

For the first 3 years (2005 to 2007) of the projection the number of actual ADC candidates was known and included in recruitment; the average number of candidates for that period is cited in Table 3. An arbitrary estimate of 100 ADC candidates per year was used in the model for the years 2008 to 2020. This conservative estimate was adopted as it is unknown whether recent high levels of applications will continue, and it is unlikely that numbers will increase much beyond 2006 levels as the ADC are nearing capacity for testing and processing. In addition, it is anecdotally reported

that a number of successful ADC candidates do not go on to reside or practise dentistry in Australia.

**Table 3: Recruitment inputs for dentist projection model**

	2005–08	2009–13	2014–20
Australian graduates	240	347	498
Overseas trained dentists			
ADC assessed	141	100	100
Automatic recognition	57	57	57
Return to practice	194	216	276
Return from abroad	93	93	93
<b>Totals</b>	<b>725</b>	<b>813</b>	<b>1,024</b>
<i>Female</i>	345	394	509
<i>Male</i>	380	418	514

### Automatic recognition of overseas qualifications

Due to the unavailability of registration data from dental boards, the numbers of dentists who qualified for automatic recognition were estimated by averaging, over the years 2000 to 2006, the number of UK, Eire or NZ citizen dentists arriving in Australia as long-term visitors (Department of Immigration and Multicultural Affairs (DIMA), analysed by the ABS). The averaged estimates were then multiplied by the dentist employment rate (84.9%, estimated from the 2005 dentist labour force collection).

This estimate is based on citizenship and not place of qualifications, and therefore may be overstated if there are UK, Eire or NZ dentists arriving in Australia who did not gain their qualification from an institution in their country of citizenship. Alternatively, there may be dentists who qualify for automatic recognition but are not a citizen of those countries.

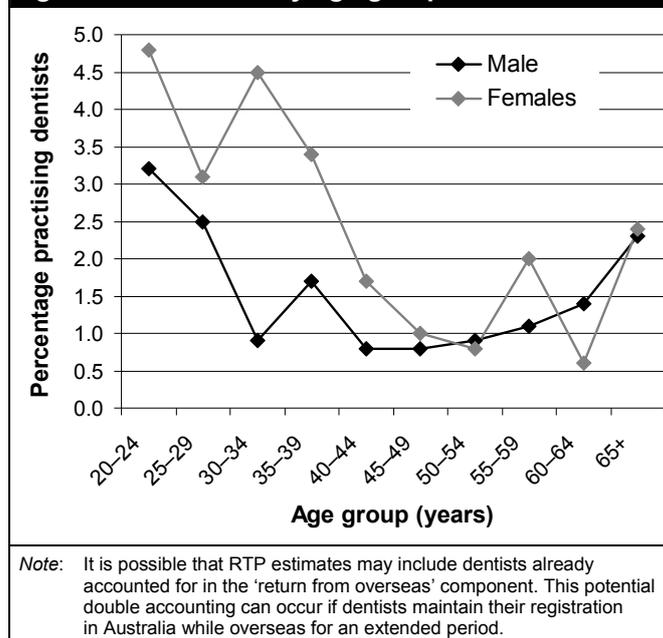
### Return to practice

The return to practice (RTP) component includes those dentists who cease practice for a period of 12 months or more and then return to practice. For a given year RTP is estimated by multiplying the number of projected dentists in the previous year of the projection by the RTP rates. RTP rates are sex and age group specific and were based on the average observed percentage of dentists who ceased practice for 12 months or longer and then returned to practice (Figure 2). The percentages returning to practice were calculated using linkable consecutive data sets (1997 to 1999). As RTPs are rates, actual numbers for this component vary each year and increase over the course of the projection.

### Return from overseas

The return from overseas component represents the dentists who return from an extended visit overseas (greater than 12 months). This was derived from the Overseas Arrivals data collected by DIMA (analysed by the ABS). Return from overseas is a separate estimate from RTP – the RTP estimate does not capture those who are not registered during their period of cessation of practice and dentists do not necessarily maintain their registration in Australia while overseas. This component was estimated by averaging the number of Australian citizen arrivals between the years 2000 and 2006 who reported their occupation as 'dentist'. These estimates were then multiplied by the employment rate (84.9%, 2005).

**Figure 2: RTP rates by age group and sex**



### Total recruitment

Due to increases in numbers graduating and increases in the RTP component, resulting in growth in the total labour force, total annual recruitment is expected to increase from an estimated 725 dentists in 2005–08 to 1,024 in 2020 (Table 3).

Graduates from Australian dental schools were the largest component of recruitment, comprising one-third (33.1%) of all new recruits in 2005 and expected to increase to 48.7% by 2013 (Table 3). In 2005 approximately half of dentist recruits were female (47.5%), and this percentage is expected to increase only marginally by 2020.

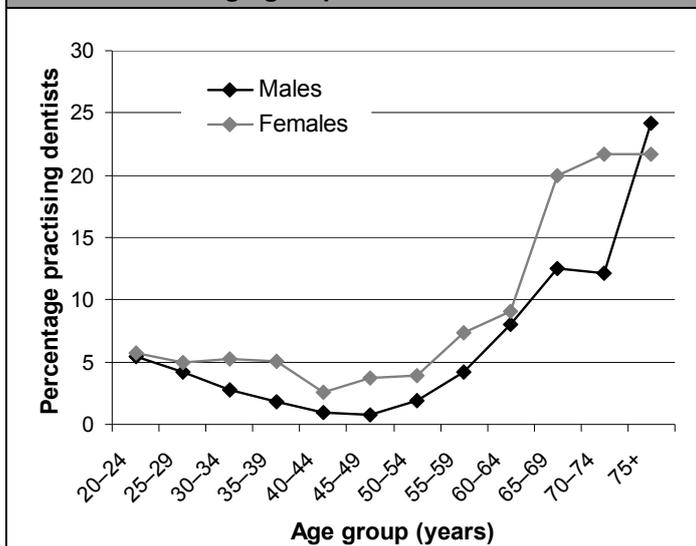
## Wastage

Calculating the percentage of dentists who cease practice either permanently or for an extended break (12 months or more) is problematic due to the limited ability to track the practice status of dentists over time. Not all state/territory datasets can be linked from year to year. Where it is possible to perform longitudinal analysis, the ability to track changes in practice status is inhibited by the fact that not all dentists respond in consecutive surveys.

Despite these limitations, estimates for sex- and age-specific wastage rates were calculated using datasets that could be linked (1997 to 1999). Where possible, changes in work status across years were tracked and numbers were enumerated for non-response.

For male dentists less than 30 years of age, wastage rates averaged approximately 5% per year. Rates for males decline from age 30 to age 45–49 years and then steadily increase as male dentists move towards retirement. For female dentists, wastage rates remain around 5% until they are 40 years of age, decline slightly and then increase in the 50–54 years age group and older (Figure 3).

**Figure 3: Practising dentists, wastage rates by sex and age group**



Note: These wastage rates were calculated using the following AIHW DSRU dentist labour force datasets: Victoria 1998, 1999; South Australia 1998 to 2000; New South Wales 1998 to 2000.

## Projected number of practising dentists

It was projected that the total number of practising dentists would increase substantially, from 10,067 in 2005 to 15,042 in 2020 (a 49.4% increase). The number of practising female dentists was projected to more than double by 2020 (109.2%); in

contrast, the number of male dentists was projected to increase by only 25.7%. A substantial increase in the number of dentists per 100,000 population was also projected, from 49.4 dentists in 2005 to 63.2 in 2020, an increase of 27.9% (Table 4).

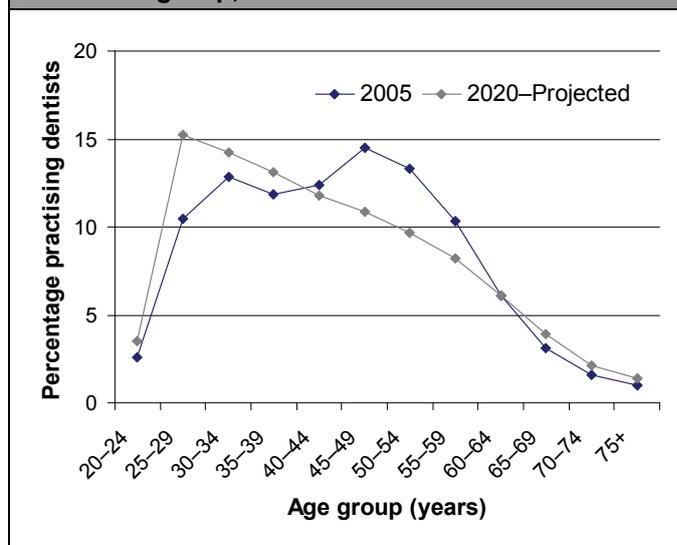
**Table 4: Projected practising dentists and dentists per 100,000 population by sex, 2005, 2010, 2015 and 2020**

	2005	2010	2015	2020
<b>Practising dentists</b>				
Males	7,210	7,736	8,349	9,063
Females	2,858	3,815	4,867	5,979
<b>Total</b>	<b>10,067</b>	<b>11,551</b>	<b>13,216</b>	<b>15,042</b>
<b>Dentists per 100,000 population</b>				
Total	49.4	53.6	58.3	63.2

Note: ABS Population projections Australia 2002–2101 (Series 8).

The age distribution of all dentists was projected to change slightly, with the percentage over 45 years of age expected to decline from 49.9% in 2005 to 42.2% in 2020 (Figure 4).

**Figure 4: Percentage practising dentists by age group, 2005 and 2020**



## Capacity to supply dentist visits

To estimate the projected supply of dentist visits in 2020, the numbers of practising dentists were multiplied by age- and sex-specific supply rates (Table 5).

Three different supply scenarios were calculated in order to test the sensitivity of the projections of visits supplied to future changes in the supply of dentists per year.

Over the past 40 years the length of a visit has been increasing, as has the number of services supplied at a visit. Over this period the number of hours worked

per week has remained stable; consequently, the number of visits supplied has declined substantially (Brennan & Spencer 2006) (Table 5). It is unlikely that this decline in number of visits supplied per year will suddenly discontinue, and it is also uncertain that it can continue at the previously observed rate. Given the uncertainty in future trends, three projections were developed. The 'high' supply projection assumed that there would be no future decline in number of visits supplied per dentist per year; that is, historical trends will cease to continue. The 'medium' supply projection assumed that the number of visits supplied per year per dentist would continue to incrementally decline at half the rate that was observed over the period 1983–84 to 2003–04. The 'low' supply projection assumed that decline would continue at the same rate as previously observed.

**Table 5: Observed and projected dentists' capacity to supply visits per year by sex and age group**

Age group (years)	Observed visits supplied per year			Projected supply in 2020 by supply scenario		
	1983–84	1993–94	2003–04	High	Med	Low
	<b>Males</b>					
20–29	3,195	2,959	2,601	2,601	2,077	1,811
30–39	3,964	3,081	2,780	2,780	2,038	1,559
40–49	3,897	3,723	3,081	3,081	2,794	2,496
50–59	3,614	3,083	3,454	3,454	2,970	2,788
60+	3,003	2,413	1,861	1,861	1,423	1,020
<b>Females</b>						
20–29	2,611	2,724	2,537	2,601	2,427	2,368
30–39	2,530	2,413	2,158	2,780	1,969	1,836
40–49	2,876	2,691	2,377	3,081	1,965	1,762
50–59	2,704	3,091	2,082	3,454	2,100	1,963
60+	2,000	2,160	2,520	1,861	2,578	2,700

Source: LSDPA 1983–84 to 2003–04.  
Teusner et al. 2008: Projected supply by supply scenario.

Under the 'low' supply scenario total annual supply of dentist visits is projected to increase slightly from 25.1 million visits in 2005 to 28.7 million visits by 2020. The 'medium' supply scenario projects visits increasing to 32.3 million, and the 'high' supply scenario to 35.8 million, visits per year (Table 6).

**Table 6: Projected supply of dentist visits by supply scenario, 2005, 2010, 2015 and 2020**

Supply scenario	2005	2010	2015	2020
<b>Visits (millions)</b>				
Low	25.11	26.28	27.53	28.72
Medium	25.11	27.23	29.64	32.28
High	25.11	28.17	31.75	35.84

## Comparison of total projected dental labour force supply of visits to projected demand for dental visits

It is projected that demand for total dental visits will be 38.8 million visits by 2020 (Teusner et al. 2008). This demand projection incorporates demand from all dental practitioners. Therefore, in order to reconcile demand with projected supply, projections were developed for each dental practitioner group and aggregated to estimate total dental labour force supply. Supply of dental visits by dental therapists, dental hygienists and dental prosthetists was estimated to total 4.1 million visits in 2005, and projected to increase slightly to 4.3 million visits by 2020. For full details of allied supply projections, see Teusner et al. 2008.

Total aggregate supply, including supply by allied dental professionals, totalled 36.6 million visits in 2020 under the 'medium' supply scenario, 2.2 million visits less than projected demand (Table 7, Figure 5). This approximately equates to a shortfall of 800 to 900 dental personnel.

**Table 7: Projected supply of total dental visits by supply scenario, 2005, 2010, 2015 and 2020**

Supply scenario	2005	2010	2015	2020
<b>Visits (millions)</b>				
Low	29.17	30.59	31.89	33.03
Medium	29.17	31.54	34.00	36.58
High	29.17	32.48	36.11	40.14

Note: Total aggregate supply includes projected dental visits supplied by dental therapists, dental hygienists and dental prosthetists.

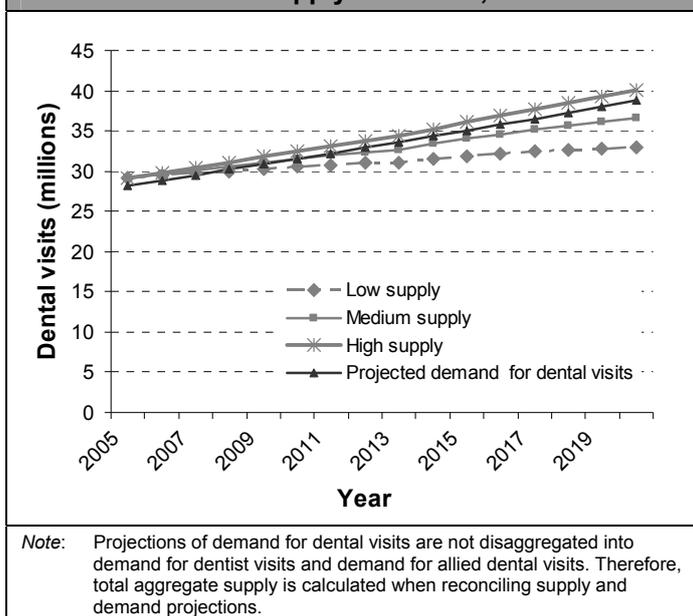
Alternatively, if previously observed trends in declining visits supplied per year cease to continue and visits supplied per year remain stable at 2003–04 levels, projected supply (under the 'high' scenario) will total 40.1 million visits, 1.3 million visits greater than projected demand.

## Discussion

Some recruitment inputs applied in these projections could be considered conservative. For example, numbers of OTDs assessed annually may increase if the ADC expands their capacity for assessment. However, given the nature of infrastructure constraints (assessment requires access to clinics and equipment), increased capacity in the near future appears unlikely. (ADC, pers. comm. 2008) Alternatively, some

inputs may have been underestimated, such as the number of international graduates from Australian dental schools remaining in Australia post graduation. As at October 2008 there were approximately 350 international students enrolled in Dentistry courses across Australia. (ACODS 2008) Estimating the numbers who immediately stay on post graduation is currently not possible and consequently they are not explicitly included in recruitment, although it is suspected that some may be captured in other recruitment components. This and other potential under/overestimations will possibly be resolved with the implementation of the national registration system in 2010.

**Figure 5: Projected capacity of dental labour force to supply dental visits by high, medium and low supply scenarios, 2005 to 2020**



Although productivity of dentists, in terms of visits supplied per annum, is arguably not the most relevant measure of productivity, it is used in these projections as it allows reconciliation of supply with projections of demand. It has been shown that projections of dental visits are most sensitive to productivity assumptions applied and less sensitive to changes in recruitment inputs (Teusner et al. 2008). For example, the difference in projected supply in 2020 between the 'high' and 'medium' supply scenarios is approximately 3.5 million visits. To achieve a similar increase would require an increase in annual recruitment by approximately 200 dentists per year. Therefore, minor unforeseen changes or underestimation of recruitment inputs are not likely to have a major impact on future supply estimates.

## Acknowledgments

The authors wish to acknowledge the assistance of the Dental Boards, the state Health Departments and the responding dentists in the collection of dental labour force data; and Dr R Broadbent (ADC) for the provision of ADC candidate numbers.

## References

- ABS (Australian Bureau of Statistics) 2003. Population projections Australia 2002-2101 (Series 8). Cat. no. 3222.0. Canberra: ABS.
- ACODS (Australasian Council of Dental Schools) October 2008. Dental Workforce Report, unpublished data.
- Brennan DS & Spencer AJ 2006. Trends in service provision among Australian private dental practitioners over a 20 year period. *International Dental Journal* 56(4):215-23.
- Broadbent R, CEO of Australian Dental Council, personal communication, 2008.
- Teusner DN, Chrisopoulos S & Spencer AJ 2008. Projected demand and supply for dental visits in Australia: analysis of the impact of changes in key inputs. Cat. no. DEN 171. (Dental Statistics and Research Series No. 38.) Canberra: AIHW.

## Data sources

- AIHW DSRU (Australian Institute of Health and Welfare Dental Statistics and Research Unit). National dental labour force data collections.
- Department of Immigration and Multicultural Affairs (DIMA). Long-term arrivals data, 2000 to 2006, analysed by ABS.
- Longitudinal Study of Dentist Practice Activity (LSDPA) in 1983-84, 1988-89, 1993-94, 1998-99 and 2003-04 (Brennan & Spencer 2002, 2006).

© AIHW Dental Statistics and Research Unit, October 2008  
 Catalogue No. DEN 189  
 ISSN 1445-775X (online)

For further information contact Dana Teusner by email <dana.teusner@adelaide.edu.au> or phone (08) 8303 4227.

*The AIHW Dental Statistics and Research Unit (DSRU) is a collaborating unit of the Australian Institute of Health and Welfare, established in 1988 at The University of Adelaide and located in the Australian Research Centre for Population Oral Health (ARCPOH), School of Dentistry, The University of Adelaide. DSRU aims to improve the oral health of Australians through the collection, analysis and reporting of information on oral health and access to dental care, the practice of dentistry and the dental labour force in Australia.*

### Published by:

AIHW Dental Statistics and Research Unit  
 ARCPOH, School of Dentistry  
 The University of Adelaide  
 SOUTH AUSTRALIA 5005

Email: <aihw.dsr@adelaide.edu.au>  
 Phone: 61 8(08) 8303 4051  
 Fax: 61 8(08) 8303 3070  
 www.arcph.adelaide.edu.au