# Projections of the Australian dental labour force

## Population Oral Health Series NO. 1

DN Teusner and AJ Spencer

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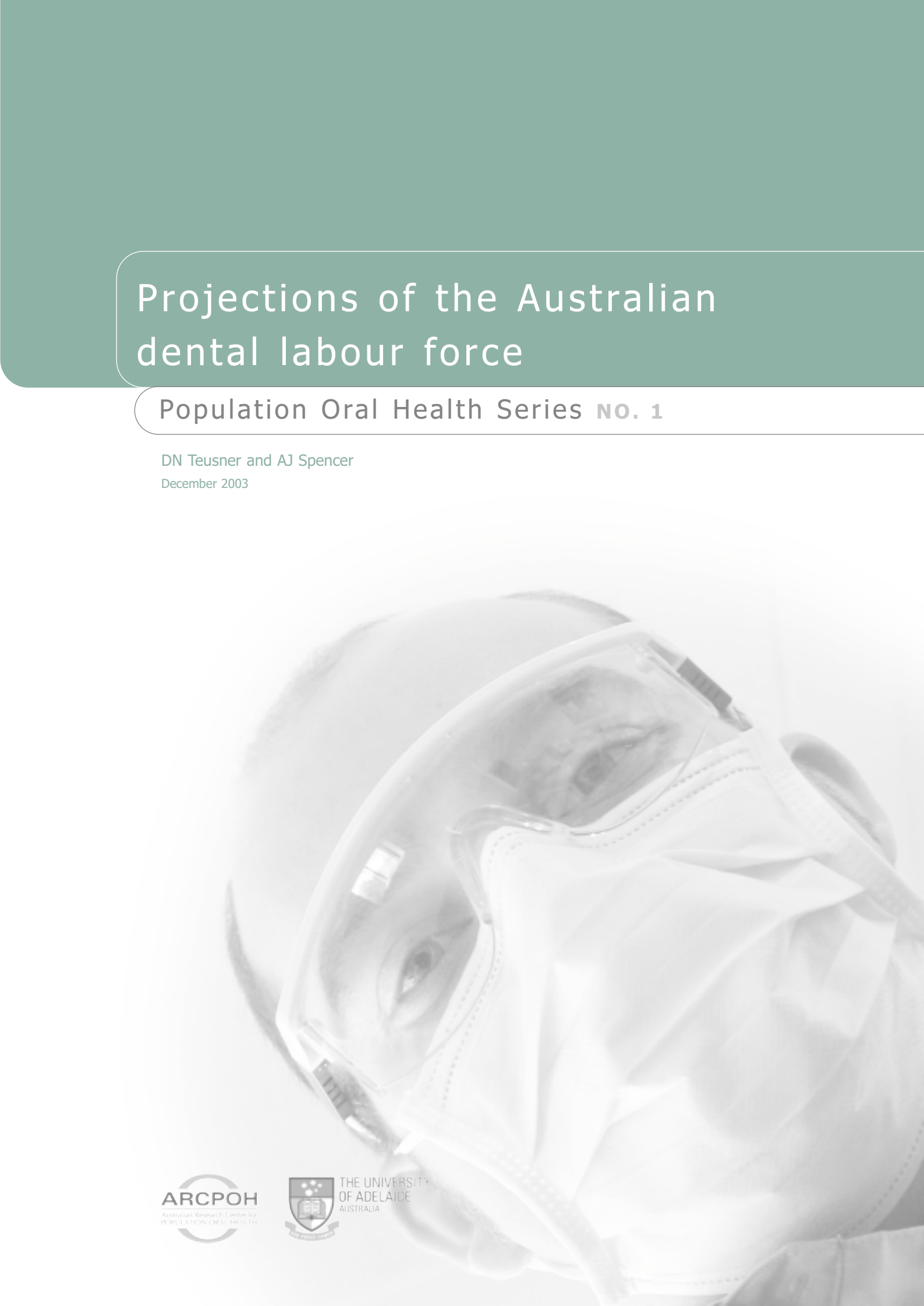

ARCPOH
Australian Research Centre for Population Oral Health
THE UNIVERSITY OF ADELAIDE AUSTRALIA

POPULATION ORAL HEALTH SERIES

Number 1

# Projections of the Australian dental labour force

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# Abbreviations

| | |
|---|---|
| ABS | Australian Bureau of Statistics |
| ADC | Australian Dental Council |
| AIHW | Australian Institute of Health and Welfare |
| DETYA | Department of Education, Training and Youth Affairs |
| DSRU | Dental Statistics and Research Unit |
| ERP | Estimated resident population |
| FTE | Full-time equivalent |

## Place abbreviations

| | |
|---|---|
| ACT | Australian Capital Territory |
| Aust | Australia |
| Eire | Ireland |
| NSW | New South Wales |
| NT | Northern Territory |
| NZ | New Zealand |
| Qld | Queensland |
| SA | South Australia |
| Tas | Tasmania |
| UK | United Kingdom |
| Vic | Victoria |
| WA | Western Australia |

# Symbols

| | |
|---|---|
| . . | not applicable |
| n.a. | not available |
| % | percentage |
| – | zero or rounded to zero |

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# Editorial team

Several people have contributed to the editing of this publication. David Brennan and Lorna Lucas of DSRU and proofreader Jo Mason have all worked to improve the consistency, layout and readability of the text.

# 1 Introduction

The primary focus of this paper is to estimate future growth in the Australian dental labour force and subsequently model the future capacity of the dental labour force to supply dental visits in Australia. Projections to the year 2015 of the dentist, dental therapist, dental hygienist and dental prosthetist labour forces are presented. Projections are supported by an examination of the recruitment (or inflow) and attrition (or outflow) of dentists and allied dental practitioners to the stock of practising dentists and allied dental practitioners in Australia. Projected estimates of numbers of practitioners are utilised to produce estimates of capacity to supply dental visits.

# 2 Projection model

The framework that underlies the projection of numbers of practising dental professionals in Australia conceives the labour force as a dynamic system of stocks and flows. The stock of dental service providers is equivalent to the estimated number of practising dentists, therapists, hygienists and prosthetists. It also includes those practitioners who work in related non-clinical fields such as research, teaching and administration. Movement into the stock of dental practitioners (recruitment) consists of practitioners who were educated in Australian educational institutions, practitioners who have migrated into Australia, and practitioners who return to practice after a period of cessation from practice. Attrition (wastage) from the stock of practitioners is associated with migration out of Australia, retirement, death and cessation of practice. Cessation of practice may be permanent in order to pursue another career or short-term (e.g. prolonged parental leave, study leave).

In order to represent the stock of practitioners in Australia, dentists were categorised into sex and age groups, and allied dental professionals were categorised into age groups only. Each element of the inflows and outflows were followed through each age/sex group, as shown in Figure 1.

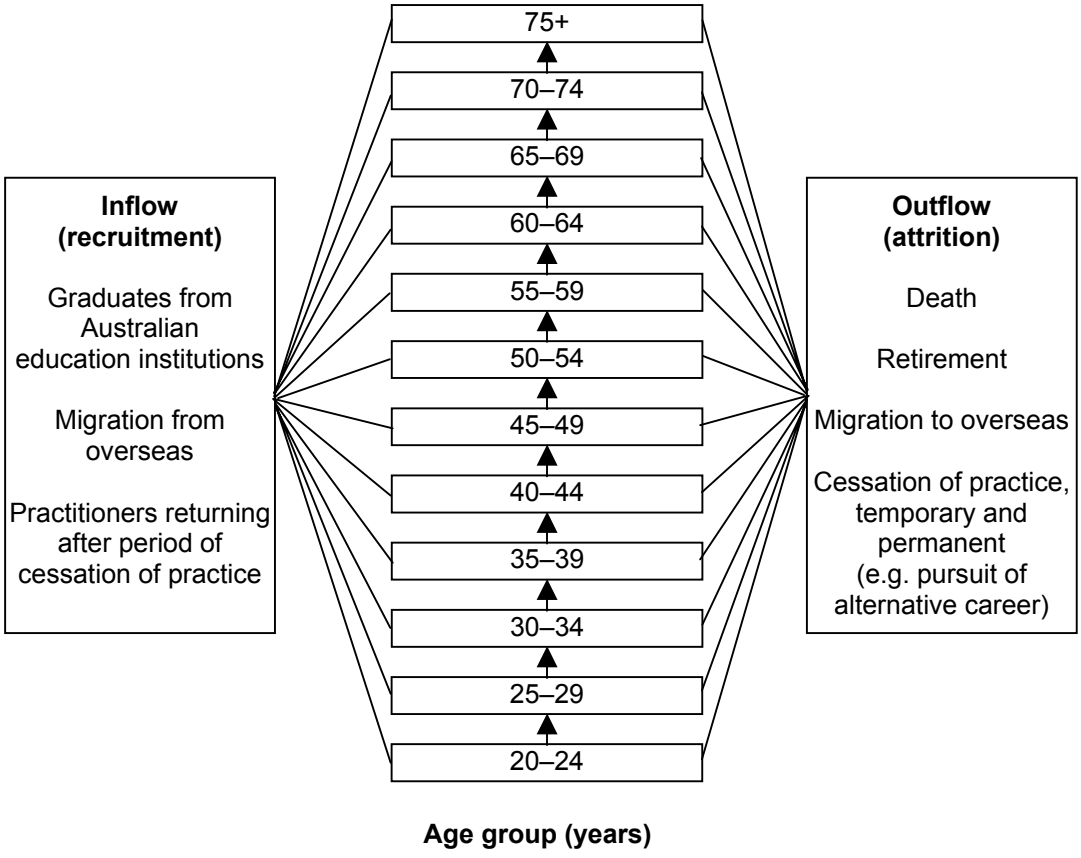



**Figure 1: Framework of the labour force projection model**

The baseline stock of dentists was divided into male and female dentists, and then grouped into 12 age categories I (I = 1,2,…I). The baseline stock of allied dental professionals was divided into 10 age categories due to negligible numbers in the older age groups. There was no categorisation by sex as these groups are highly gendered, the prosthetists are dominated by males and the therapists and hygienists are dominated by females. A basic Markov chain model was adopted; the model assumes that dentists flow in and out of age categories independently and with identical probabilities that do not vary over time (Bartholomew & Forbes 1979). Each dentist with the passage of time has a given probability of staying in the same age group ($P_{ii}$) or of making a transition into an older age group ($P_{i,i+1}$). The transitional probabilities between each of the age groups is set out in an array as follows:

| | | | | | |
|---|---|---|---|---|---|
| $P_{11}$ | $P_{12}$ | … | … | … | $W_1$ |
| … | $P_{22}$ | $P_{23}$ | … | … | $W_2$ |
| … | … | $P_{33}$ | $P_{34}$ | … | $W_3$ |
| … | … | … | $P_{II}$ | $P_0$ | $W_I$ |

Each element $\mathbf{P}_{ii}$ is the probability that a member of the age category i at the start of the time interval remains in the age category i at the end, and $\mathbf{P}_{i,i+1}$ is the probability that a member of age category i at the start of the time interval is in age category i+1 at the end. $\mathbf{W}_i$ is the probability that a member of age category i at the start would no longer contribute to the stock of dentists at the end of the time interval. Since each dentist must either stay in the same age group, move to the next age group, or no longer contribute to the stock of dentists, then each row sums to 1:

$$P_{ii} + P_{i,i+1} + W_i = 1$$

(Note: as there are only 12 age categories, dentists that are 75 years or older cannot move into the next age category—they can only stay in the current age category or be wasted out of the stock of dentists).

The matrix **P** is called the transition matrix and the row vector **W** ($W_1$, $W_2$…$W_I$) is the wastage vector. It is implicit in this model that time is discrete, typically one year. The elements of **P** and **W** are assigned numerical values by estimating the probabilities from past data.

The Markov chain model is completed by an estimation of the flow of new recruits. The number of recruits at year T and for age category i is denoted by $R_i(T)$, referred to as the recruitment vector. The recruitment vector is set out in an array as follows:

| | | |
|---|---|---|
| $R_1(2001)$ | $R_1(2002)$ | …$R_1(T)$ |
| $R_2(2001)$ | $R_2(2002)$ | …$R_2(T)$ |
| … | … | … |
| $R_I(2001)$ | $R_I(2002)$ | …$R_I(T)$ |

The following notation specifies the calculation for each age category, with the total number of practising dentists in an age category for year T denoted by $D_i(T)$:

$$D_i(T) = R_i(T) + D_i(T-1) \times P_{ii} + D_{i-1}(T-1) \times P_{i-1,i}$$

$$I = 12, T>2000$$

For example, the notation for the calculation of the number of practising dentists in age category 2, (i = 2, 25 to 29 years) in 2003 would be:

$$D_2(2003) = R_2(2003) + D_2(2002) \times P_{22} + D_1(2002) \times P_{12}$$

# 3 Dentist labour force

## 3.1 Previous labour force projections

DSRU has previously published dental labour force projections (AIHW DSRU 1998). These projections were calculated using 1992 baseline data and a total recruitment vector of 377 dentists per year. The projections estimated a 4.3% increase, from 7,493 practising dentists in 1992 to 7,818 dentists in 2000. The actual increase was far greater, with a 20.0% increase in the number of practising dentists to a total of 8,991 in 2000 (Table 1).

**Table 1: Baseline data for 1992 and comparison of previous projections with actual practising dentists by sex, 2000**

| | 1992 baseline data* | 2000 projection** | 2000 actual† | Projected % change | Actual % change |
|---|---|---|---|---|---|
| Males | 6,256 | 6,234 | 6,932 | –0.4 | 10.8 |
| Females | 1,237 | 1,584 | 2,059 | 28.0 | 66.5 |
| Persons | 7,493 | 7,818 | 8,991 | 4.3 | 20.0 |

Source: †Teusner & Spencer, 2003
*AIHW DSRU1994
**AIHW DSRU, 1998

In order to understand why the previous projections underestimated the growth in the dental labour force, the wastage vector, recruitment vector and the actual and projected age distributions for the previous projections were examined. Although several contributing factors were identified, including the possible overestimation of the 2000 dental labour force numbers (see 'Baseline data: 2000 dentist labour force' page 6), the primary explanation appears to be the underestimation of the return to practice component of the recruitment vector.

The recruitment vector used in the previous projection was developed from estimates of dentistry course completions, net migration and Australian Dental Council (ADC) accreditations. Also included in the recruitment vector was an estimate of the number of dentists that would return to practice in Australia after a period of cessation of practice. This return to practice component was estimated to be 75 to 80 dentists per year. The estimates for course completions, net migration and ADC accreditations were very similar to actual numbers, but the return to practice component may have been more than double what was previously anticipated. In addition to limited availability of suitable data, there are numerous reasons why this component was difficult to predict. The issues are discussed at greater length below, (see 'Return to practice', page 12).

Although it is suspected that underestimation of recruitment was the main explanation for low projections, current data provides evidence that actual wastage from the stock of dentists may also have been less than anticipated. For the purposes of the current projections, revised wastage rates (percentage of dentists ceasing practice) were calculated. Although the new wastage rates display the same patterns of attrition as the wastage rates applied in the previous projections, the new rates indicate that the previous wastage rates for dentists aged 35 to 55 years may have been too high. This

was further supported by the differences in the projected and actual age distribution, as the projections underestimated the numbers in those same age groups.

## 3.2 Baseline data: 2000 dentist labour force

Table 2 presents the dental labour force estimates for 2000 by sex, age group and State/Territory; these data provide the baseline for the labour force projections. Projections are based on the numbers of practising dentists rather than registered numbers, in order to avoid complications of multiple registration. Overall, the practising rate was 46.9 dentists per 100,000 population. Female dentists comprised 22.9% of all practising dentists. Just over half (53.4%) of the male practitioners were 45 years or older. In comparison, only a quarter (24.7%)of female dentists were 45 years or older.

**Table 2: Practising dentists by age group, sex and State/Territory, and practising rate per 100,000 population, 2000**

| Age group (years) | NSW | Vic | Qld | SA | WA | Tas | NT[(a)] | ACT | Total | % Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Males** | | | | | |
| 20–24 | 24 | 14 | 31 | 3 | 15 | 2 | — | 1 | 90 | 1.3 |
| 25–29 | 173 | 131 | 109 | 58 | 43 | 7 | 5 | 5 | 531 | 7.7 |
| 30–34 | 230 | 154 | 118 | 39 | 64 | 6 | 3 | 7 | 621 | 9.0 |
| 35–39 | 331 | 193 | 137 | 42 | 73 | 8 | 5 | 15 | 804 | 11.6 |
| 40–44 | 428 | 251 | 212 | 107 | 131 | 18 | 8 | 28 | 1,183 | 17.1 |
| 45–49 | 366 | 232 | 166 | 137 | 119 | 17 | 6 | 33 | 1,076 | 15.5 |
| 50–54 | 295 | 252 | 163 | 130 | 97 | 21 | 7 | 19 | 984 | 14.2 |
| 55–59 | 210 | 175 | 129 | 61 | 94 | 6 | 5 | 8 | 688 | 9.9 |
| 60–64 | 137 | 125 | 94 | 20 | 48 | 8 | 3 | 10 | 445 | 6.4 |
| 65–69 | 110 | 56 | 49 | 17 | 17 | 3 | 1 | 4 | 257 | 3.7 |
| 70–74 | 76 | 39 | 29 | 15 | 8 | 2 | — | 7 | 176 | 2.5 |
| 75+ | 37 | 21 | 5 | 6 | 7 | 1 | — | — | 77 | 1.1 |
| **Total** | **2,417** | **1,643** | **1,242** | **635** | **716** | **99** | **43** | **137** | **6,932** | **100.0** |
| | | | | | **Females** | | | | | |
| 20–24 | 24 | 8 | 17 | 1 | 10 | — | 1 | — | 61 | 3.0 |
| 25–29 | 116 | 106 | 62 | 37 | 49 | 4 | 3 | 13 | 390 | 18.9 |
| 30–34 | 136 | 107 | 55 | 24 | 28 | 5 | 3 | 8 | 366 | 17.8 |
| 35–39 | 125 | 120 | 75 | 29 | 34 | — | 3 | 8 | 394 | 19.1 |
| 40–44 | 139 | 78 | 54 | 33 | 23 | 2 | 1 | 9 | 339 | 16.5 |
| 45–49 | 91 | 80 | 31 | 31 | 25 | 4 | 3 | 6 | 271 | 13.2 |
| 50–54 | 44 | 35 | 14 | 20 | 11 | 3 | 2 | 2 | 131 | 6.4 |
| 55–59 | 15 | 16 | 7 | 7 | 10 | 1 | 1 | 1 | 58 | 2.8 |
| 60–64 | 13 | 8 | 3 | 2 | 5 | 1 | — | — | 32 | 1.6 |
| 65–69 | 1 | 1 | 2 | — | — | — | — | — | 4 | 0.2 |
| 70–74 | 1 | 1 | 2 | — | 2 | — | — | — | 6 | 0.3 |
| 75+ | 4 | 1 | — | 2 | — | — | — | — | 7 | 0.3 |
| **Total** | **709** | **561** | **322** | **186** | **197** | **20** | **17** | **47** | **2,059** | **100.0** |
| | | | | | **Persons** | | | | | |
| 20–24 | 48 | 22 | 48 | 4 | 25 | 2 | 1 | 1 | 151 | 1.7 |
| 25–29 | 289 | 237 | 171 | 95 | 92 | 11 | 8 | 18 | 921 | 10.2 |
| 30–34 | 366 | 261 | 173 | 63 | 92 | 11 | 6 | 15 | 987 | 11.0 |
| 35–39 | 456 | 313 | 212 | 71 | 107 | 8 | 8 | 23 | 1,198 | 13.3 |
| 40–44 | 567 | 329 | 266 | 140 | 154 | 20 | 9 | 37 | 1,522 | 16.9 |
| 45–49 | 457 | 312 | 197 | 168 | 144 | 21 | 9 | 39 | 1,347 | 15.0 |
| 50–54 | 339 | 287 | 177 | 150 | 108 | 24 | 9 | 21 | 1,115 | 12.4 |
| 55–59 | 225 | 191 | 136 | 68 | 104 | 7 | 6 | 9 | 746 | 8.3 |
| 60–64 | 150 | 133 | 97 | 22 | 53 | 9 | 3 | 10 | 477 | 5.3 |
| 65–69 | 111 | 57 | 51 | 17 | 17 | 3 | 1 | 4 | 261 | 2.9 |
| 70–74 | 77 | 40 | 31 | 15 | 10 | 2 | — | 7 | 182 | 2.0 |
| 75+ | 41 | 22 | 5 | 8 | 7 | 1 | — | — | 84 | 0.9 |
| **Total** | **3,126** | **2,204** | **1,564** | **821** | **913** | **119** | **60** | **184** | **8,991** | **100.0** |
| **Practising rate[(b)]** | **48.4** | **46.3** | **43.9** | **54.8** | **48.5** | **25.3** | **30.5** | **59.2** | **46.9** | **. .** |

(a) Sex and age data were not available for respondents of the Northern Territory 2000 labour force questionnaire. The numbers of dentists in each age group were estimated by multiplying the percentage of all registered dentists in that age group by the total number of estimated practising dentists.

(b) Practising rate: number of dental practitioners per 100,000 ERP. See Appendix A for ERP at 30 June 2000.

Note: Includes dentists practising solely or mainly in this State/Territory. Adjusted to take account of non-response.

Source: Teusner & Spencer, 2003.

The response rate to the dental labour force survey represented 81.3% of total dental registrations in all States and Territories.

Estimations of the number and characteristics of practising dental practitioners in each State and Territory were based on the responses of those practitioners practising solely or mainly within that State or Territory. Practitioners who were on leave for three or more months were excluded from tables of practising dentists.

For all estimates it was assumed that non-respondents to the survey had the same labour force characteristics as respondents. Survey data were weighted up to the registrations by distributing non-response numbers on the basis of this assumption. Consequently the estimation process may overestimate the numbers of practising dentists if non-respondents are more likely to be those with multiple registrations, working overseas, no longer working as a dentist or permanently retired. Furthermore, some dental boards did not forward a survey to practitioners registering for the first time; these practitioners were most likely to be new graduates yet to commence working.

## 3.3 Previous growth in the dentist labour force

Since the last national labour force data collection in 1994 there has been a 17.3% increase in the number of practising dentists in Australia (Table 3). The rate per 100,000 population has also increased by 9.2%. The growth in the labour force was not experienced uniformly across the States and Territories. The smaller States experienced negligible increases in the practising rate and the Northern Territory experienced a decline in the practising rate per 100,000 population. Of the larger States, Western Australia experienced the greatest increase in the practising rate, (22.1%). It appears that interstate migration was a major contributing factor to growth of the labour force in that State as the majority of recent recruits to the Western Australia dental register had qualified in other States of Australia.

**Table 3: Practising dentists, practising rate per 100,000 population and percentage by State/Territory, region, 1994 and 2000**

| | Practising dentists | | | Practising rate per 100,000 population [(a)] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Capital city | | | Rest of State | | | Total | | |
| State/ Territory | 1994 | 2000 | Per cent change | 1994 | 2000 | Per cent change | 1994 | 2000 | Per cent change | 1994 | 2000 | Per cent change |
| **NSW** | 2,733 | 3,126 | 14.4 | 54.8 | 58.4 | 6.5 | 29.6 | 31.2 | 5.4 | 45.2 | 48.4 | 7.0 |
| **Vic** | 1,867 | 2,204 | 18.1 | 48.2 | 52.4 | 8.7 | 25.5 | 29.9 | 17.3 | 41.7 | 46.3 | 10.9 |
| **Qld** | 1,314 | 1,564 | 19.0 | 50.2 | 52.3 | 4.2 | 33.5 | 36.7 | 9.7 | 41.1 | 43.9 | 6.7 |
| **SA** | 731 | 821 | 12.3 | 59.4 | 64.6 | 8.8 | 23.4 | 28.1 | 19.9 | 49.7 | 54.8 | 10.2 |
| **WA** | 675 | 913 | 35.3 | 45.8 | 55.6 | 21.3 | 23.4 | 29.0 | 23.8 | 39.7 | 48.5 | 22.1 |
| **Tas** | 119 | 119 | –0.1 | 31.9 | 34.6 | 8.4 | 20.5 | 18.7 | –8.7 | 25.2 | 25.3 | 0.2 |
| **NT** | 55 | 60 | 8.4 | 42.3 | 48.7 | 15.1 | 20.5 | 15.0 | –27.0 | 32.1 | 30.5 | –5.0 |
| **ACT** | 173 | 184 | 6.5 | 57.5 | 59.2 | 2.9 | — | — | — | 57.5 | 59.3 | 3.1 |
| **Aust** | **7,667** | **8,991** | **17.3** | **51.2** | **55.7** | **8.8** | **28.7** | **31.4** | **9.5** | **43.0** | **46.9** | **9.2** |

(a) Practising rate: number of dental practitioners per 100,000 ERP. See Appendix A for ERP at 30 June 2000.

Source: AIHW DSRU Dental labour force data collection, 2000. Includes dentists practising solely or mainly in this State/Territory. Adjusted to take account of non-response.

# 4 Projections of the dentist labour force

## 4.1 Dentist labour force recruitment

The first step in projecting the future dental labour force is the development of a 'likely' recruitment vector for the years 2001 to 2015. Inflow of dentists to the stock of practising dentists can be determined by examining four key areas of recruitment. As discussed below, there are varying degrees of confidence in estimating these areas of recruitment. Development of an accurate recruitment vector is hindered by availability of suitable data and by the potential overlap between the key areas of recruitment.

### Australian university graduates

In 2000 there were five Bachelor of Dental Surgery Science courses available in Australian universities. Data on course completions for the years 1989 to 1999 were obtained from the Department of Education, Training and Youth Affairs and are presented in Table 4. It can be seen that the number of course completions fluctuates from year to year. The average number of male course completions for the period 1989 to 1999 was 130.9 graduates per year, and the average number of female course completions was 86 graduates per year.

Course completions are expected to remain stable in the short term; however, the age distribution of graduates is expected to change slightly, with decreasing numbers of graduates in the 20 to 24 years age group. This change is expected to occur as a result of the University of Sydney recently altering course entrance criteria.

The Australian educated dentists component of the recruitment vector was estimated using average course completion numbers for the years 1989 to 1999, with adjustments to the numbers in the 20 to 24 and 25 to 29 years age groups. The 20 to 24 years age group was reduced to 80% and the remaining 20% was included in the 25 to 29 years age group.

**Table 4: Dentistry course completions from Australian universities by age group and sex, 1989 to 1999**

| Age Group (years) | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | Total | Average completions per year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Males** | | | | | | |
| 20–24 | 109 | 89 | 113 | 79 | 103 | 112 | 116 | 85 | 106 | 76 | 88 | 1,076 | 97.8 |
| 25–29 | 29 | 26 | 19 | 26 | 29 | 25 | 20 | 25 | 18 | 24 | 20 | 261 | 23.7 |
| 30–34 | 3 | 7 | 6 | 2 | 4 | 5 | 6 | 8 | 3 | 7 | 12 | 63 | 5.7 |
| 35–39 | 1 | 1 | 3 | 3 | 4 | 4 | 1 | 3 | 1 | 4 | 3 | 28 | 2.5 |
| 40–44 | — | — | 1 | — | 1 | 1 | 1 | — | 2 | 2 | 2 | 10 | 0.9 |
| 45–49 | 1 | — | — | — | — | 1 | 1 | — | — | — | — | 4 | 0.3 |
| **Total** | **143** | **123** | **142** | **110** | **141** | **148** | **145** | **121** | **130** | **113** | **125** | **1,441** | **130.9** |
| | | | | | | | **Females** | | | | | | |
| 20–24 | 58 | 59 | 50 | 65 | 57 | 65 | 70 | 73 | 73 | 65 | 63 | 698 | 63.5 |
| 25–29 | 18 | 4 | 20 | 8 | 15 | 20 | 20 | 22 | 16 | 11 | 23 | 177 | 16.1 |
| 30–34 | 5 | 3 | 2 | 1 | 5 | 3 | 3 | 5 | 1 | 1 | 5 | 34 | 3.1 |
| 35–39 | 3 | 2 | 1 | — | — | 3 | 2 | 2 | 3 | 3 | 3 | 22 | 2.0 |
| 40–44 | — | 1 | — | — | 2 | 1 | 1 | — | 2 | 1 | 1 | 9 | 0.8 |
| 45–49 | — | — | — | — | 2 | — | 1 | 1 | 1 | — | — | 5 | 0.5 |
| **Total** | **84** | **69** | **73** | **74** | **81** | **92** | **97** | **103** | **96** | **81** | **95** | **945** | **86.0** |
| | | | | | | | **Persons** | | | | | | |
| 20–24 | 167 | 148 | 163 | 144 | 160 | 177 | 186 | 158 | 179 | 141 | 151 | 1,774 | 161.3 |
| 25–29 | 47 | 30 | 39 | 34 | 44 | 45 | 40 | 47 | 34 | 35 | 43 | 438 | 39.8 |
| 30–34 | 8 | 10 | 8 | 3 | 9 | 8 | 9 | 13 | 4 | 8 | 17 | 97 | 8.8 |
| 35–39 | 4 | 3 | 4 | 3 | 4 | 7 | 3 | 5 | 4 | 7 | 6 | 50 | 4.5 |
| 40–44 | — | 1 | 1 | — | 3 | 2 | 2 | — | 4 | 3 | 3 | 19 | 1.7 |
| 45–49 | 1 | — | — | — | 2 | 1 | 2 | 1 | 1 | — | — | 8 | 0.7 |
| **Total** | **227** | **192** | **215** | **184** | **222** | **240** | **242** | **224** | **226** | **194** | **220** | **2,386** | **216.9** |

Notes

1. Overseas student course completions were excluded.
2. Students graduating with Honours as a separate course award have been excluded (The University of Adelaide).

Source: DETYA unit record files, unpublished data.

## Migration

Dentists who obtained their dental qualifications in the United Kingdom, Ireland or New Zealand are granted registration on the basis of mutual recognition of qualifications. Dental practitioners from all other countries gain registration after being awarded a certificate from the Australian Dental Council (ADC).

There were a total of 294 dentists who qualified for an ADC certificate in the years 1990 to 2001, averaging approximately 27 accreditations per year. Of the certificates awarded in that time, 44.8% were awarded to female dentists; age data for those gaining accreditation were unavailable. Although the numbers of dentists applying for assessment fluctuates considerably, the ADC informally reports that there is likely to be an increase in the number of certificates awarded. Pass rates in the final examination have been rising progressively. It is suspected that preparation of candidates has improved, and consequently the ADC anticipates that there will be approximately 35 to 40 accreditations per year for the next 5 to 10 years. The ADC accreditations component of the recruitment vector is a conservative 'best guess' based on the available information and is presented in Table 5.

**Table 5: Estimated numbers of ADC accreditations of overseas dentists per year, by age group and sex, for the period 2001 to 2015**

| Age group (years) | Males | Females | Total |
|---|---|---|---|
| 25–29 | 1 | 1 | 2 |
| 30–34 | 3 | 3 | 6 |
| 35–39 | 6 | 4 | 10 |
| 40–44 | 6 | 4 | 10 |
| 45–49 | 3 | 3 | 6 |
| 50–54 | 1 | 1 | 2 |
| **Total** | **20** | **16** | **36** |
| **Total %** | **55.6** | **44.4** | **100.0** |

Source: Personal communication, Dr R King, ADC, June 2002.

There were several difficulties in determining the numbers of dentists who had gained registration in Australia via mutual recognition of qualifications in the past decade. In addition to gaps in available data, not all registration boards were able to provide qualifications data for registered dentists. However, data of overseas arrivals to Australia were analysed in order to determine the numbers of dentists arriving in Australia from New Zealand, United Kingdom and Ireland who intended to live and work in Australia for periods of 12 months or longer. Unpublished data supplied by the Australian Bureau of Statistics is presented in Table 6. These numbers should be viewed as indicative only, as those overseas arrivals that stated dentistry as their occupation may not necessarily apply for mutual recognition of qualifications and may not practice dentistry while in Australia. Furthermore, those arrivals with United Kingdom, Irish or New Zealand citizenship may not have gained their dentistry qualification in those countries, and hence may not be eligible for mutual recognition.

**Table 6: Long-term overseas arrivals with United Kingdom, Ireland and New Zealand citizenship by age group and sex, 1998, 1999 and 2000**

| Age group | 1998 | | | 1999 | | | 2000 (YTD 30th June) | | |
|---|---|---|---|---|---|---|---|---|---|
| (years) | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| 20–29 | 11 | 7 | 18 | 6 | 9 | 15 | 8 | 7 | 15 |
| 30–39 | 5 | 3 | 8 | 13 | 3 | 16 | 7 | 6 | 13 |
| 40–49 | — | — | — | — | — | — | 3 | — | 3 |
| 50–59 | — | — | — | 3 | — | 3 | — | — | — |
| 60+ | — | — | — | — | — | — | — | — | — |
| **Total** | **16** | **10** | **26** | **22** | **12** | **34** | **18** | **13** | **31** |

Notes

1. A 'long-term arrival' is a visitor intending to stay for 12 months or longer.
2. YTD denotes year to date.

Source: Overseas arrivals data are collected by the Department of Immigration, & Multicultural & Indigenous Affairs (DIMIA). Unpublished data were made available via the Australian Bureau of Statistics; due to necessity to maintain confidentiality, only limited data were made available.

It is believed that the number of long-term arrival dentists to Australia varies considerably from year to year. Predicting numbers of long-term arrivals in the future is further complicated by influences such as unforseen world events and changes in government migration policy. With these issues in consideration, a conservative recruitment estimate for the migration of dentists from United Kingdom, Ireland and New Zealand was developed. The numbers of overseas arrivals were averaged for the

available years of data and multiplied by the participation rate (the percentage of registered dentists practising, 2000 labour force data collection, 84.7%). The resulting estimate is presented in Table 7.

**Table 7: Estimated number of dentists with United Kingdom, Ireland and New Zealand citizenship arriving in Australia per year, estimated participation in dentistry by age group and sex, for the period 2001 to 2015**

| | Males | | Females | |
|---|---|---|---|---|
| Age group (years) | Averaged long-term arrivals[(a)] | Estimated participation[(b)] | Averaged long-term arrivals[(a)] | Estimated participation[(b)] |
| 20–24 | 5.0 | 4.2 | 4.6 | 3.9 |
| 25–29 | 5.0 | 4.2 | 4.6 | 3.9 |
| 30–34 | 5.0 | 4.2 | 2.4 | 2.0 |
| 35–39 | 5.0 | 4.2 | 2.4 | 2.0 |
| 40–44 | 0.6 | 0.5 | — | — |
| 45–49 | 0.6 | 0.5 | — | — |
| 50–54 | 0.6 | 0.5 | — | — |
| 55–59 | 0.6 | 0.5 | — | — |
| 60+ | — | — | — | — |
| **Total** | **22.4** | **19.0** | **14.0** | **11.9** |

(a) United Kingdom, Ireland and New Zealand citizen dentists arriving in Australia intending to stay for 12 months or more, numbers averaged for 1998, 1999 and 2000 (YTD 30th June).

(b) Estimated participation: the estimated number of arrivals commencing practice of dentistry in the year of arrival ('averaged long-term arrivals' x 'participation rates for the year 2000', 84.7%).

## Return to practice

In any given year there are a number of dentists who recommence the practice of dentistry after a temporary cessation of practice. Those who cease practice for more than 12 months are typically treated as labour force attrition. Hence, those returning to practice after a break of more than 12 months need to be accounted for in the recruitment vector. This component of the recruitment vector is referred to as the 'return to practice' component, and is estimated to be approximately 40% of total recruitment.

Recent research by Newton, Buck and Gibbons (2001), investigating the frequency and duration of career breaks taken by dental health care professionals practising in the United Kingdom, indicates that the temporary cessation of practice is not uncommon. Of those surveyed, 3.6% of male dentists and 6.0% of female dentists were currently on a career break. Nearly half of those currently on a break expected to return to employment as a dentist (46.3% of male dentists and 48.6% of female dentists). Of those dentists who were currently practising, 60.9% of female and 26.8% of male dentists had taken a career break at some point in their working lives. The average total duration of all career breaks taken by a dentist was 13.26 months for male dentists (median, 4 months) and 19.44 months for female dentists (median, 9 months).

An Australian study of dentist's career pathways identified several reasons for the temporary cessation of practice. These included overseas practice and travel, extended maternity/parental leave, extended study leave, illness and the pursuit of an alternative career (Szuster, 1999). It is also anecdotally reported that some dentists have returned to the practice of dentistry after retirement, due to economic or lifestyle reasons.

There are great difficulties in determining accurate 'return to practice' rates for dentists from currently available data. There is only a limited ability to track the practice activity of individual dentists over time, as not all registration boards provide data to DSRU that contains a consistent key or ID number (i.e. registration number). When it has been possible to link consecutive data sets, tracking practice activity was impeded by gaps in the data. Either dentists did not respond to the labour force questionnaire in consecutive collections, or annual consecutive collections of labour force data were not conducted.

Given the difficulties cited above, an estimate of the 'return to practice' percentage was derived from the labour force data by examination of reported changes in practice status. The available data sets were linked to determine the percentage of dentists in each age and sex group who reported not practising in Australia in 1998 or 1999, but reported practising in Australia in the following year. The number determined for each age and sex group was weighted to account for non-response and divided by the total number practising in that age/sex group to determine the return to practice rate for that age/sex group. The estimated percentages are presented in Table 8.

**Table 8: Estimated percentage of dentists returning to practice in Australia by age group and sex, 1999 and 2000**

| | Per cent males | | | Per cent females | | |
|---|---|---|---|---|---|---|
| Age group (years) | 1999 | 2000 | Total | 1999 | 2000 | Total |
| 20–24 | 3.8 | — | 2.2 | — | — | — |
| 25–29 | 1.5 | 3.3 | 2.4 | 2.4 | 2.4 | 2.4 |
| 30–34 | 2.5 | 1.4 | 2.0 | 3.7 | 3.1 | 3.4 |
| 35–39 | 1.0 | 1.0 | 1.0 | 3.1 | 2.2 | 2.6 |
| 40–44 | 1.0 | 1.1 | 1.0 | 4.8 | 2.0 | 3.3 |
| 45–49 | 0.6 | 1.0 | 0.8 | 1.9 | 0.6 | 1.2 |
| 50–54 | 0.4 | 0.5 | 0.5 | — | 1.2 | 0.7 |
| 55–59 | 1.1 | 0.6 | 0.8 | — | — | — |
| 60–64 | 0.9 | 2.6 | 1.8 | — | — | — |
| 65+ | 3.5 | 2.2 | 2.9 | — | 11.7 | 5.3 |
| **Total** | **1.3** | **1.3** | **1.3** | **2.8** | **2.0** | **2.4** |

Note: These estimates were calculated using the AIHW DSRU dentist labour force data sets: Victoria 1998, 1999, 2000; South Australia 1998, 1999, 2000; New South Wales 1998, 1999, 2000.

As can be seen in Table 8, similar patterns of return to practice could be observed in the two years of available data. The overall higher rates of return to practice for female dentists is consistent with research by Newton, Buck and Gibbons (2001) which found that a larger proportion of female dentists take a career break at some point during their working lives.

There was no evidence of female dentists aged 55 to 64 years returning to practice. This is perhaps a function of the low numbers of female dentists in those age groups, and not necessarily indicative of the working patterns of female dentists.

Obviously the number of dentists returning to practice cannot be determined from observed alterations in reported practice status alone. As only registered dentists are surveyed, an assessment of the number of dentists who have been restored to a register after a period of non-registration is also required.

Some dental boards maintain data items that reflect the registration type of an individual dentist. For these registers it is possible to differentiate between dentists

restoring registration, renewing registration or registering for the first time. However, for other dental registers, where these items are not maintained, it is not possible to make the distinction between these types of registration. This presents a problem in determining numbers of dentists who have effectively 'returned to practice' after a period of non-registration and who consequently would not be accounted for in the above 'return to practice' estimation.

Furthermore, many dentists maintain registration in multiple States/Territories. Currently it is not possible to cross-reference State/Territory data sets to determine whether a dentist who appears to have returned to practice in one State/Territory has actually returned after cessation of practice in Australia or has simply migrated from interstate.

Consequently, due to this incapacity to account for non-registered dentists returning from a period of cessation of practice, it is probable that the rates cited in Table 8 underestimate the actual rates of dentists returning to the practice of dentistry.

To address this issue, other data sources were examined in order to achieve a more likely recruitment vector. As it is suspected that a large proportion of return to practice recruitment is a result of overseas travel, and that those ceasing practice for the purpose of overseas travel are less likely to maintain registration in Australia during their time abroad, it was suspected that these dentists were unlikely to have been included in the estimations above (Table 8). Hence, in order to more accurately estimate a likely recruitment vector, an estimate of the numbers of Australian citizen dentists returning from a long-term stay abroad should be a component of recruitment.

To capture ex-patriot dentists returning home, a quota for Australian resident dentists arriving in Australia was included in the migration component of the recruitment vector. Long-term arrivals data were examined to estimate this quota. The available data on Australian dentists (i.e. holding Australian citizenship) arriving in Australia after being overseas for 12 months or more is presented in Table 9.

**Table 9: Australian citizen dentists returning to Australia after long-term stay abroad by age group and sex, 1998, 1999 and 2000**

| Age group | 1998 | | | 1999 | | | 2000 (YTD 30th June) | | |
|---|---|---|---|---|---|---|---|---|---|
| (years) | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| 20–29 | 10 | 11 | 21 | 8 | 15 | 23 | 10 | 12 | 22 |
| 30–39 | 14 | 5 | 19 | 13 | 9 | 22 | 7 | 4 | 11 |
| 40–49 | 16 | 7 | 23 | 13 | 5 | 18 | 13 | 3 | 16 |
| 50–59 | 9 | 3 | 12 | 11 | 3 | 14 | 4 | 3 | 7 |
| 60+ | — | — | — | — | — | — | 3 | — | 3 |
| **Total** | **49** | **26** | **75** | **45** | **32** | **77** | **37** | **22** | **59** |

Notes

1. A 'long-term stay overseas' is a visitor who was abroad for 12 months or longer.
2. YTD denotes year to date.

Source: Overseas arrivals data are collected by the Department of Immigration & Multicultural & Indigenous Affairs (DIMIA). Unpublished data were made available via the Australian Bureau of Statistics; due to necessity to maintain confidentiality, only limited data were made available.

Although the data presented in Table 9 can be averaged to achieve an estimate of the numbers of Australian dentists returning from a long-term stay abroad, it is not possible

to determine whether an arriving dentist will re-register or actually practice dentistry in that year. Furthermore, by including the dentists returning from a long-term stay abroad in the recruitment vector, there is the possibility of double counting those dentists who maintained registration while abroad and then reported in labour force surveys that they had returned to practice in Australia. Therefore, for the purposes of developing a likely recruitment vector, a conservative estimate of Australian dentists returning to practice after a long-term stay abroad was determined by averaging arrivals data. The average was then multiplied by the 2000 dentist participation rate (the percentage of registered dentists practising, 2000 labour force data collection, 84.7%). The resulting estimate is presented in Table 10.

**Table 10: Estimated number of Australian citizen dentists returning to practice after long-term stay abroad per year, by age group and sex, for the period 2001 to 2015**

| Age group | Males | | Females | |
|---|---|---|---|---|
| (years) | Averaged long-term arrivals[(a)] | Estimated participation[(b)] | Averaged long-term arrivals[(a)] | Estimated participation[(b)] |
| 20–24 | 5.6 | 4.7 | 7.6 | 6.4 |
| 25–29 | 5.6 | 4.7 | 7.6 | 6.4 |
| 30–34 | 6.8 | 5.8 | 3.6 | 3.0 |
| 35–39 | 6.8 | 5.8 | 3.6 | 3.0 |
| 40–44 | 8.4 | 7.1 | 3 | 2.5 |
| 45–49 | 8.4 | 7.1 | 3 | 2.5 |
| 50–54 | 4.8 | 4.1 | 1.8 | 1.5 |
| 55–59 | 4.8 | 4.1 | 1.8 | 1.5 |
| 60+ | 1.2 | 1.0 | — | — |
| **Total** | **52.4** | **44.4** | **32.0** | **27.1** |

(a) Australian citizen dentists arriving in Australia after being overseas for 12 months or more, numbers averaged for years 1998, 1999 and 2000 (YTD 30th June).

(b) Estimated participation: the estimated number of arrivals commencing practice of dentistry in the year of arrival ('averaged long-term arrivals' x 'participation rates for the year 2000', 84.7%).

### Summary of recruitment components

In summary, the recruitment vector applied in the following projections is calculated by the addition of several components. Those components and the total numbers for each are presented in Figure 2.

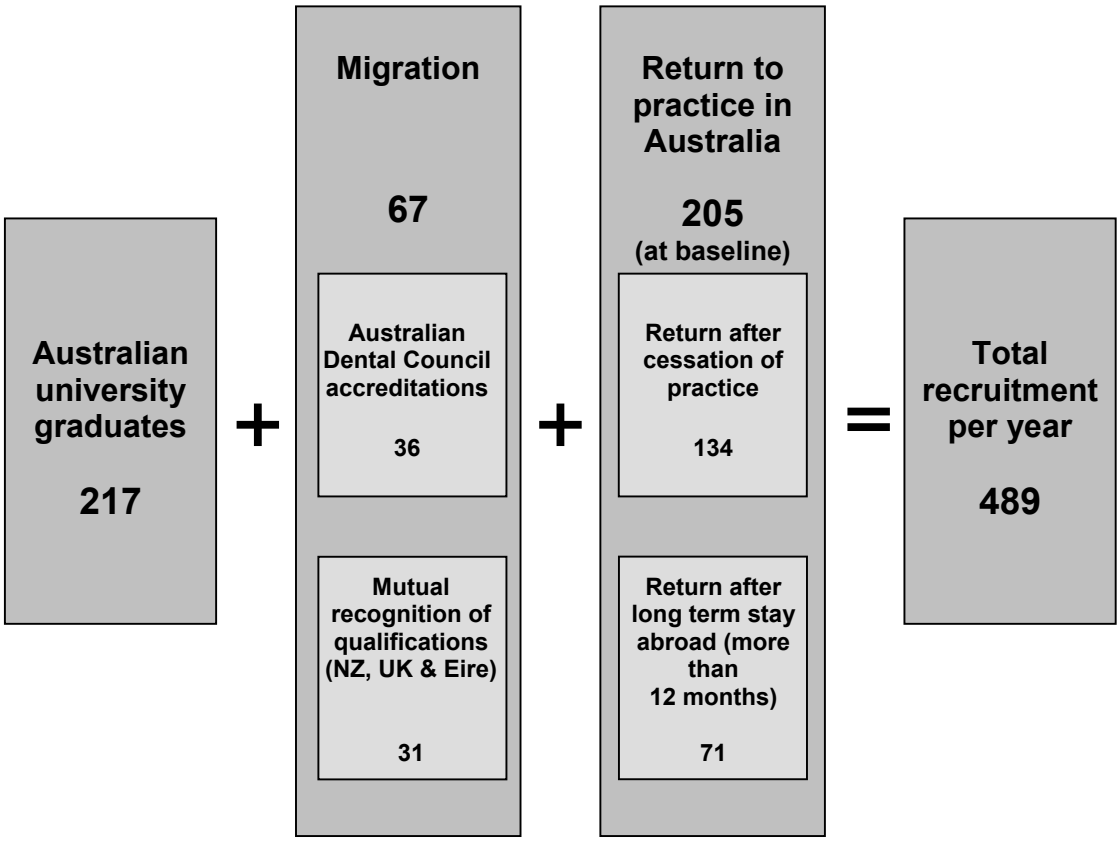



**Figure 2:** **Components of the recruitment vector for projection of dentists for the period 2000 to 2015**

## 4.2 Dentist labour force attrition

Labour force attrition from the stock of practising dentists can be attributed to death, retirement, overseas migration and the temporary (12 months or more) or permanent cessation of the practice of dentistry. Attrition is represented in the projection model by the input of sex/age specific wastage rates.

Calculation of wastage rates for previously conducted State labour force projections (i.e. NSW) were developed by examining the wastage from the State register. Wastage rates observed from registers were appropriate for the State projections, as these projections used the total number of registered dentists as the baseline and then projected the number of practitioners registered in the future. Following the projection of registered dentists, the number of practising dentists was imputed and the projected number of

registered dentists was multiplied by the average participation rates for each age/sex group.

Due to issues relating to multiple registrations and the inability to cross reference State/Territory dental registers, national projections were based on numbers of practising dentists; consequently, wastage rates previously determined for State based projections are not useful indicators of wastage rates at a national level. Firstly, the wastage rates from State registers include a large proportion of dentists migrating interstate, hence State wastage rates are generally higher than the total national wastage. Secondly, a dentist may cease practice but not necessarily cease the maintenance of their registration, hence in certain sex/age groups wastage from practising numbers may be greater than observed wastage from the register.

Consequently, the development of a national wastage vector that reflected the numbers of dentists who cease to practice in Australia, as opposed to the numbers who cease to maintain registration, was required. In order to determine this wastage vector, labour force collection data sets, where possible, were linked from year to year, and the following dentists were identified as having ceased practice in Australia:

- Dentists who were practising in Australia in 1998 and 1999 and were not practising in Australia in the following year (numbers were weighted up to account for non response).

- Dentists who became unregistered in a given year and had reported practising in the previous year. In order to limit the number of dentists migrating interstate being included in this group, only dentists working solely or mainly in the State of registration were included as wastage. For those dentists whose work status was mainly or solely in another State and then became unregistered, it was assumed that their un-registered status was a result of permanent interstate migration and therefore they were included as wastage.

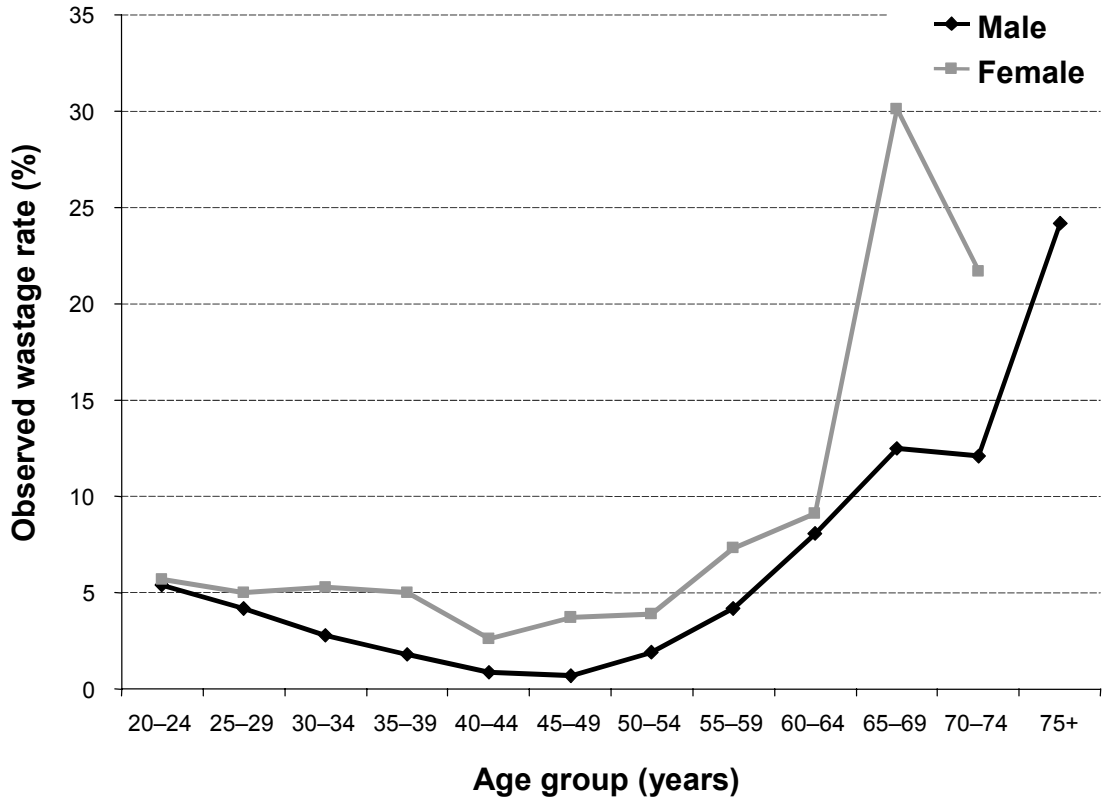
The resulting wastage rates are presented in Table 11.

**Table 11: Practising dentists, wastage rates by age group and sex, 1999 and 2000**

| Age group | Per cent males | | | Per cent females | | |
|---|---|---|---|---|---|---|
| (years) | 1999 | 2000 | Total | 1999 | 2000 | Total |
| 20–24 | 6.1 | 3.7 | 5.4 | 4.7 | 8.1 | 5.7 |
| 25–29 | 4.3 | 4.0 | 4.2 | 6.1 | 3.2 | 5.0 |
| 30–34 | 3.0 | 2.5 | 2.8 | 5.3 | 5.2 | 5.3 |
| 35–39 | 2.3 | 1.0 | 1.8 | 5.2 | 4.9 | 5.0 |
| 40–44 | 0.9 | 0.9 | 0.9 | 3.5 | 1.4 | 2.6 |
| 45–49 | 0.5 | 1.1 | 0.7 | 2.5 | 5.3 | 3.7 |
| 50–54 | 1.5 | 2.5 | 1.9 | 5.0 | 2.5 | 3.9 |
| 55–59 | 4.9 | 3.3 | 4.2 | 6.0 | 9.5 | 7.3 |
| 60–64 | 6.9 | 10.0 | 8.1 | 8.1 | 10.2 | 9.1 |
| 65–69 | 11.2 | 14.6 | 12.5 | 42.8 | — | 30.1 |
| 70–74 | 7.4 | 18.0 | 12.1 | 28.4 | — | 21.7 |
| 75+ | 21.1 | 27.8 | 24.2 | — | — | — |
| **Total** | **3.2** | **3.8** | **3.5** | **5.1** | **4.1** | **4.7** |

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

As can be seen from Figure 3, the highest wastage rates were observed in the 60 years and older age groups. This is consistent with the expectation that the majority of labour force attrition can be related to retirement. Wastage rates overall were higher for female dentists than for male dentists. This was also to be expected as other research has found that female dentists are more likely to take career breaks, the primary reason being maternity leave (Newton, Buck & Gibbons 2001). Wastage rates were lowest in the 35 to 54 years age group for male dentists and the 40 to 54 years age group for female dentists, indicating that these are particularly stable times in a dentist's career, when they are less likely to pursue alternative careers, take parental leave or travel overseas.




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

**Figure 3: Practising dentists, wastage rates by age group and sex, 1999 and 2000**

# 4.3 Projections of practising dentists

The matrices of transitional probabilities for female and male dentists were calculated using the observed wastage rates (see 'Dentist labour force attrition', page 16) and the age distribution of practising dentists in 2000. In order to assess the impact of slightly higher or slightly lower wastage rates on the future labour force, additional matrices of transitional probabilities were calculated. The 'high' matrix was calculated from observed wastage increased by 5% and the 'low' matrix was calculated from observed wastage decreased by 5%. The medium, high and low probabilities are presented in Table 12 and Table 13.

**Table 12: Transitional probabilities matrix, male dentists**

| Males | Wastage rates (W) | Probability of staying in same age group ($P_{ii}$) | Probability of moving to the next age group ($P_{i,i+1}$) | Transitional probabilities ('medium', W proportionally applied) $P_{ii}$ | $P_{i,i+1}$ | W | ('high', W increased 5%) $P_{ii}$ | $P_{i,i+1}$ | W | Transitional probabilities ('low', W decreased 5%) $P_{ii}$ | $P_{i,i+1}$ | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 5.45% | 0.2000 | 0.8000 | 0.1891 | 0.7564 | 0.0545 | 0.1886 | 0.7542 | 0.0572 | 0.1897 | 0.7586 | 0.0517 |
| | 4.21% | 0.7800 | 0.2200 | 0.7472 | 0.2107 | 0.0421 | 0.7455 | 0.2103 | 0.0442 | 0.7488 | | 0.0400 |
| 30–34 | 2.80% | 0.7800 | 0.2200 | 0.7582 | 0.2138 | 0.0280 | 0.7571 | | 0.0294 | 0.7593 | 0.2142 | 0.0266 |
| 35–39 | 1.81% | 0.7800 | 0.2200 | 0.7659 | | 0.0181 | 0.7652 | 0.2158 | 0.0190 | 0.7666 | 0.2162 | 0.0172 |
| 40–44 | 0.91% | | 0.1900 | 0.8026 | 0.1883 | 0.0091 | 0.8022 | 0.1882 | 0.0096 | 0.8030 | 0.1883 | 0.0087 |
| | 0.73% | 0.8100 | 0.1900 | 0.8041 | 0.1886 | 0.0073 | 0.8038 | 0.1885 | 0.0077 | | 0.1887 | 0.0070 |
| 50–54 | 1.89% | 0.8100 | 0.1900 | 0.7947 | 0.1864 | 0.0189 | | 0.1862 | 0.0198 | 0.7955 | 0.1866 | 0.0179 |
| 55–59 | 4.21% | 0.8300 | 0.1700 | | 0.1628 | 0.0421 | 0.7933 | 0.1625 | 0.0442 | 0.7968 | 0.1632 | 0.0400 |
| 60–64 | 8.06% | 0.8500 | 0.1500 | 0.7815 | 0.1379 | 0.0806 | 0.7781 | 0.1373 | 0.0846 | 0.7849 | 0.1385 | 0.0765 |
| | 12.54% | 0.8200 | 0.1800 | 0.7172 | | 0.1254 | 0.7120 | 0.1563 | 0.1317 | 0.7223 | 0.1586 | 0.1191 |
| 70–74 | 12.10% | 0.8700 | 0.1300 | 0.7647 | 0.1143 | 0.1210 | 0.7595 | 0.1135 | 0.1271 | 0.7700 | 0.1151 | 0.1150 |
| 75+ | 24.18% | 1.0000 | 0.0000 | 0.7582 | 0.0000 | 0.2418 | 0.7461 | 0.0000 | 0.2539 | 0.7703 | 0.0000 | 0.2297 |

Note: Wastage is proportionally applied to $P_{ii}$ and $P_{i,i+1}$, e.g. $P_{11} = 0.2 - (0.2 \times 0.0545)$, $P_{12} = 0.8 - (0.8 \times 0.0545)$.

**Table 13: Transitional probabilities matrix, female dentists**

| Females | Wastage rates (W) | Probability of staying in same age group ($P_{ii}$) | Probability of moving to the next age group ($P_{i,i+1}$) | Transitional probabilities ('medium', W proportionally applied) $P_{ii}$ | $P_{i,i+1}$ | W | Transitional probabilities ('high', W increased 5%) $P_{ii}$ | $P_{i,i+1}$ | W | Transitional probabilities ('low', W decreased 5%) $P_{ii}$ | $P_{i,i+1}$ | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 5.69% | 0.2000 | 0.8000 | 0.1886 | 0.7545 | 0.0569 | 0.1880 | 0.7522 | 0.0598 | 0.1892 | 0.7567 | 0.0541 |
| 25–29 | 5.00% | 0.7800 | 0.2200 | 0.7410 | 0.2090 | 0.0500 | 0.7390 | 0.2084 | 0.0525 | 0.7429 | 0.2095 | 0.0475 |
| 30–34 | 5.29% | 0.7800 | 0.2200 | 0.7388 | 0.2084 | 0.0529 | 0.7367 | 0.2078 | 0.0555 | 0.7408 | 0.2089 | 0.0502 |
| 35–39 | 5.04% | 0.7800 | 0.2200 | 0.7407 | 0.2089 | 0.0504 | 0.7387 | 0.2083 | 0.0530 | 0.7426 | 0.2095 | 0.0479 |
| 40–44 | 2.59% | 0.8100 | 0.1900 | 0.7890 | 0.1851 | 0.0259 | 0.7880 | 0.1848 | 0.0272 | 0.7901 | 0.1853 | 0.0246 |
| 45–49 | 3.71% | 0.8100 | 0.1900 | 0.7799 | 0.1829 | 0.0371 | 0.7784 | 0.1826 | 0.0390 | 0.7814 | 0.1833 | 0.0353 |
| 50–54 | 3.92% | 0.8100 | 0.1900 | 0.7782 | 0.1825 | 0.0392 | 0.7766 | 0.1822 | 0.0412 | 0.7798 | 0.1829 | 0.0373 |
| 55–59 | 7.33% | 0.8300 | 0.1700 | 0.7691 | 0.1575 | 0.0733 | 0.7661 | 0.1569 | 0.0770 | 0.7722 | 0.1582 | 0.0697 |
| 60–64 | 9.10% | 0.8500 | 0.1500 | 0.7726 | 0.1363 | 0.0910 | 0.7687 | 0.1357 | 0.0956 | 0.7765 | 0.1370 | 0.0865 |
| 65–69 | 30.10% | 0.8200 | 0.1800 | 0.5732 | 0.1258 | 0.3010 | 0.5608 | 0.1231 | 0.3161 | 0.5855 | 0.1285 | 0.2860 |
| 70–74 | 21.73% | 0.8700 | 0.1300 | 0.6810 | 0.1018 | 0.2173 | 0.6715 | 0.1003 | 0.2282 | 0.6904 | 0.1032 | 0.2064 |
| 75+[(a)] | 21.73% | 1.0000 | — | 0.7827 | — | 0.2173 | 0.7718 | — | 0.2282 | 0.7936 | — | 0.2064 |

(a) There was no observed wastage in the 75 years or older age group for female dentists. It is suspected that this was due to the extremely low numbers of female dentists in that age group. Hence the wastage rate for the 70 to 74 years age group was applied to the 75 years or older group (21.73%).

Note: Wastage is proportionally applied to $P_{ii}$ and $P_{i,i+1}$, e.g. $P_{11} = 0.2 - (0.2 \times 0.0545)$, $P_{12} = 0.8 - (0.8 \times 0.0545)$.

As discussed above, a likely recruitment vector was estimated by consideration of overseas dentists migration into Australia, numbers of Australian educated dentists and the number of dentists anticipated to return to practice after a period of cessation of practice. These vectors are presented in Table 14 and Table 15. Estimated recruitment for graduates, ADC accreditations and migration were maintained for all years in the vector (2001 to 2015). However, as the return to practice component of the recruitment vector is based on a percentage of practising dentists, the number of dentists in this component changes as the numbers of practising dentists in each age and sex group change over time. Table 14 and Table 15 present the return to practice numbers for 2001 only. For complete recruitment vectors for the years 2001 to 2015, see Appendix B.

The male dentists recruitment vector totalled 300 dentists per year. New graduates comprised 43.6% of the total vector, the return to practice component accounted for 43.5%, while migration only accounted for 13% of the total vector.

**Table 14: Estimated male dentists recruitment vector, 2001**

| | Aust University | Return to practice 2001 | | Migration | | |
|---|---|---|---|---|---|---|
| Age group (years) | Course completions | Ex-patriots return to Aust | Within Aust | NZ, UK & Eire | ADC certificates | Total 2001 |
| 20–24 | 97.8 | 4.7 | 2.0 | 4.2 | — | 108.7 |
| 25–29 | 23.7 | 4.7 | 12.8 | 4.2 | 1.0 | 46.4 |
| 30–34 | 5.7 | 5.8 | 12.3 | 4.2 | 3.0 | 31.0 |
| 35–39 | 2.5 | 5.8 | 8.3 | 4.2 | 6.0 | 26.8 |
| 40–44 | 0.9 | 7.1 | 11.9 | 0.5 | 6.0 | 26.4 |
| 45–49 | 0.3 | 7.1 | 8.4 | 0.5 | 3.0 | 19.3 |
| 50–54 | — | 4.1 | 4.5 | 0.5 | 1.0 | 10.1 |
| 55–59 | — | 4.1 | 5.6 | 0.5 | — | 10.2 |
| 60–64 | — | 1.0 | 8.0 | — | — | 9.0 |
| 65+ | — | — | 12.4 | — | — | 12.4 |
| **Total** | **130.9** | **44.4** | **86.2** | **18.8** | **20.0** | **300.3** |

The female dentists recruitment vector totalled 189 dentists per year. New graduates comprised 45.6% of the total vector, the return to practice component accounted for 39.6%, while migration only accounted for 14.8% of the total vector.

**Table 15: Estimated female dentists recruitment vector, 2001**

| | Aust University | Return to practice 2001 | | Migration | | |
|---|---|---|---|---|---|---|
| Age group (years) | Course completions | Ex-patriots return to Aust | Within Aust | NZ, UK & Eire | ADC certificates | Total 2001 |
| 20–24 | 50.8 | 6.4 | — | 3.9 | — | 73.8 |
| 25–29 | 28.8 | 6.4 | 9.4 | 3.9 | 1.0 | 36.8 |
| 30–34 | 3.1 | 3.0 | 12.5 | 2.0 | 3.0 | 23.6 |
| 35–39 | 2.0 | 3.0 | 10.4 | 2.0 | 4.0 | 21.4 |
| 40–44 | 0.8 | 2.5 | 11.3 | 0.0 | 4.0 | 18.6 |
| 45–49 | 0.5 | 2.5 | 3.2 | 0.0 | 3.0 | 9.2 |
| 50–54 | — | 1.5 | 0.9 | — | 1.0 | 3.4 |
| 55–59 | — | 1.5 | — | — | — | 1.5 |
| 60–64 | — | — | — | — | — | — |
| 65+ | — | — | 0.5 | — | — | 0.5 |
| **Total** | **86.0** | **26.8** | **48.2** | **11.8** | **16.0** | **188.8** |

The transitional probabilities and estimated recruitment vectors were used to calculate the projected stock of practising dentists to the year 2015, as presented in Table 16 and Table 17.

The number of practising male dentists is projected to increase from 6,932 dentists in 2000 to 7,481 in 2015, representing an increase of 7.9%. The annual increase in the number of male dentists steadily declines as the projection progresses. As the numbers of male dentists in the older age groups increase, so does the projected wastage, effectively reducing overall growth in the labour force (see Figure 4).

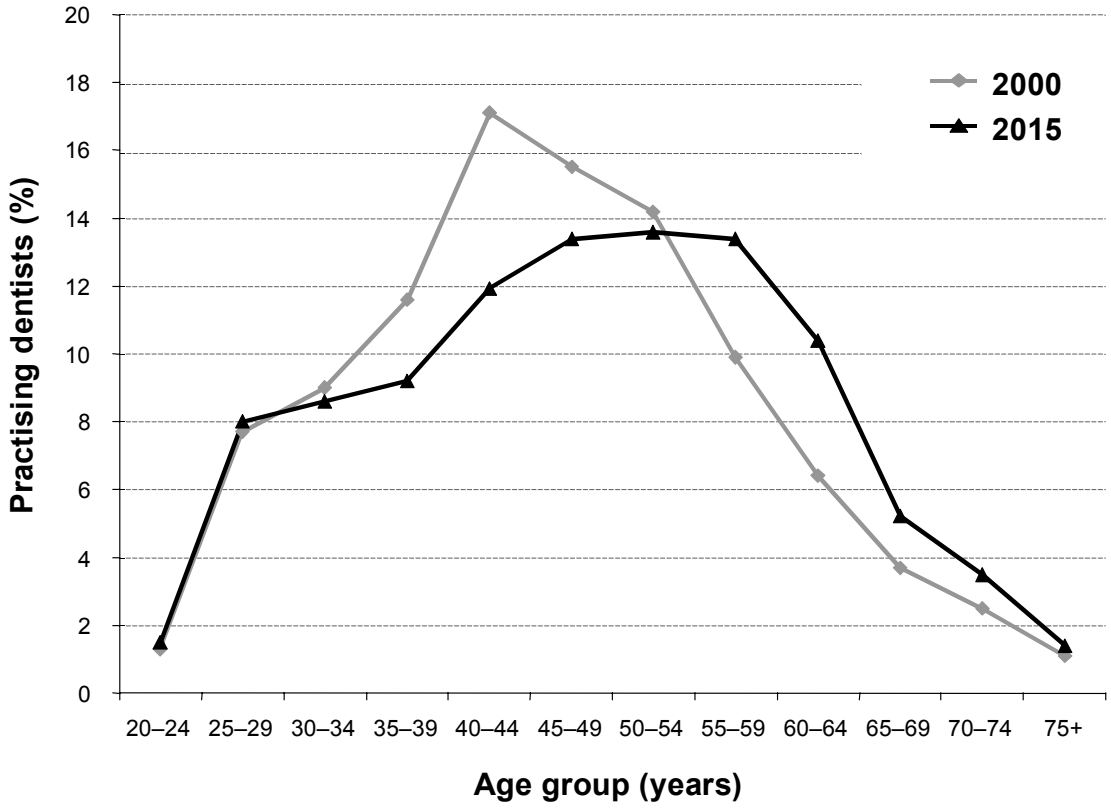
**Table 16: Projected number of practising male dentists by age group, 2000 to 2015**

| Age group (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 90 | 106 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 |
| 25–29 | 531 | 531 | 543 | 555 | 564 | 572 | 578 | 582 | 586 | 589 | 591 | 592 | 593 | 594 | 595 | 596 |
| 30–34 | 621 | 614 | 608 | 606 | 607 | 610 | 614 | 618 | 622 | 626 | 630 | 633 | 636 | 639 | 641 | 643 |
| 35–39 | 804 | 775 | 751 | 732 | 716 | 704 | 695 | 689 | 686 | 684 | 683 | 683 | 684 | 686 | 687 | 689 |
| 40–44 | 1,183 | 1,150 | 1,116 | 1,084 | 1,053 | 1,025 | 1,000 | 977 | 958 | 941 | 927 | 915 | 906 | 899 | 893 | 889 |
| 45–49 | 1,076 | 1,107 | 1,126 | 1,136 | 1,137 | 1,132 | 1,123 | 1,111 | 1,097 | 1,082 | 1,066 | 1,051 | 1,037 | 1,023 | 1,011 | 1,000 |
| 50–54 | 984 | 995 | 1,010 | 1,025 | 1,039 | 1,051 | 1,059 | 1,064 | 1,065 | 1,064 | 1,060 | 1,054 | 1,046 | 1,038 | 1,028 | 1,018 |
| 55–59 | 688 | 741 | 785 | 823 | 857 | 887 | 913 | 935 | 954 | 969 | 982 | 991 | 997 | 1,000 | 1,001 | 1,001 |
| 60–64 | 445 | 469 | 496 | 526 | 555 | 585 | 613 | 639 | 664 | 688 | 709 | 727 | 744 | 758 | 770 | 780 |
| 65–69 | 257 | 253 | 253 | 257 | 264 | 274 | 285 | 297 | 310 | 323 | 335 | 348 | 360 | 371 | 381 | 390 |
| 70–74 | 176 | 180 | 183 | 185 | 187 | 190 | 194 | 199 | 204 | 211 | 218 | 226 | 234 | 242 | 251 | 259 |
| 75+ | 77 | 78 | 80 | 82 | 83 | 84 | 86 | 87 | 89 | 91 | 93 | 95 | 98 | 101 | 104 | 108 |
| **Total** | **6,932** | **6,999** | **7,062** | **7,120** | **7,174** | **7,224** | **7,269** | **7,310** | **7,345** | **7,377** | **7,404** | **7,427** | **7,446** | **7,461** | **7,472** | **7,481** |
| **Per cent increase[(a)]** | | **1.0%** | **0.9%** | **0.8%** | **0.8%** | **0.7%** | **0.6%** | **0.6%** | **0.5%** | **0.4%** | **0.4%** | **0.3%** | **0.3%** | **0.2%** | **0.2%** | **0.1%** |

(a) Per cent increase over previous year.

Note: Projections based on medium wastage vector.

The age distribution of male dentists is projected to shift to an older distribution, with the number of dentists over 50 years of age increasing from 37.9% in 2000 to 47.5% in 2015.




Note: Projections based on medium wastage vector.

**Figure 4: Percentage of practising male dentists by age group, 2000 and 2015**

The number of practising female dentists is projected to increase from 2,059 dentists in 2000 to 3,102 dentists in 2015, representing an increase of 50.7%. The annual increase in the number of female dentists, like the male dentists, also steadily declines as the projection progresses. As the numbers of female dentists in the older age groups increase, so does the projected wastage, effectively reducing overall growth (see Figure 5).

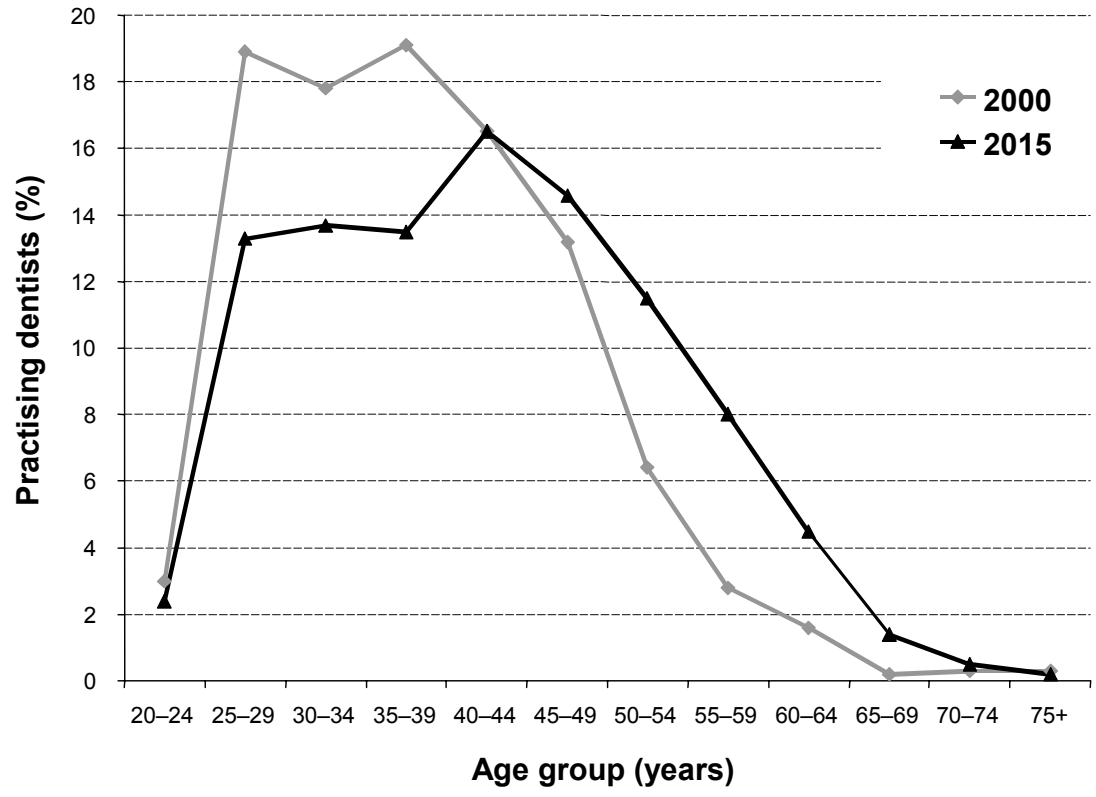
**Table 17: Projected number of practising female dentists by age group, 2000 to 2015**

| Age group (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 61 | 73 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| 25–29 | 390 | 384 | 389 | 394 | 398 | 402 | 404 | 406 | 408 | 409 | 410 | 410 | 411 | 411 | 411 | 412 |
| 30–34 | 366 | 376 | 382 | 387 | 393 | 398 | 403 | 407 | 410 | 414 | 416 | 418 | 420 | 422 | 423 | 424 |
| 35–39 | 394 | 389 | 388 | 388 | 389 | 392 | 394 | 397 | 401 | 404 | 407 | 410 | 412 | 415 | 417 | 419 |
| 40–44 | 339 | 368 | 392 | 410 | 426 | 439 | 450 | 460 | 469 | 476 | 483 | 490 | 496 | 501 | 506 | 511 |
| 45–49 | 271 | 283 | 299 | 315 | 331 | 347 | 362 | 376 | 389 | 401 | 411 | 421 | 430 | 438 | 446 | 453 |
| 50–54 | 131 | 155 | 176 | 195 | 213 | 231 | 247 | 263 | 277 | 291 | 305 | 317 | 328 | 339 | 349 | 358 |
| 55–59 | 58 | 70 | 84 | 98 | 112 | 127 | 141 | 155 | 169 | 182 | 195 | 207 | 218 | 229 | 240 | 250 |
| 60–64 | 32 | 34 | 37 | 42 | 48 | 55 | 62 | 70 | 79 | 87 | 96 | 105 | 114 | 122 | 131 | 139 |
| 65–69 | 4 | 7 | 9 | 11 | 12 | 14 | 16 | 19 | 21 | 24 | 27 | 30 | 33 | 36 | 39 | 43 |
| 70–74 | 6 | 5 | 4 | 4 | 5 | 5 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 14 | 15 |
| 75+ | 7 | 6 | 5 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 5 |
| **Total** | **2,059** | **2,150** | **2,239** | **2,325** | **2,408** | **2,488** | **2,564** | **2,638** | **2,708** | **2,774** | **2,837** | **2,897** | **2,953** | **3,006** | **3,056** | **3,102** |
| **Per cent increase[(a)]** | | **1.8%** | **1.7%** | **1.6%** | **1.5%** | **1.4%** | **1.3%** | **1.2%** | **1.1%** | **1.0%** | **0.9%** | **0.8%** | **0.7%** | **0.7%** | **0.6%** | **0.5%** |

(a) Per cent increase over previous year.

Note: Projections based on medium wastage vector.

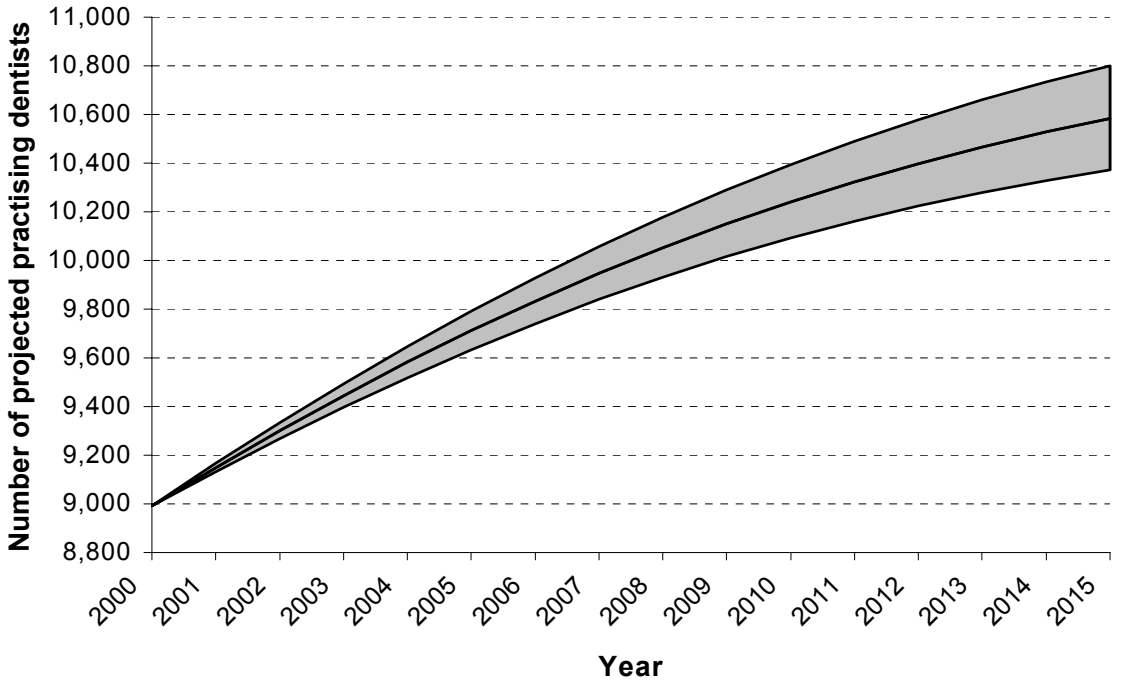
The age distribution of female dentists is projected to shift to a slightly older distribution, with the number of dentists over 50 years of age increasing from 11.6% in 2000 to 26.1% in 2015.




Note: Projections based on medium wastage vector.

**Figure 5: Percentage of practising female dentists by age group, 2000 and 2015**

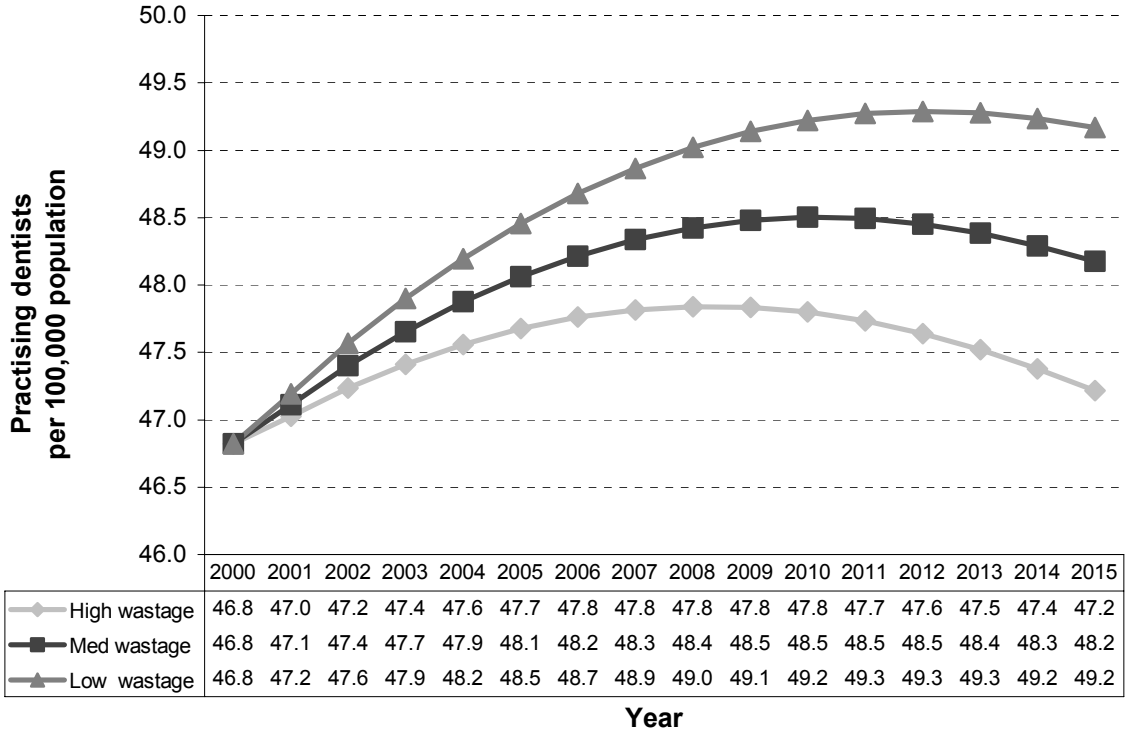
Overall, under the medium wastage vector, it is projected that in 2015 the number of practising dentists will be 10,583, representing an increase of 17.7% (Figure 6).




Note: Allowance for variability in future wastage rates was accommodated by the calculation of an error margin for the projection. This margin was calculated by applying the high and low wastage transitional probabilities. For complete tables of all projections see Appendix C.

**Figure 6: Projected number of practising dentists, 2000 to 2015**

Growth in the dentist labour force up to the year 2009 is projected to slightly out pace population growth, with the practising rate per 100,000 population increasing from 46.8 to 48.5 dentists under the medium wastage vector (Figure 7). However, by 2013 the practising rate per 100,000 population starts to decline, indicating that projected growth in the labour force will not keep pace with population growth in the longer term.




| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High wastage | 46.8 | 47.0 | 47.2 | 47.4 | 47.6 | 47.7 | 47.8 | 47.8 | 47.8 | 47.8 | 47.8 | 47.7 | 47.6 | 47.5 | 47.4 | 47.2 |
| Med wastage | 46.8 | 47.1 | 47.4 | 47.7 | 47.9 | 48.1 | 48.2 | 48.3 | 48.4 | 48.5 | 48.5 | 48.5 | 48.5 | 48.4 | 48.3 | 48.2 |
| Low wastage | 46.8 | 47.2 | 47.6 | 47.9 | 48.2 | 48.5 | 48.7 | 48.9 | 49.0 | 49.1 | 49.2 | 49.3 | 49.3 | 49.3 | 49.2 | 49.2 |

Note: Calculated using Australian Bureau of Statistics ERP projection series 'q' (see Appendix D).

**Figure 7: Projected number of practising dentists per 100,000 population, 2000 to 2015**

## Sensitivity analysis

To explore the impact of different recruitment levels on the dentist labour force, a series of projections were developed. The projected practising rates per 100,000 population attained as a result of a series of hypothetical recruitment vectors are presented in Table 18. It can be seen that, in order to attain a practising rate above 50 dentists per 100,000, a recruitment vector totaling over 540 dentists per year would need to be maintained. Very similar rates are achieved if the recruitment is not constant and the average recruitment over the projection period, 2000 to 2015, is equivalent to the annual total of the recruitment vector. (This applies only because of the short time frame of the projections and probably would not hold true for projections greater than the year 2015.)

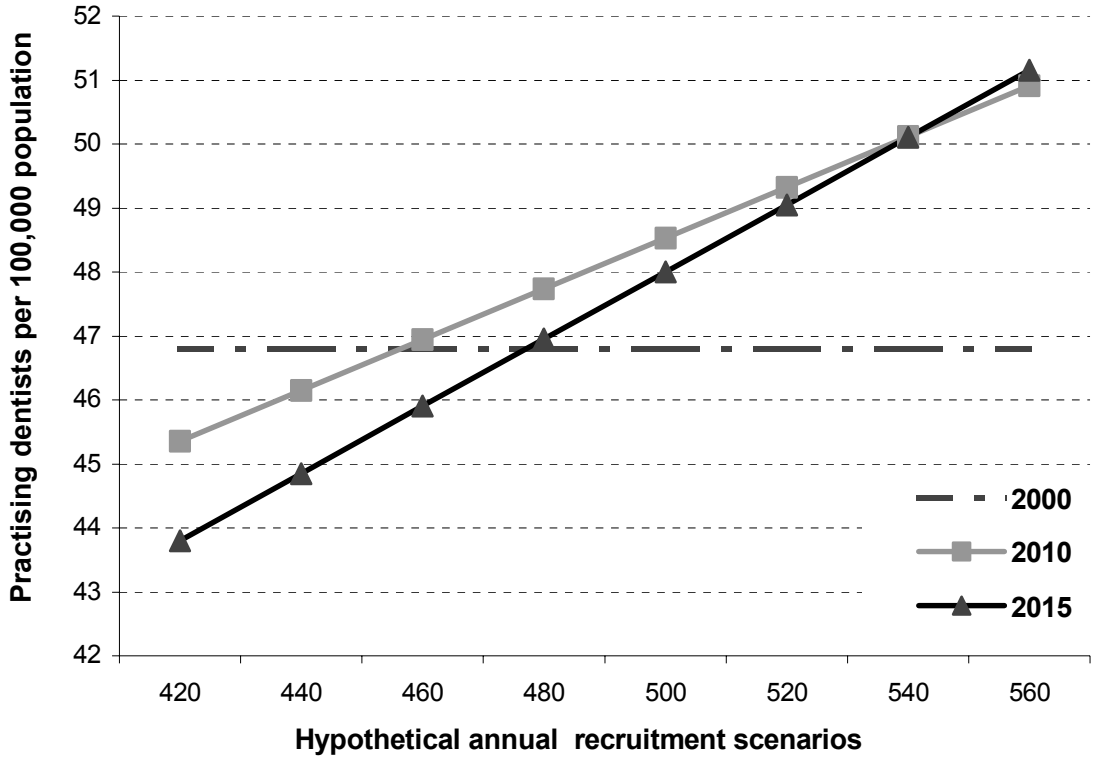
**Table 18: Projected practising dentists per 100,000 population by total average recruitment per year, 2010 and 2015**

| | Average recruitment per year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **420** | **440** | **460** | **480** | **500** | **520** | **540** | **560** |
| **Practising rate per 100,000 population in 2010** | 45.4 | 46.1 | 46.9 | 47.7 | 48.5 | 49.3 | 50.1 | 50.9 |
| **Practising rate per 100,000 population in 2015** | 43.8 | 44.8 | 45.9 | 47.0 | 48.0 | 49.1 | 50.1 | 51.2 |

Notes

1. Calculated using Australian Bureau of Statistics ERP projection series 'q' (see Appendix D).
2. The age and sex distribution of dentists in the recruitment vectors were maintained at the percentages of the total recruitment for 2001. Unlike the projections presented in Figure 7, the recruitment vectors were static and did not fluctuate as the numbers in each age and sex group altered over the period of the projection.
   (See Appendix B for details of recruitment vectors).
3. Projections based on medium wastage vector.

Analysis of the sensitivity of the recruitment vector is shown in Figure 8. The total recruitment per year is shown in the values of the *x* axis. The 2010 and 2015 lines show, respectively, the projected practising rates per 100,000 population attained if the level of recruitment indicated by the *x* axis is maintained for the 10 or 15 years of projection. The 2000 line shows the practising rate per 100,000 at baseline, 46.8 dentists. In order to maintain the baseline practising rate, average annual recruitment would need to be approximately 475 dentists per year.




Notes

1. The projected practising dentists rate per 100,000 population in 2010 and 2015 if the total recruitment per year is *x* (or average recruitment over the 10-year period 2000 to 2010 is *x*).
2. Australian Bureau of Statistics ERP projection series 'q', (see Appendix D).
3. The practising dentist rate per 100,000 population in 2000 was 46.8 dentists.
4. The age and sex distribution of dentists in the recruitment vectors were maintained at the percentages of the total recruitment for 2001. Unlike the projections presented in Figure 7, the recruitment vectors were static and did not fluctuate as the numbers in each age and sex group altered over the period of the projection. (See Appendix E for details of recruitment vectors). Projections based on medium wastage vector.

**Figure 8: Projected practising dentists per 100,000 population by total average recruitment per year, 2000, 2010 and 2015**

## 4.4 Capacity of the dentist labour force to supply dental visits

Annual productivity is the product of total hours worked per year multiplied by the rate of visits per hour. Annual productivity measured in number of visits supplied each year is an alternative expression of full time equivalence, the amount of work characteristically performed by different age and sex groups.

In 1998–99 male dentists aged 30–39, 40–49 and 50–59 years supplied the highest number of dental visits per year. Female dentists aged 20 to 29 and 50 to 59 years were the next most productive in terms of visits supplied. Female dentists aged 30 to 49 and aged 60 years or older provided the fewest number of visits per year (Table 19).

**Table 19: Annual productivity (number of visits supplied per year per dentist) of practising dentists by sex and age group, 1998–99**

| Age group (years) | Male dentists 1998–99 | Female dentists 1998–99 |
|---|---|---|
| 20–29 | 2,248 | 2,393 |
| 30–39 | 2,883 | 2,163 |
| 40–49 | 3,396 | 2,085 |
| 50–59 | 3,083 | 2,367 |
| 60+ | 2,339 | 2,200[(a)] |

(a) No available data, 'guess' estimate for purpose of calculating productivity projections.

Source: 1998–1999 Longitudinal study of dental practice activity, practising dentists. D Brennan & AJ Spencer unpublished data.

The capacity of practising dentists to supply dental visits is generated by multiplying the number of projected practising dentists (Table 16 and Table 17) by the percentage of practising dentists working in clinical practice (96.6%) by the 1998–99 annual productivity rates for each age and sex group (Table 19).

The capacity to supply dental visits in 2000 (baseline supply) and the projected capacity to supply dental visits under the medium wastage vector are shown in Table 20. It is projected that the total number of visits supplied by dentists will increase by 13.6 % from 24.26 million visits in 2000 to 27.56 million visits in 2015.

**Table 20: Projected number of dental visits supplied (millions) by sex and age, 2000 to 2015**

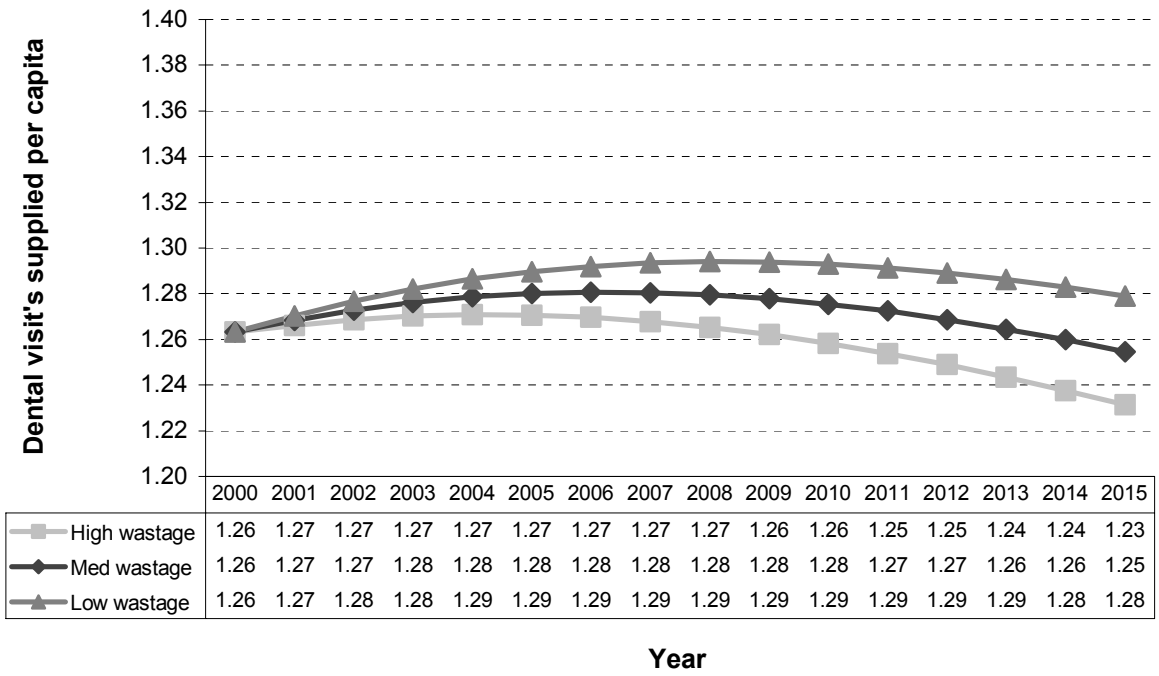
| Age group | Projected number of dental visits supplied (millions) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| **Male dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 1.35 | 1.38 | 1.42 | 1.44 | 1.47 | 1.48 | 1.49 | 1.50 | 1.51 | 1.52 | 1.52 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 |
| 30–39 | 3.97 | 3.87 | 3.79 | 3.73 | 3.69 | 3.66 | 3.65 | 3.64 | 3.64 | 3.65 | 3.66 | 3.67 | 3.68 | 3.69 | 3.70 | 3.71 |
| 40–49 | 7.41 | 7.40 | 7.36 | 7.28 | 7.19 | 7.08 | 6.96 | 6.85 | 6.74 | 6.64 | 6.54 | 6.45 | 6.37 | 6.30 | 6.25 | 6.19 |
| 50–59 | 4.98 | 5.17 | 5.34 | 5.50 | 5.65 | 5.77 | 5.87 | 5.95 | 6.01 | 6.06 | 6.08 | 6.09 | 6.08 | 6.07 | 6.04 | 6.01 |
| 60+ | 2.16 | 2.22 | 2.29 | 2.37 | 2.46 | 2.56 | 2.66 | 2.76 | 2.86 | 2.96 | 3.06 | 3.15 | 3.24 | 3.33 | 3.40 | 3.47 |
| **Total** | **19.87** | **20.04** | **20.19** | **20.33** | **20.45** | **20.55** | **20.64** | **20.71** | **20.77** | **20.82** | **20.86** | **20.89** | **20.91** | **20.92** | **20.92** | **20.92** |
| **Female dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 1.04 | 1.06 | 1.07 | 1.08 | 1.09 | 1.10 | 1.11 | 1.11 | 1.12 | 1.12 | 1.12 | 1.12 | 1.12 | 1.12 | 1.13 | 1.13 |
| 30–39 | 1.59 | 1.60 | 1.61 | 1.62 | 1.63 | 1.65 | 1.67 | 1.68 | 1.69 | 1.71 | 1.72 | 1.73 | 1.74 | 1.75 | 1.76 | 1.76 |
| 40–49 | 1.23 | 1.31 | 1.39 | 1.46 | 1.53 | 1.58 | 1.64 | 1.68 | 1.73 | 1.77 | 1.80 | 1.84 | 1.87 | 1.89 | 1.92 | 1.94 |
| 50–59 | 0.43 | 0.51 | 0.59 | 0.67 | 0.75 | 0.82 | 0.89 | 0.96 | 1.02 | 1.08 | 1.14 | 1.20 | 1.25 | 1.30 | 1.35 | 1.39 |
| 60+ | 0.10 | 0.11 | 0.12 | 0.13 | 0.15 | 0.16 | 0.19 | 0.21 | 0.23 | 0.26 | 0.29 | 0.32 | 0.34 | 0.37 | 0.40 | 0.43 |
| **Total** | **4.40** | **4.59** | **4.78** | **4.97** | **5.15** | **5.32** | **5.48** | **5.64** | **5.79** | **5.94** | **6.07** | **6.20** | **6.32** | **6.44** | **6.54** | **6.64** |
| **All dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 2.39 | 2.44 | 2.49 | 2.53 | 2.56 | 2.58 | 2.60 | 2.62 | 2.63 | 2.64 | 2.64 | 2.65 | 2.65 | 2.65 | 2.66 | 2.66 |
| 30–39 | 5.56 | 5.47 | 5.39 | 5.35 | 5.32 | 5.31 | 5.31 | 5.32 | 5.34 | 5.36 | 5.38 | 5.40 | 5.42 | 5.44 | 5.45 | 5.47 |
| 40–49 | 8.64 | 8.72 | 8.75 | 8.74 | 8.71 | 8.66 | 8.60 | 8.53 | 8.47 | 8.40 | 8.34 | 8.29 | 8.24 | 8.20 | 8.16 | 8.14 |
| 50–59 | 5.41 | 5.68 | 5.94 | 6.18 | 6.39 | 6.59 | 6.76 | 6.91 | 7.03 | 7.14 | 7.22 | 7.29 | 7.34 | 7.37 | 7.39 | 7.40 |
| 60+ | 2.26 | 2.33 | 2.41 | 2.50 | 2.61 | 2.72 | 2.85 | 2.97 | 3.10 | 3.22 | 3.35 | 3.47 | 3.59 | 3.70 | 3.80 | 3.90 |
| **Total** | **24.26** | **24.63** | **24.97** | **25.29** | **25.59** | **25.87** | **26.12** | **26.35** | **26.56** | **26.76** | **26.93** | **27.09** | **27.23** | **27.35** | **27.46** | **27.56** |

Note: The projection of the number of practising dentists was based on the medium wastage vector.

The projected increase in supply of dental visits (13.6%) is less than the projected increase in numbers of practising dentists (17.7%). The projected growth in dental visits does not parallel the projected growth in practitioners due to demographic changes

within the dentist labour force. It is projected that the percentage of female dentists will increase from 22.9% to 29.3% by 2015, and that the percentage of dentists over 60 years of age will increase from 11.1% to 16.4%. As these subgroups, on average, provide substantially fewer dental visits per annum, these demographic changes have a combined effect of limiting the growth in visits supplied.

The projected number of dental visits supplied per capita is presented in Figure 9. The number of visits per capita under the medium wastage vector appears to keep pace with population growth for the period of the projection. The number of visits per capita marginally increases from 1.26 in 2000 to 1.28 in 2003, then remains stable but later declines to 1.25 visits by 2015.




| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High wastage | 1.26 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 1.26 | 1.26 | 1.25 | 1.25 | 1.24 | 1.24 | 1.23 |
| Med wastage | 1.26 | 1.27 | 1.27 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.27 | 1.27 | 1.26 | 1.26 | 1.25 |
| Low wastage | 1.26 | 1.27 | 1.28 | 1.28 | 1.29 | 1.29 | 1.29 | 1.29 | 1.29 | 1.29 | 1.29 | 1.29 | 1.29 | 1.29 | 1.28 | 1.28 |

Note: Calculated using Australian Bureau of Statistics ERP projection series 'q', (see Appendix D).

**Figure 9: Projected number of dental visits supplied per capita, 2000 to 2015**

## Impact of declining annual productivity

Dentist practice activity studies have shown that while the total hours worked by dentists has altered little, the number of visits per hour has been declining for 35 years (Spencer & Lewis, 1986). There has been both an increase in the duration of a visit and an increase in the number of services provided per visit. While the total number of services produced annually per year per dentist has remained more stable, those services are delivered across fewer visits. This decline in number of visits supplied per year is shown in Table 21, which summarises the average number of visits supplied per annum from the longitudinal studies of dental practice activity conducted between 1983 and 1999.

**Table 21: Annual productivity (number of visits supplied per year per dentist) of practising dentists by sex, age group and year of study**

| Age group | Male dentists | | | | Female dentists | | | |
|---|---|---|---|---|---|---|---|---|
| (years) | 1983–84 | 1988–89 | 1993–94 | 1998–99 | 1983–84 | 1988–89 | 1993–94 | 1998–99 |
| 20–29 | 3,195 | 2,828 | 2,959 | 2,248 | 2,611 | 2,638 | 2,724 | 2,393 |
| 30–39 | 3,964 | 3,707 | 3,081 | 2,883 | 2,530 | 2,303 | 2,413 | 2,163 |
| 40–49 | 3,897 | 3,753 | 3,723 | 3,396 | 2,876 | 2,444 | 2,691 | 2,085 |
| 50–59 | 3,614 | 3,972 | 3,083 | 3,083 | 2,704 | 2,036 | 3,091 | 2,367 |
| 60+ | 3,003 | 2,744 | 2,413 | 2,339 | 1,936 | 2,427 | 2,160 | 2,200[(a)] |

(a) No available data, 'guess' estimate for purpose of calculating productivity projections.

Source: Longitudinal study of dental practice activity, practising dentists. D Brennan and AJ Spencer, unpublished data.

Taking into account the observed trends, it appears unlikely that the number of visits provided per annum is going to stabilise and remain static. Intuitively we may suspect that productivity rates must stabilise at some stage. However, the impact on projections, if historical productivity trends continue, should be explored.

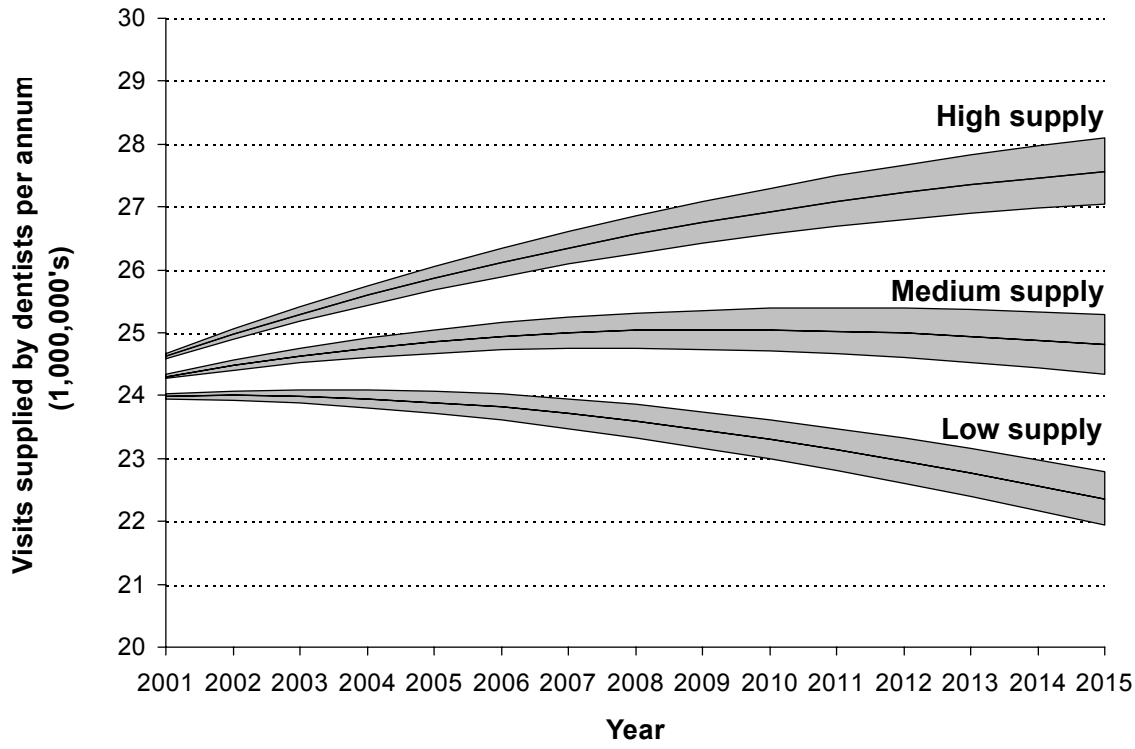
Based on this premise, a range of supply scenarios were developed. In addition to the projection presented above in Table 20, perceived to be the 'best case scenario' and hence referred to as the high supply projection, two other supply projections were calculated.

The assumptions of the three supply projections are as follows:

- High supply projection — assumes that the number of dental visits supplied per annum will remain static and historic decline in annual productivity is ignored.
- Medium supply projection — assumes that supply rates will continue to decline at half the rate that was observed between 1983–84 and 1998–99.
- Low supply projection — assumes that supply rates will continue to decline at the same rate that was observed between 1983–84 and 1998–99.

It is suspected that both the high and low supply projections are unlikely to occur; however, they serve to illustrate the breadth of potential outcomes.

The three supply projections are represented in Figure 10. The high supply projection results in a 13.6% increase in visits supplied by 2015. The medium supply projection results in a 2.9% increase, and the low supply projection calculated a 6.6% decrease in total dental visits supplied per annum.




Notes

1. The centre lines within the bands represent each projection. The upper and lower lines of the bands represent projections calculated by using +5% and –5% wastage vectors.
2. For complete tables of the three supply projections see Appendix F, Appendix G, and Appendix H

**Figure 10: Dentists' projected capacity to supply dental visits, 2001 to 2015**

# 5 Projections of the allied dental practitioner labour force

## 5.1 Recruitment and attrition of allied dental practitioners

Projection of the allied dental practitioner labour force is a more uncertain process than for dentists. Firstly, the numbers of practising dental therapists, hygienists and prosthetists are relatively small, increasing the potential for error. Secondly, accurate baseline supply data is difficult to obtain; the ability to determine accurate practising numbers is dependent on formal registration of practitioners, but not all allied practitioner groups are registered in all States and Territories. In particular, it is suspected that labour force estimates for hygienists and therapists are understated.

The development of likely recruitment vectors is hindered by inconsistency in the training and education policies of allied dental practitioners. Course intakes can vary greatly from year to year, and some courses have been placed on indefinite moratoriums. In the case of hygienists and therapists, future practice activity is particularly difficult to anticipate due to the recent emergence of a hybrid course, Bachelor of Oral Health Therapy. Graduates of this course can practice as either a hygienist or a therapist. The degree to which graduates move between the professions or specialise remains to be seen.

The impact of migration on the allied dental labour force varies between the professions. Nearly one-fifth (18.8%) of the practising hygienist labour force was trained overseas, this comparatively high proportion was primarily due to a lack of training courses available in Australia prior to 1998–99. In contrast, only 2.9% of practising dental therapists were trained overseas and the vast majority (89.8%) gained their initial therapy qualification in the State where they currently practiced. Similarly, only a small percentage (5.4%)of prosthetists were trained overseas.

Due to the difficulties of developing a likely recruitment vector, a series of constant recruitment vectors for each professional group was developed and a range of projections were calculated. The age distribution of the recruitment vectors approximated the age distribution of recent graduates, as reported in the 2000 dental labour force data collection.

Estimating attrition of allied dental practitioners was limited by lack of consecutive data collections. Consecutive annual data collections for allied dental practitioners only commenced in 2000, and at the time of this publication only 1997 and 2000 data were available, greatly limiting the capacity to calculate wastage rates. Hence, for the purposes of producing labour force projections the observed dentist wastage rates were applied as a proxy. For dental prosthetists, as the percentage of female prosthetists was only 8.6 %, the projections were calculated using the observed male dentist wastage rates. For dental hygienists and dental therapists, as the percentage of male practitioners in these professions was negligible, the female dentist wastage rates were applied. However, as has been shown in other studies (Newton, Buck & Gibbons 2001), the wastage rates for therapists and hygienists are typically higher than the wastage rates of

female dentists. Hence, the wastage rates applied in the projections of dental therapists and dental hygienists were increased by 50%.

## 5.2 Dental therapist labour force

As can be seen in Table 22, the estimated number of practising dental therapists in 2000 was 1,260, and the overall practising rate per 100,000 population was 6.6 therapists. This estimate provides the baseline for projections to the year 2015.

**Table 22: Dental therapists by practice status and States and Territories, 2000**

| Practice status | NSW | Vic[(a)] | Qld | SA | WA | Tas | NT | ACT | Total |
|---|---|---|---|---|---|---|---|---|---|
| Working as dental therapist | 216 | 140[(b)] | 361 | 128 | 331 | 50 | 16 | 19 | 1,260 |
| Working, on 3+ months' leave | 11 | n.a. | 14 | 7 | 12 | 2 | — | — | 46 |
| Overseas | — | n.a. | — | — | 2 | — | — | — | 2 |
| Working, but not in dental therapy | 19 | n.a. | 17 | 12 | 23 | 2 | — | — | 73 |
| Working, but not in dentistry | 11 | n.a. | 23 | 4 | 23 | — | — | — | 61 |
| Not working | 3 | n.a. | 50 | — | 31 | 1 | — | — | 85 |
| **Total** | **260** | **260** | **465** | **151** | **422** | **55** | **16** | **19** | **1,648** |
| **Practising rate per 100,000 ERP** | **3.3** | **2.9** | **10.1** | **8.5** | **17.6** | **10.6** | **8.2** | **6.1** | **6.6** |

(a) Victoria was not included in the 2000 labour force collection; total number registered known but practice status unknown.

(b) The estimated number of therapists practising in Victoria was imputed by multiplying the number registered as at December 2000 (260) by the 1997 participation rate (53.9%).

Notes

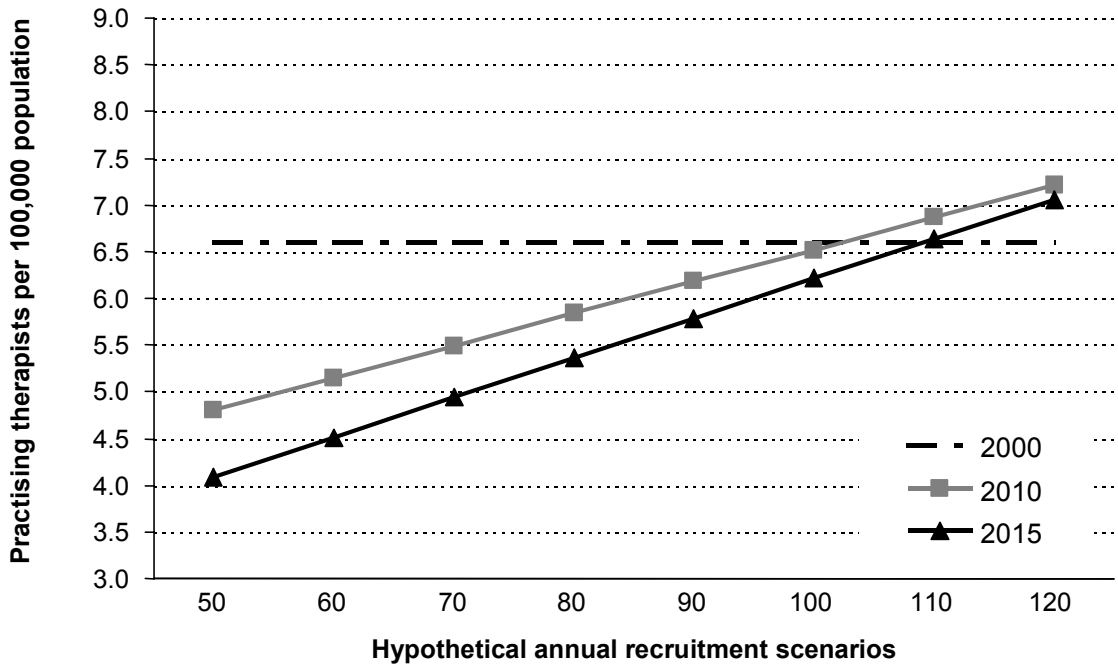
1. Not all rows and columns sum to totals due to the rounding of estimates to whole integers, and missing data.
2. Practising solely or mainly in the cited State/Territory. Adjusted to take account of non-response.

Source: Teusner & Spencer 2003

### Projections of practising dental therapists

Figure 11 shows the projected practising rate per 100,000 population attained as a result of a series of hypothetical recruitment vectors which total between 50 and 120 dental therapists per year. The total average recruitment per year is shown in the values of the *x* axis. The 2010 and 2015 lines show, respectively, the projected practising rates per 100,000 population attained if the level of recruitment per year indicated by the *x* axis is maintained for the 10 or 15 years of projection. The 2000 line shows the practising rate per 100,000 at baseline, 6.6 dental therapists. Very similar results are achieved if the recruitment is not constant and the average recruitment over the projection period, 2000 to 2015, is equivalent to the *x* axis value. (This applies only because of the short time frame of the projections and probably would not hold true for projections greater than the year 2015).

It can be seen from Figure 11 that an average recruitment of 110 dental therapists per year is required in order to maintain the 2000 practising rate of 6.6 therapists per 100,000 population in 2015.




| Year | Practising rate per 100,000 population | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2010 | 4.8 | 5.2 | 5.5 | 5.8 | 6.2 | 6.5 | 6.9 | 7.2 |
| 2015 | 4.1 | 4.5 | 4.9 | 5.4 | 5.8 | 6.2 | 6.6 | 7.1 |

Notes

1. The projected practising dental therapists rate per 100,000 population in 2010 and 2015 if the total recruitment per year is *x* (or average recruitment over the 10-year period 2000 to 2010 is *x*).
2. Australian Bureau of Statistics ERP projection series 'q', (see Appendix D).
3. The practising dental therapist rate per 100,000 population in 2000 was 6.6 therapists.
4. Projections based on constant recruitment vectors, see Appendix I for recruitment vectors by age group.

**Figure 11: Projected practising therapists per 100,000 population by total average recruitment per year, 2000, 2010 and 2015**

For the purposes of projecting the future number of practising dental therapists, a 'best guess' projection was calculated. Application of a recruitment vector totalling 75 dental therapists projected that there would be 1,131 practising therapists in 2015, representing a 10.2% decrease. The annual rate of decline in practising numbers is projected to increase year to year as the number of dental therapists in the older age groups increases.

**Table 23: Projected number of practising dental therapists by age group, 2000 to 2015**

| Age group (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 37 | 32 | 31 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 25–29 | 182 | 181 | 178 | 175 | 172 | 170 | 168 | 167 | 166 | 165 | 165 | 164 | 164 | 164 | 164 | 164 |
| 30–34 | 185 | 188 | 191 | 192 | 193 | 193 | 192 | 191 | 190 | 190 | 189 | 188 | 188 | 188 | 187 | 187 |
| 35–39 | 271 | 246 | 228 | 215 | 205 | 199 | 194 | 190 | 187 | 184 | 183 | 181 | 180 | 179 | 178 | 177 |
| 40–44 | 433 | 383 | 340 | 303 | 273 | 248 | 227 | 211 | 197 | 186 | 177 | 170 | 164 | 159 | 156 | 153 |
| 45–49 | 129 | 181 | 220 | 231 | 233 | 229 | 220 | 210 | 199 | 188 | 178 | 169 | 160 | 152 | 146 | 140 |
| 50–54 | 24 | 42 | 56 | 84 | 107 | 124 | 137 | 145 | 149 | 150 | 148 | 145 | 141 | 136 | 132 | 127 |
| 55–59 | — | 4 | 8 | 16 | 27 | 39 | 52 | 62 | 72 | 79 | 84 | 88 | 90 | 91 | 90 | 89 |
| 60–64 | — | — | — | 1 | 4 | 7 | 12 | 18 | 23 | 29 | 34 | 38 | 42 | 45 | 47 | 49 |
| 65+ | — | — | — | — | — | 1 | 2 | 3 | 5 | 7 | 9 | 11 | 12 | 14 | 16 | 17 |
| **Total** | **1,260** | **1,258** | **1,250** | **1,248** | **1,244** | **1,239** | **1,233** | **1,226** | **1,217** | **1,207** | **1,196** | **1,184** | **1,172** | **1,158** | **1,145** | **1,131** |
| **Per cent change[(a)]** | | **–0.2%** | **–0.6%** | **–0.2%** | **–0.3%** | **–0.4%** | **–0.5%** | **–0.6%** | **–0.7%** | **–0.8%** | **–0.9%** | **–1.0%** | **–1.1%** | **–1.1%** | **–1.2%** | **–1.2%** |

(a) Per cent change over previous year.

Note: Based on a constant recruitment vector of 75 dental therapists per year.

# 5.3 Dental hygienist labour force

As can be seen in Table 24, the estimated number of practising dental hygienists in 2000 was 405, and the overall practising rate per 100,000 population was 2.1 dental hygienists. This estimate provides the baseline for projections to the year 2015.

**Table 24: Dental hygienists by practice status and States and Territories, 2000**

| Practice status | NSW | Vic[(a)] | Qld | SA | WA | Tas[(b)] | NT | ACT | Total |
|---|---|---|---|---|---|---|---|---|---|
| Working as dental hygienist | 58 | 86[(c)] | 45 | 82 | 110 | . . | 2 | 22 | 405 |
| Working, on 3+ months' leave | — | n.a. | 2 | 2 | 5 | . . | — | 1 | 10 |
| Working, but not in dental hygiene | 2 | n.a. | 5 | 11 | 9 | . . | — | 1 | 28 |
| Not working | 1 | n.a. | 1 | 2 | 8 | . . | — | — | 12 |
| Overseas | — | n.a. | 1 | — | 5 | . . | — | — | 6 |
| **Total** | **61** | **107** | **54** | **97** | **137** | . . | **2** | **24** | **482** |
| **Practising rate per 100,000 ERP** | **0.9** | **1.8** | **1.3** | **4.4** | **7.3** | **. .** | **1.0** | **7.1** | **2.1** |

(a) Victoria was not included in the 2000 labour force collection; total number registered known but practice status unknown.

(b) In 2000 dental hygienists were not able to register or practice in the State of Tasmania.

(c) The estimated number of hygienists practising in Victoria was imputed by multiplying the number registered as at December 2000 (107) by the 1997 participation rate (80.6%).

Notes

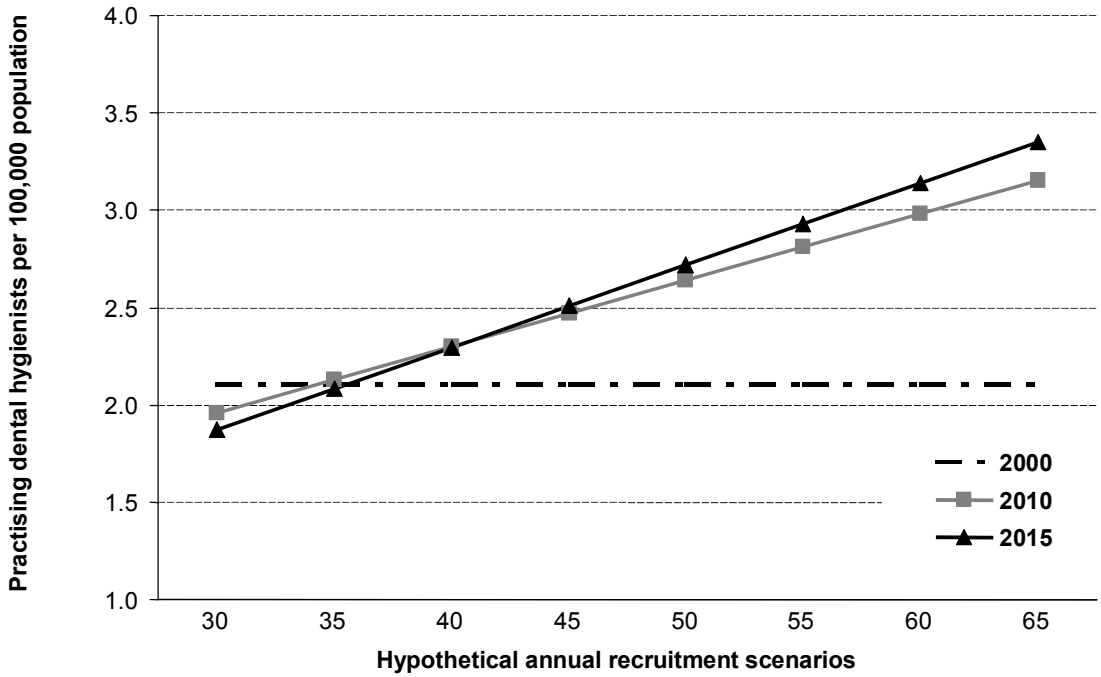
1. Not all rows and columns sum to totals due to the rounding of estimates to whole integers, and missing data.
2. Practising solely or mainly in the cited State/Territory. Adjusted to take account of non-response.

Source: Teusner & Spencer 2003.

## Projections of practising dental hygienists

Figure 12 shows the projected practising rate per 100,000 population attained as a result of a series of hypothetical recruitment vectors totaling between 30 and 65 dental hygienists per year. The total average recruitment per year is shown in the values of the *x* axis. The 2010 and 2015 lines show, respectively, the projected practising rates per 100,000 population attained if the level of recruitment per year indicated by the *x* axis is maintained for the 10 or 15 years of projection. The 2000 line shows the practising rate per 100,000 population at baseline, 2.1 dental hygienists. Very similar results are achieved if the recruitment is not constant and the average recruitment over the projection period, 2000 to 2015, is equivalent to the *x* axis value. (This applies only because of the short time frame of the projections and probably would not hold true for projections greater than the year 2015).

It can be seen from Figure 12 that an average recruitment of 35 hygienists per year is required in order to maintain the 2000 practising rate of 2.1 dental hygienists per 100,000 population in 2015.




| Year | Practising rate per 100,000 population | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2010 | 2.0 | 2.1 | 2.3 | 2.5 | 2.6 | 2.8 | 3.0 | 3.2 |
| 2015 | 1.9 | 2.1 | 2.3 | 2.5 | 2.7 | 2.9 | 3.1 | 3.4 |

Notes

1. The projected practising dental hygienists rate per 100,000 population in 2010 and 2015 if the total recruitment per year is *x* (or average recruitment over the 10-year period 2000 to 2010 is *x*).
2. Australian Bureau of Statistics ERP projection series 'q', (see Appendix D).
3. The practising dental hygienist rate per 100,000 population in 2000 was 2.1 hygienists.
4. Projections based on constant recruitment vectors, see Appendix J for recruitment vectors by age group.

**Figure 12: Projected practising hygienists per 100,000 population by total average recruitment per year, 2000, 2010 and 2015**

For the purposes of projecting the future number of practising dental hygienists, a 'best guess' projection was calculated and is presented in Table 25. Application of a recruitment vector totalling 45 dental hygienists projected that there would be 551 practising dental hygienists in 2015, representing a 36% increase. The annual rate of increase in practising numbers is projected to decline year to year as the number of dental hygienists in the older age groups increases.

**Table 25: Projected number of practising dental hygienists by age group, 2000 to 2015**

| Age group (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 51 | 35 | 28 | 26 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 25–29 | 65 | 92 | 103 | 108 | 110 | 111 | 111 | 112 | 112 | 112 | 113 | 113 | 113 | 113 | 113 | 113 |
| 30–34 | 97 | 92 | 94 | 97 | 101 | 103 | 106 | 107 | 109 | 110 | 111 | 111 | 112 | 112 | 113 | 113 |
| 35–39 | 75 | 78 | 79 | 80 | 82 | 83 | 85 | 87 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 95 |
| 40–44 | 61 | 61 | 61 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 |
| 45–49 | 35 | 38 | 41 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 53 | 54 |
| 50–54 | 17 | 19 | 21 | 24 | 26 | 28 | 29 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |
| 55–59 | 3 | 5 | 7 | 9 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 22 | 23 |
| 60–64 | 1 | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 |
| 65+ | — | — | — | — | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 |
| **Total** | **405** | **422** | **436** | **450** | **464** | **476** | **487** | **497** | **506** | **515** | **522** | **529** | **535** | **541** | **546** | **551** |
| **Per cent increase[(a)]** | **4.1%** | **3.3%** | **3.3%** | **3.0%** | **2.6%** | **2.3%** | **2.1%** | **1.9%** | **1.6%** | **1.5%** | **1.3%** | **1.2%** | **1.1%** | **0.9%** | **0.8%** |

(a) Per cent change over previous year.

Note: Based on a constant recruitment vector of 45 dental hygienists per year.

# 5.4 Dental prosthetist labour force

As can be seen in Table 26, the estimated number of practising dental prosthetists in 2000 was 836, and the overall practising rate per 100,000 population was 4.4 dental prosthetists. This estimate provides the baseline for projections to the year 2015.

**Table 26: Dental prosthetists, practice status by States and Territories, 2000**

| Practice status | NSW | Vic[(a)] | Qld | SA | WA | Tas | NT[(b)] | ACT | Total |
|---|---|---|---|---|---|---|---|---|---|
| Working solely in this State/Territory or mainly in this State/Territory | 304 | 260[(c)] | 117 | 27 | 60 | 52 | . . | 16 | 836 |
| Working only in another State/Territory | 6 | n.a. | 4 | 3 | — | — | . . | 2 | 15 |
| On extended leave (3+ months) | 2 | n.a. | 2 | — | — | — | . . | — | 4 |
| Working overseas | 2 | n.a. | 2 | 2 | — | — | . . | — | 6 |
| Not working | 38 | n.a. | 9 | 2 | 22 | — | . . | — | 71 |
| Working in dentistry but not in prosthetics | 25 | n.a. | 11 | — | 3 | — | . . | — | 39 |
| Working, but not in dentistry or prosthetics | 8 | n.a. | 2 | 2 | 3 | — | . . | — | 15 |
| **Total registered** | **385** | **306** | **147** | **36** | **88** | **52** | . . | **18** | **1,032** |
| **Practising rate per 100,000 population** | **4.7** | **5.5** | **3.3** | **1.8** | **3.2** | **11.1** | **. .** | **5.1** | **4.4** |

(a) Victoria was not included in the 2000 labour force collection; total number registered known but practice status unknown.

(b) Dental prosthetists are not able to register to practice in the Northern Territory.

(c) The estimated number of prosthetists practising in Victoria was imputed by multiplying the number registered as at December 2000 (306) by the 1998 participation rate (85.1%).

Notes:

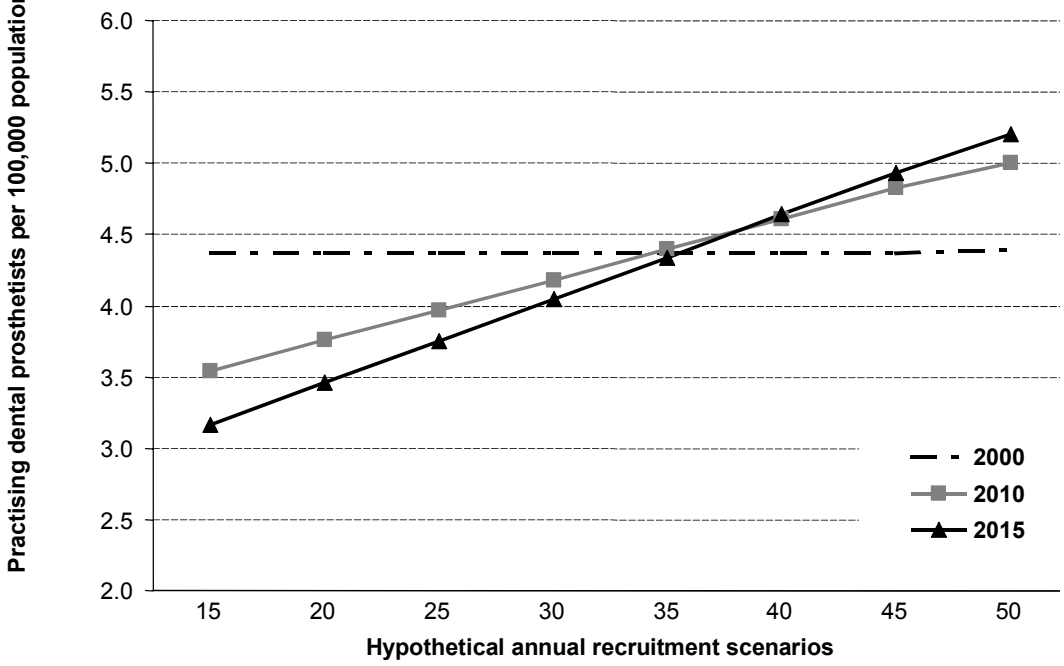
1. Not all rows and columns sum to totals due to the rounding of estimates to whole integers, and missing data.
2. Practising solely or mainly in the cited State/Territory. Adjusted to take account of non-response.

Source: Teusner & Spencer 2003.

## Projections of practising prosthetists

Figure 13 shows the projected practising rate per 100,000 population attained as a result of a series of hypothetical recruitment vectors totalling between 15 and 50 dental prosthetists per year. The total average recruitment per year is shown in the values of the *x* axis. The 2010 and 2015 lines show, respectively, the projected practising rates per 100,000 population attained if the level of recruitment per year indicated by the *x* axis is maintained for the 10 or 15 years of projection. The 2000 line shows the practising rate per 100,000 at baseline, 4.4 dental prosthetists. Very similar results are achieved if the recruitment is not constant and the average recruitment over the projection period, 2000 to 2015, is equivalent to the *x* axis value. (This applies only because of the short time frame of the projections and most likely would not hold true for projections greater than the year 2015).

It can be seen from Figure 13 that an average recruitment of 35 dental prosthetists per year is required in order to maintain the 2000 practising rate of 4.4 dental prosthetists per 100,000 population in 2015.




| Year | Practising rate per 100,000 population | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2010 | 3.5 | 3.8 | 4.0 | 4.2 | 4.4 | 4.6 | 4.8 | 5.0 |
| 2015 | 3.2 | 3.5 | 3.8 | 4.1 | 4.3 | 4.6 | 4.9 | 5.2 |

Notes

1. The projected practising dental prosthetists rate per 100,000 population in 2010 and 2015 if the total recruitment per year is $x$ (or average recruitment over the 10-year period 2000 to 2010 is $x$).
2. Australian Bureau of Statistics ERP projection series 'q', (see Appendix D).
3. The practising dental prosthetist rate per 100,000 population in 2000 was 4.4 prosthetists.
4. Projections based on constant recruitment vectors, see Appendix K for recruitment vectors by age group.

**Figure 13: Projected practising dental prosthetists per 100,000 population by total average recruitment per year, 2000, 2010 and 2015**

For the purposes of projecting the future number of practising dental prosthetists, a 'best guess' projection was calculated and is presented in Table 27. Application of a recruitment vector totalling 20 dental prosthetists projected that there would be 757 practising dental prosthetists in 2015, representing a 9.4% decrease. The annual rate of decline in practising numbers is projected to increase year to year as the number of dental prosthetists in the older age groups increases.

**Table 27: Projected number of practising dental prosthetists by age group, 2000 to 2015**

| Age group (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 25–29 | 27 | 26 | 25 | 25 | 25 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| 30–34 | 81 | 73 | 67 | 62 | 58 | 55 | 53 | 51 | 50 | 49 | 48 | 48 | 47 | 47 | 46 | 46 |
| 35–39 | 154 | 139 | 126 | 115 | 105 | 97 | 90 | 84 | 80 | 76 | 72 | 70 | 68 | 66 | 64 | 63 |
| 40–44 | 199 | 197 | 192 | 185 | 177 | 169 | 161 | 152 | 145 | 137 | 130 | 124 | 119 | 114 | 110 | 106 |
| 45–49 | 125 | 138 | 148 | 155 | 160 | 162 | 162 | 161 | 158 | 154 | 150 | 145 | 140 | 135 | 130 | 125 |
| 50–54 | 99 | 103 | 105 | 112 | 118 | 124 | 129 | 133 | 136 | 138 | 139 | 138 | 137 | 136 | 133 | 130 |
| 55–59 | 47 | 56 | 63 | 70 | 76 | 83 | 89 | 95 | 100 | 105 | 109 | 113 | 115 | 117 | 119 | 119 |
| 60–64 | 40 | 39 | 38 | 40 | 43 | 46 | 49 | 53 | 57 | 61 | 64 | 68 | 72 | 75 | 78 | 80 |
| 65+ | 65 | 61 | 59 | 56 | 54 | 52 | 51 | 51 | 51 | 52 | 53 | 55 | 57 | 59 | 61 | 63 |
| **Total** | **836** | **831** | **823** | **819** | **816** | **812** | **808** | **804** | **800** | **795** | **790** | **784** | **778** | **771** | **764** | **757** |
| **Per cent change[(a)]** | **–0.6%** | **–1.0%** | **–0.5%** | **–0.4%** | **–0.4%** | **–0.5%** | **–0.5%** | **–0.5%** | **–0.6%** | **–0.7%** | **–0.7%** | **–0.8%** | **–0.9%** | **–0.9%** | **–1.0%** | |

(a) Per cent change over previous year.

Note: Based on a constant recruitment vector of 20 prosthetists per year.

## 5.5 Capacity of the allied dental practitioner labour force to supply dental visits

The allied dental labour force provide a relatively small proportion of the total dental visits supplied. The services provided by dental therapists, dental hygienists and dental prosthetists tend to be concentrated, both in the range of services delivered and/or the age groups treated. Consequently, the services provided are more significant in relation to specific target groups in the population. The services provided by the allied dental labour force can be viewed as largely complementary to those provided by dentists; however, substantial overlap between the professional groups in terms of services provided does exist.

Table 28 presents productivity information for dental therapists, dental hygienists, and dental prosthetists. The mean number of hours worked per week is highest for prosthetists at 43.6 hours, followed by hygienists at 30.0 hours and then therapists at 28.8 hours per week. Patient visits per year are calculated for each group based on the information available. (Dentist data was cited where no profession specific data was available). These figures show that practising therapists provide 1,969 visits per year, compared with dental hygienists who provide 2,154 visits per year, and dental prosthetists who provide 3,345 visits per year.

**Table 28: Estimated annual productivity (estimated number of dental visits): dental hygienists, dental therapists and dental prosthetists**

| | Dental therapists | Dental hygienists | Dental prosthetists |
|---|---|---|---|
| Hours per week [(a)] | 28.80 | 30.00 | 43.60 |
| Weeks per year [(b)] | 43.26 | 43.26 | 44.60 |
| Hours per year[(c)] | 1245.89 | 1,297.80 | 1,944.56 |
| Patient visits per hour [(d)] | 1.58 | 1.66 | 1.72 |
| Patient visits per year [(e)] | 1968.50 | 2,154.35 | 3,344.64 |
| (a) | 2000 Therapist Labour Force Collection | 2000 Hygienist Labour Force Collection | 2000 Prosthetist Labour Force Collection |
| (b) | 1998–99 Longitudinal Study of Dentists' Practice Activity, practising female dental practitioners | 1998–99 Longitudinal Study of Dentists' Practice Activity, practising female dental practitioners | 1998–99 Longitudinal Study of Dentists' Practice Activity, practising male dental practitioners |
| (c) | [Hours per week] x [Weeks per year] | [Hours per week] x [Weeks per year] | [Hours per week] x [Weeks per year] |
| (d) | 1998–99 Longitudinal Study of Dentists' Practice Activity in Australia, practising female dental practitioners | 1998 Dental Hygienist Labour Force Practice Activity in Australia | 1998–99 Longitudinal Study of Dentists' Practice Activity in Australia, Practising male dental practitioners |
| (e) | [Hours per year] x [Patient visits per hour] | [Hours per year] x [Patient visits per hour] | [Hours per year] x [Patient visits per hour] |

Due to the limited availability of appropriate annual productivity data, additional caution needs to be exercised when interpreting the projections of the allied dental labour force to provide dental visits. It should be noted that not all practising allied dental professionals are principally involved in the delivery of clinical services. This is particularly relevant for dental prosthetists, the majority of who do not work in clinical practice but in laboratory settings. Hence, the calculation of visits supplied by allied dental professionals was multiplied by an estimate of the number practising whose principal practice location was clinical. The projected capacity of the allied dental labour force to provide visits is presented in Table 29. It is projected that the overall number of visits supplied by the allied dental labour force will only decline by 0.9%, from a total of 4.32 million visits in 2000 to 4.28 million dental visits in 2015.

**Table 29: Capacity of the allied dental labour force to supply dental visits, 2000 and 2015**

| | 2000 | | 2000 (baseline supply) | | 2015 (projected supply) | |
|---|---|---|---|---|---|---|
| | Patient visits per year[(a)] | Percentage Clinical practice[(b)] | Number practising | Capacity to supply visits ('000)[(c)] | Projected number practising[(d)] | Capacity to supply visits ('000)[(c)] |
| **Dental therapists** | 1,968.50 | 95.1% | 1,260 | 2,359.62 | 1,131 | 2,118.72 |
| **Dental hygienists** | 2,154.35 | 97.6% | 405 | 851.72 | 551 | 1,157.74 |
| **Dental prosthetists** | 3,344.64 | 39.6% | 836 | 1,107.80 | 757 | 1,002.28 |
| **Total capacity to supply dental visits** | . . | . . | . . | **4,319.15** | . . | **4,278.74** |

(a) Estimated visits supplied per year (Table 28).

(b) Percentage of practising dental auxiliaries that reported their type of main practice was clinical or mainly clinical, Labour force data collection, 2000

(c) [Patient visits per year (Table 28)] x [% Clinical practice] x [Number practising].

(d) Projected number practising based on constant recruitment vectors totalling 45 hygienists per year, 75 therapists per year and 20 prosthetists per year.

# 6 Overview

Projections of the dentist and allied dental practitioner labour forces are summarised in Table 30. Calculated using a total annual recruitment of 489 dentists per year and the medium age/sex specific wastage rates, the dentists labour force was projected to increase by 17.7% by the year 2015. The projected growth, up to the year 2010, is expected to slightly out pace population growth, however, by 2013 the practising rate per 100,000 population starts to decline, indicating that projected growth in the labour force will not keep pace with population growth in the longer term.

Projections of the therapist and prosthetist labour force resulted in decreases in the number of practitioners (10.2% and 9.4% respectively). In contrast, a substantial increase was projected for the hygienist labour force, 36.0%, although this increase was calculated from a low base.

**Table 30: Projections of the dental labour force, 2000, 2005, 2010 and 2015**

| | Professional group | | | |
|---|---|---|---|---|
| **Year** | **Dentists** | **Therapists** | **Hygienists** | **Prosthetists** |
| | | **Number of practitioners** | | |
| 2000 (baseline) | 8,991 | 1,260 | 405 | 836 |
| 2005 | 9,712 | 1,239 | 476 | 812 |
| 2010 | 10,241 | 1,196 | 522 | 790 |
| 2015 | 10,583 | 1,131 | 551 | 757 |
| **Per cent change,2000 to 2015** | 17.7% | –10.2% | 36.0% | –9.4% |
| | | **Practising rate per 100,000 population** | | |
| 2000 (baseline) | 46.8 | 6.6 | 2.1 | 4.4 |
| 2005 | 48.1 | 6.1 | 2.4 | 4.0 |
| 2010 | 48.5 | 5.7 | 2.5 | 3.7 |
| 2015 | 48.2 | 5.1 | 2.5 | 3.4 |
| **Per cent change,2000 to 2015** | 3.0% | –21.5% | 18.9% | –20.8% |

Notes

1. Projected number of dentist visits supplied based on practising dentists projections calculated under the medium wastage vector.
2. Projected number of allied dental visits supplied based on practising allied practitioners calculated by applying constant recruitment vectors totalling 45 hygienists per year, 75 therapists per year and 20 prosthetists per year.

Dentist projections calculated using a range of recruitment scenarios illustrated that projected practising rates were not particularly sensitive to alterations in the total average annual recruitment. An increase in annual average recruitment from 489 to 560 dentists per year (a 14.5% increase) only resulted in a small increase in the projected practising rate in 2015. An average recruitment level of 489 resulted in 48.2 dentists per 100,000 population, as compared to 51.2 if recruitment totalled 560, (an increase of 6.2%).

Table 31 summarises the projected capacity of both dentists and the allied dental practitioners to supply dental visits to the year 2015. While the capacity of the dentist labour force is projected to increase by 13.6%, from 24.26 million visits in 2000 to 27.56 million visits by 2015, the capacity of the allied dental labour force to provide dental visits is projected to decline by 0.9%, from a total 4.319 million visits in 2000 to 4.279 million visits in 2015.

In 2000 it was estimated that the combined capacity of the allied dental labour force to supply dental visits was 15.1% of all visits supplied. By 2015 this percentage is expected to decline slightly, with the allied dental practitioner labour force providing 13.4% of all dental visits.

The projected total capacity to provide dental visits in 2015 is 31.84 million visits, an increase of 11.4%. It appears that this growth will not keep pace with projected growth in the population, as the visits per capita will decline from 1.49 visits per capita in 2000 to 1.45 in 2015.

**Table 31: Capacity of the dental labour force to supply dental visits, 2000, 2005, 2010 and 2015**

| | Dental visits supplied ('000) | | | |
|---|---|---|---|---|
| Year | Dentist labour force | Allied dental labour force | Total | Visits per capita |
| 2000 (baseline) | 24.261 | 4.319 | 28.580 | 1.49 |
| 2005 | 25.866 | 4.396 | 30.263 | 1.50 |
| 2010 | 26.931 | 4.385 | 31.316 | 1.48 |
| 2015 | 27.563 | 4.279 | 31.841 | 1.45 |
| **Per cent change, 2000 to 2015** | **13.6%** | **–0.9%** | **11.4%** | **–2.6%** |

Notes

1. Projected number of dentist visits supplied based on practising dentists projections calculated under the medium wastage vector.
2. Projected number of allied dental visits supplied based on practising allied practitioners calculated by applying constant recruitment vectors totalling 45 hygienists per year, 75 therapists per year and 20 prosthetists per year.

Alternate dentist supply projections were calculated in order to examine the impact on supply if previously observed trends of declining visits per annum continued in the future. Table 32 summarises the projected change in the entire dental labour force under the dentist supply projections based on three different assumptions. These results illustrate the sensitivity of projections of capacity to supply dental visits to differing assumptions of the visits supplied per annum by dentists.

The long-term trend has been a decline in visits supplied per annum. While historically some of the decrease was a result of reduced hours per year, most of the decrease was due to an increase in the length of time per visit. One possible reason for the increased length of time per visit is the impact of science and technology on dental practice. In more recent times factors like infection control may have contributed to the lengthening of visits and the consequent reduction in visits supplied per annum.

The low dentist supply projection presented in Table 32 reflects the full continuation of the decrease in visits supplied per annum by dentists and results in a decrease of 17.6% in visits supplied per capita. A cautious approach would be to place emphasis on the medium dentists supply projection. This indicates a marginal growth in capacity to supply visits between 2000 and 2015 of some 2.4%, however this growth fails to keep pace with population growth and results in a decrease in visits per capita by 10.5%. Population growth is a major driver of the burden of disease, demand and use of dental services. Hence, the projections of the dental labour force and capacity to supply visits may potentially be at odds with trends in demand for dental services.

**Table 32: Capacity of the dental labour force to supply dental visits: high, medium and low supply projections, 2000, 2005, 2010 and 2015**

| | Capacity to supply dental visits by total dental labour force | | | | | |
|---|---|---|---|---|---|---|
| | High dentist supply projection | | Medium dentist supply projection | | Low dentist supply projection | |
| Year | Visits ('000) | Visits per capita | Visits ('000) | Visits per capita | Visits ('000) | Visits per capita |
| 2000 (baseline) | 28.580 | 1.49 | 28.419 | 1.48 | 28.258 | 1.47 |
| 2005 | 30.263 | 1.50 | 29.257 | 1.45 | 28.290 | 1.40 |
| 2010 | 31.316 | 1.48 | 29.430 | 1.39 | 27.687 | 1.31 |
| 2015 | 31.841 | 1.45 | 29.087 | 1.32 | 26.643 | 1.21 |
| **Per cent change, 2000 to 2015** | **11.4%** | **–2.6%** | **2.4%** | **–10.5%** | **–5.7%** | **–17.6%** |

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## Appendix A: Estimated resident population, Australian States and Territories, 30th June 2000

| ABS Cat. No. 30th June 2000 | State | Total | Capital city | Capital city population | Other regions population |
|---|---|---|---|---|---|
| **3235.1** | **NSW** | 6,463,455 | Sydney | 4,085,578 | 2,377,877 |
| **3235.2** | **Vic** | 4,765,856 | Melbourne | 3,466,025 | 1,299,831 |
| **3235.3** | **Qld** | 3,566,357 | Brisbane | 1,626,865 | 1,939,492 |
| **3235.4** | **SA** | 1,497,634 | Adelaide | 1,096,102 | 401,532 |
| **3235.5** | **WA** | 1,883,860 | Perth | 1,381,127 | 502,733 |
| **3235.6** | **Tas** | 470,376 | Greater Hobart | 194,228 | 276,148 |
| **3235.7** | **NT** | 195,463 | Darwin | 90,011 | 105,452 |
| **3235.8** | **ACT** | 310,839 | Canberra | 310,839 | . . |
| | **Aust** | **19,153,840** | | **12,250,775** | **6,903,065** |

# Appendix B: Complete recruitment vectors, low, medium and high wastage projections

**Recruitment vector, low wastage, male dentists, 2001 to 2015**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 89.1 | 89.5 | 89.5 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 |
| 25–29 | 66.0 | 66.0 | 66.3 | 66.6 | 66.8 | 67.0 | 67.2 | 67.3 | 67.4 | 67.5 | 67.5 | 67.6 | 67.6 | 67.6 | 67.6 |
| 30–34 | 31.0 | 30.9 | 30.8 | 30.7 | 30.8 | 30.9 | 30.9 | 31.0 | 31.1 | 31.2 | 31.3 | 31.4 | 31.4 | 31.5 | 31.6 |
| 35–39 | 26.8 | 26.5 | 26.2 | 26.0 | 25.9 | 25.8 | 25.7 | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 | 25.7 |
| 40–44 | 26.4 | 26.1 | 25.8 | 25.5 | 25.1 | 24.9 | 24.6 | 24.4 | 24.2 | 24.1 | 23.9 | 23.8 | 23.7 | 23.7 | 23.6 |
| 45–49 | 19.3 | 19.6 | 19.8 | 19.8 | 19.8 | 19.8 | 19.7 | 19.7 | 19.5 | 19.4 | 19.3 | 19.2 | 19.1 | 19.0 | 18.9 |
| 50–54 | 10.1 | 10.2 | 10.2 | 10.3 | 10.4 | 10.4 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.4 | 10.4 | 10.4 |
| 55–59 | 10.2 | 10.6 | 11.0 | 11.3 | 11.6 | 11.9 | 12.1 | 12.3 | 12.4 | 12.6 | 12.7 | 12.8 | 12.8 | 12.9 | 12.9 |
| 60–64 | 9.0 | 9.5 | 10.0 | 10.5 | 11.1 | 11.7 | 12.2 | 12.7 | 13.2 | 13.6 | 14.0 | 14.4 | 14.7 | 15.0 | 15.2 |
| 65–69 | 7.3 | 7.3 | 7.3 | 7.5 | 7.7 | 8.0 | 8.4 | 8.8 | 9.2 | 9.6 | 10.0 | 10.4 | 10.7 | 11.1 | 11.4 |
| 70–74 | 5.0 | 5.2 | 5.3 | 5.4 | 5.5 | 5.6 | 5.8 | 5.9 | 6.1 | 6.3 | 6.6 | 6.8 | 7.1 | 7.4 | 7.6 |
| **Total** | **300.3** | **301.2** | **302.2** | **303.3** | **304.4** | **305.5** | **306.6** | **307.8** | **308.9** | **309.9** | **311.0** | **311.9** | **312.8** | **313.7** | **314.4** |

**Recruitment vector, low wastage, female dentists, 2001 to 2015**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 |
| 25–29 | 49.5 | 49.4 | 49.5 | 49.6 | 49.7 | 49.8 | 49.9 | 49.9 | 50.0 | 50.0 | 50.0 | 50.0 | 50.1 | 50.1 | 50.1 |
| 30–34 | 23.6 | 24.0 | 24.2 | 24.4 | 24.7 | 24.9 | 25.0 | 25.2 | 25.3 | 25.5 | 25.6 | 25.7 | 25.7 | 25.8 | 25.8 |
| 35–39 | 21.4 | 21.3 | 21.3 | 21.3 | 21.4 | 21.5 | 21.5 | 21.6 | 21.8 | 21.9 | 22.0 | 22.0 | 22.1 | 22.2 | 22.3 |
| 40–44 | 18.6 | 19.6 | 20.4 | 21.1 | 21.6 | 22.1 | 22.5 | 22.9 | 23.2 | 23.5 | 23.8 | 24.0 | 24.2 | 24.4 | 24.6 |
| 45–49 | 9.2 | 9.4 | 9.6 | 9.8 | 10.0 | 10.2 | 10.3 | 10.5 | 10.7 | 10.8 | 11.0 | 11.1 | 11.2 | 11.3 | 11.4 |
| 50–54 | 3.4 | 3.6 | 3.7 | 3.8 | 4.0 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 4.6 | 4.7 | 4.8 | 4.8 | 4.9 |
| 55–59 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| 60–64 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 60–64 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 65–69 | 0.2 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.1 | 1.2 | 1.4 | 1.5 | 1.7 | 1.9 | 2.1 | 2.3 |
| 70–74 | 0.3 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 |
| **Total** | **188.8** | **190.4** | **192.0** | **193.5** | **194.9** | **196.1** | **197.3** | **198.5** | **199.5** | **200.6** | **201.5** | **202.4** | **203.3** | **204.1** | **204.8** |

**Recruitment vector, medium wastage, male dentists, 2001 to 2015**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 89.1 | 89.5 | 89.5 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 |
| 25–29 | 66.0 | 65.9 | 66.2 | 66.5 | 66.8 | 66.9 | 67.1 | 67.2 | 67.3 | 67.3 | 67.4 | 67.4 | 67.5 | 67.5 | 67.5 |
| 30–34 | 31.0 | 30.8 | 30.7 | 30.7 | 30.7 | 30.8 | 30.8 | 30.9 | 31.0 | 31.1 | 31.2 | 31.2 | 31.3 | 31.3 | 31.4 |
| 35–39 | 26.8 | 26.5 | 26.2 | 26.0 | 25.8 | 25.7 | 25.6 | 25.6 | 25.5 | 25.5 | 25.5 | 25.5 | 25.5 | 25.5 | 25.6 |
| 40–44 | 26.4 | 26.1 | 25.8 | 25.4 | 25.1 | 24.8 | 24.6 | 24.4 | 24.2 | 24.0 | 23.8 | 23.7 | 23.6 | 23.6 | 23.5 |
| 45–49 | 19.3 | 19.6 | 19.7 | 19.8 | 19.8 | 19.8 | 19.7 | 19.6 | 19.5 | 19.4 | 19.3 | 19.2 | 19.0 | 18.9 | 18.8 |
| 50–54 | 10.1 | 10.2 | 10.2 | 10.3 | 10.4 | 10.4 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.4 | 10.4 | 10.4 | 10.3 |
| 55–59 | 10.2 | 10.6 | 11.0 | 11.3 | 11.6 | 11.8 | 12.0 | 12.2 | 12.4 | 12.5 | 12.6 | 12.7 | 12.7 | 12.7 | 12.8 |
| 60–64 | 9.0 | 9.4 | 9.9 | 10.4 | 11.0 | 11.5 | 12.0 | 12.5 | 12.9 | 13.4 | 13.7 | 14.1 | 14.4 | 14.6 | 14.8 |
| 65–69 | 7.3 | 7.2 | 7.2 | 7.4 | 7.6 | 7.8 | 8.1 | 8.5 | 8.9 | 9.2 | 9.6 | 9.9 | 10.3 | 10.6 | 10.9 |
| 70–74 | 5.0 | 5.1 | 5.2 | 5.3 | 5.4 | 5.4 | 5.5 | 5.7 | 5.8 | 6.0 | 6.2 | 6.5 | 6.7 | 6.9 | 7.2 |
| **Total** | **300.3** | **301.0** | **301.8** | **302.7** | **303.7** | **304.6** | **305.6** | **306.6** | **307.5** | **308.5** | **309.4** | **310.2** | **311.0** | **311.7** | **312.3** |

## Appendix B*(continued)*: Complete recruitment vectors, low, medium and high wastage projections

**Recruitment vector, medium wastage, female dentists, 2001 to 2015**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 |
| 25–29 | 49.5 | 49.3 | 49.4 | 49.6 | 49.7 | 49.7 | 49.8 | 49.9 | 49.9 | 49.9 | 49.9 | 50.0 | 50.0 | 50.0 | 50.0 |
| 30–34 | 23.6 | 23.9 | 24.1 | 24.3 | 24.5 | 24.7 | 24.9 | 25.0 | 25.1 | 25.2 | 25.3 | 25.4 | 25.5 | 25.5 | 25.6 |
| 35–39 | 21.4 | 21.3 | 21.2 | 21.2 | 21.3 | 21.3 | 21.4 | 21.5 | 21.6 | 21.7 | 21.7 | 21.8 | 21.9 | 21.9 | 22.0 |
| 40–44 | 18.6 | 19.6 | 20.4 | 21.0 | 21.5 | 22.0 | 22.3 | 22.7 | 23.0 | 23.2 | 23.5 | 23.7 | 23.9 | 24.1 | 24.2 |
| 45–49 | 9.2 | 9.4 | 9.5 | 9.7 | 9.9 | 10.1 | 10.3 | 10.5 | 10.6 | 10.8 | 10.9 | 11.0 | 11.1 | 11.2 | 11.3 |
| 50–54 | 3.4 | 3.5 | 3.7 | 3.8 | 3.9 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 4.6 | 4.6 | 4.7 | 4.8 | 4.9 |
| 55–59 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| 60–64 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 65–69 | 0.2 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.3 | 1.4 | 1.6 | 1.8 | 1.9 | 2.1 |
| 70–74 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 0.7 |
| **Total** | **188.8** | **190.3** | **191.8** | **193.1** | **194.4** | **195.6** | **196.7** | **197.7** | **198.6** | **199.6** | **200.4** | **201.2** | **202.0** | **202.7** | **203.4** |

**Recruitment vector, high wastage, male dentists, 2001 to 2015**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 89.1 | 89.5 | 89.5 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 | 89.6 |
| 25–29 | 66.0 | 65.9 | 66.2 | 66.5 | 66.7 | 66.9 | 67.0 | 67.1 | 67.2 | 67.2 | 67.3 | 67.3 | 67.3 | 67.4 | 67.4 |
| 30–34 | 31.0 | 30.8 | 30.7 | 30.6 | 30.6 | 30.7 | 30.7 | 30.8 | 30.9 | 31.0 | 31.0 | 31.1 | 31.1 | 31.2 | 31.2 |
| 35–39 | 26.8 | 26.4 | 26.2 | 26.0 | 25.8 | 25.7 | 25.6 | 25.5 | 25.5 | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 25.5 |
| 40–44 | 26.4 | 26.1 | 25.7 | 25.4 | 25.1 | 24.8 | 24.5 | 24.3 | 24.1 | 23.9 | 23.8 | 23.7 | 23.5 | 23.5 | 23.4 |
| 45–49 | 19.3 | 19.6 | 19.7 | 19.8 | 19.8 | 19.8 | 19.7 | 19.6 | 19.5 | 19.4 | 19.2 | 19.1 | 19.0 | 18.9 | 18.8 |
| 50–54 | 10.1 | 10.2 | 10.2 | 10.3 | 10.3 | 10.4 | 10.4 | 10.5 | 10.5 | 10.4 | 10.4 | 10.4 | 10.4 | 10.3 | 10.3 |
| 55–59 | 10.2 | 10.6 | 11.0 | 11.3 | 11.5 | 11.8 | 12.0 | 12.1 | 12.3 | 12.4 | 12.5 | 12.6 | 12.6 | 12.6 | 12.6 |
| 60–64 | 9.0 | 9.4 | 9.9 | 10.4 | 10.9 | 11.4 | 11.8 | 12.3 | 12.7 | 13.1 | 13.4 | 13.8 | 14.0 | 14.3 | 14.5 |
| 65–69 | 7.3 | 7.2 | 7.2 | 7.2 | 7.4 | 7.6 | 7.9 | 8.2 | 8.6 | 8.9 | 9.2 | 9.6 | 9.9 | 10.2 | 10.4 |
| 70–74 | 5.0 | 5.1 | 5.2 | 5.2 | 5.2 | 5.3 | 5.3 | 5.4 | 5.6 | 5.7 | 5.9 | 6.1 | 6.3 | 6.5 | 6.7 |
| **Total** | **300.3** | **300.8** | **301.5** | **302.2** | **303.0** | **303.8** | **304.6** | **305.4** | **306.3** | **307.0** | **307.8** | **308.5** | **309.2** | **309.7** | **310.3** |

**Recruitment vector, high wastage, female dentists, 2001 to 2015**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 | 61.1 |
| 25–29 | 49.5 | 49.3 | 49.4 | 49.5 | 49.6 | 49.7 | 49.7 | 49.8 | 49.8 | 49.8 | 49.8 | 49.9 | 49.9 | 49.9 | 49.9 |
| 30–34 | 23.6 | 23.9 | 24.1 | 24.2 | 24.4 | 24.6 | 24.7 | 24.8 | 24.9 | 25.0 | 25.1 | 25.2 | 25.2 | 25.3 | 25.3 |
| 35–39 | 21.4 | 21.2 | 21.2 | 21.2 | 21.2 | 21.2 | 21.3 | 21.3 | 21.4 | 21.4 | 21.5 | 21.6 | 21.6 | 21.7 | 21.7 |
| 40–44 | 18.6 | 19.6 | 20.3 | 20.9 | 21.4 | 21.8 | 22.2 | 22.5 | 22.7 | 23.0 | 23.2 | 23.4 | 23.5 | 23.7 | 23.8 |
| 45–49 | 9.2 | 9.4 | 9.5 | 9.7 | 9.9 | 10.1 | 10.3 | 10.4 | 10.6 | 10.7 | 10.8 | 10.9 | 11.0 | 11.1 | 11.2 |
| 50–54 | 3.4 | 3.5 | 3.7 | 3.8 | 3.9 | 4.0 | 4.2 | 4.3 | 4.4 | 4.4 | 4.5 | 4.6 | 4.7 | 4.7 | 4.8 |
| 55–59 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| 60–64 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 65–69 | 0.2 | 0.4 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 1.0 | 1.1 | 1.2 | 1.4 | 1.5 | 1.7 | 1.8 | 2.0 |
| 70–74 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 |
| **Total** | **188.8** | **190.2** | **191.5** | **192.8** | **193.9** | **195.0** | **196.0** | **196.9** | **197.8** | **198.6** | **199.3** | **200.0** | **200.7** | **201.3** | **201.9** |

## Appendix C: Projected number of practising dentists, high and low wastage, sex and age groups, 2000 to 2015

**Projected number of practising male dentists, age groups, 2000 to 2015 (low wastage)**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 106 | 110 | 110 | 110 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 |
| 25–29 | 532 | 545 | 557 | 568 | 576 | 582 | 587 | 591 | 593 | 596 | 597 | 599 | 600 | 601 | 601 |
| 30–34 | 615 | 610 | 609 | 611 | 614 | 619 | 624 | 629 | 633 | 637 | 641 | 644 | 647 | 649 | 651 |
| 35–39 | 776 | 753 | 734 | 719 | 708 | 700 | 695 | 692 | 691 | 691 | 691 | 693 | 695 | 697 | 699 |
| 40–44 | 1,150 | 1,117 | 1,086 | 1,056 | 1,029 | 1,004 | 982 | 963 | 947 | 934 | 923 | 915 | 908 | 903 | 899 |
| 45–49 | 1,108 | 1,127 | 1,137 | 1,139 | 1,135 | 1,126 | 1,115 | 1,101 | 1,087 | 1,072 | 1,058 | 1,044 | 1,031 | 1,019 | 1,009 |
| 50–54 | 996 | 1,011 | 1,027 | 1,042 | 1,054 | 1,063 | 1,069 | 1,071 | 1,070 | 1,067 | 1,061 | 1,054 | 1,046 | 1,037 | 1,028 |
| 55–59 | 742 | 788 | 827 | 862 | 893 | 920 | 944 | 964 | 980 | 993 | 1,003 | 1,010 | 1,014 | 1,016 | 1,016 |
| 60–64 | 471 | 500 | 531 | 562 | 593 | 623 | 651 | 678 | 703 | 725 | 745 | 763 | 779 | 792 | 803 |
| 65–69 | 255 | 256 | 262 | 270 | 281 | 293 | 306 | 320 | 334 | 348 | 362 | 375 | 387 | 399 | 409 |
| 70–74 | 181 | 185 | 189 | 192 | 196 | 201 | 207 | 214 | 222 | 230 | 239 | 248 | 258 | 267 | 277 |
| 75+ | 80 | 82 | 85 | 87 | 89 | 91 | 93 | 96 | 98 | 101 | 104 | 108 | 112 | 116 | 120 |
| **Total** | **7,011** | **7,085** | **7,154** | **7,219** | **7,278** | **7,333** | **7,383** | **7,429** | **7,469** | **7,505** | **7,536** | **7,564** | **7,587** | **7,606** | **7,622** |

**Projected number of practising female dentists, age groups, 2000 to 2015 (low wastage)**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 73 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| 25–29 | 385 | 391 | 396 | 401 | 405 | 407 | 410 | 411 | 413 | 414 | 414 | 415 | 415 | 416 | 416 |
| 30–34 | 376 | 384 | 390 | 397 | 402 | 408 | 413 | 417 | 420 | 423 | 426 | 428 | 430 | 431 | 432 |
| 35–39 | 390 | 390 | 391 | 393 | 396 | 400 | 404 | 408 | 412 | 415 | 419 | 422 | 425 | 428 | 430 |
| 40–44 | 369 | 393 | 413 | 429 | 443 | 455 | 466 | 475 | 484 | 492 | 500 | 506 | 513 | 519 | 524 |
| 45–49 | 284 | 300 | 316 | 334 | 350 | 366 | 381 | 394 | 407 | 418 | 429 | 439 | 448 | 457 | 464 |
| 50–54 | 155 | 177 | 196 | 215 | 233 | 250 | 266 | 281 | 296 | 310 | 323 | 335 | 347 | 357 | 367 |
| 55–59 | 70 | 84 | 99 | 114 | 129 | 143 | 158 | 172 | 186 | 199 | 212 | 224 | 236 | 247 | 258 |
| 60–64 | 34 | 38 | 42 | 49 | 56 | 64 | 72 | 81 | 90 | 99 | 109 | 118 | 127 | 136 | 145 |
| 65–69 | 7 | 9 | 11 | 13 | 15 | 17 | 20 | 22 | 25 | 29 | 32 | 35 | 39 | 42 | 46 |
| 70–74 | 5 | 5 | 5 | 5 | 5 | 6 | 7 | 7 | 8 | 9 | 11 | 12 | 14 | 15 | 17 |
| 75+ | 6 | 5 | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 6 |
| **Total** | **2,155** | **2,249** | **2,340** | **2,428** | **2,513** | **2,595** | **2,673** | **2,748** | **2,820** | **2,888** | **2,953** | **3,015** | **3,073** | **3,127** | **3,179** |

**Projected number of practising male dentists, age groups, 2000 to 2015 (high wastage)**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 106 | 109 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 |
| 25–29 | 530 | 541 | 552 | 561 | 568 | 574 | 578 | 581 | 584 | 586 | 587 | 588 | 589 | 590 | 590 |
| 30–34 | 613 | 606 | 603 | 603 | 605 | 609 | 612 | 616 | 619 | 622 | 625 | 628 | 630 | 632 | 634 |
| 35–39 | 775 | 750 | 729 | 713 | 700 | 691 | 684 | 680 | 677 | 676 | 675 | 676 | 677 | 678 | 679 |
| 40–44 | 1,149 | 1,115 | 1,082 | 1,051 | 1,022 | 996 | 973 | 952 | 935 | 920 | 907 | 897 | 889 | 883 | 878 |
| 45–49 | 1,107 | 1,125 | 1,134 | 1,135 | 1,130 | 1,120 | 1,107 | 1,093 | 1,077 | 1,061 | 1,045 | 1,030 | 1,016 | 1,003 | 991 |
| 50–54 | 994 | 1,008 | 1,023 | 1,036 | 1,047 | 1,055 | 1,059 | 1,060 | 1,058 | 1,054 | 1,047 | 1,039 | 1,029 | 1,019 | 1,008 |
| 55–59 | 739 | 782 | 819 | 852 | 880 | 905 | 926 | 944 | 959 | 970 | 978 | 984 | 986 | 987 | 985 |
| 60–64 | 467 | 493 | 520 | 548 | 576 | 603 | 628 | 651 | 673 | 692 | 710 | 725 | 738 | 749 | 757 |
| 65–69 | 251 | 250 | 253 | 259 | 267 | 277 | 288 | 299 | 311 | 323 | 334 | 345 | 355 | 364 | 373 |
| 70–74 | 179 | 180 | 181 | 182 | 184 | 187 | 191 | 195 | 201 | 207 | 213 | 220 | 228 | 235 | 242 |
| 75+ | 77 | 78 | 79 | 79 | 80 | 80 | 81 | 82 | 84 | 85 | 87 | 89 | 91 | 94 | 97 |
| **Total** | **6,987** | **7,039** | **7,087** | **7,131** | **7,170** | **7,206** | **7,237** | **7,264** | **7,287** | **7,305** | **7,320** | **7,331** | **7,339** | **7,343** | **7,344** |

## Appendix C *(continued)*: Projected number of practising dentists, high and low wastage, sex and age groups, 2000 to 2015

**Projected number of practising female dentists, age groups, 2000 to 2015 (high wastage)**

| Age group (years) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20–24 | 73 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| 25–29 | 384 | 387 | 392 | 396 | 399 | 401 | 403 | 404 | 405 | 406 | 406 | 407 | 407 | 407 | 407 |
| 30–34 | 375 | 380 | 385 | 389 | 394 | 398 | 401 | 404 | 407 | 409 | 411 | 413 | 414 | 415 | 416 |
| 35–39 | 388 | 386 | 385 | 386 | 387 | 389 | 391 | 394 | 396 | 399 | 401 | 403 | 405 | 407 | 409 |
| 40–44 | 368 | 390 | 408 | 423 | 435 | 445 | 454 | 462 | 469 | 475 | 480 | 485 | 490 | 494 | 498 |
| 45–49 | 283 | 298 | 313 | 329 | 344 | 359 | 372 | 384 | 395 | 404 | 413 | 421 | 429 | 435 | 441 |
| 50–54 | 155 | 175 | 194 | 212 | 229 | 244 | 259 | 274 | 287 | 299 | 311 | 321 | 331 | 340 | 349 |
| 55–59 | 70 | 83 | 97 | 111 | 125 | 139 | 153 | 166 | 178 | 190 | 202 | 213 | 223 | 233 | 242 |
| 60–64 | 34 | 37 | 41 | 47 | 54 | 61 | 69 | 77 | 85 | 93 | 102 | 110 | 118 | 126 | 133 |
| 65–69 | 7 | 9 | 10 | 12 | 14 | 16 | 18 | 20 | 23 | 26 | 28 | 31 | 34 | 37 | 40 |
| 70–74 | 5 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 75+ | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| **Total** | **2,146** | **2,229** | **2,310** | **2,388** | **2,463** | **2,535** | **2,603** | **2,668** | **2,729** | **2,787** | **2,842** | **2,893** | **2,941** | **2,986** | **3,028** |

## Appendix D: Australian Bureau of Statistics, projected estimated resident population, series 'q', 2000 to 2015, Australia

| Year | Estimated resident population |
|---|---|
| **2000** | 19,202,671 |
| **2001** | 19,421,345 |
| **2002** | 19,622,082 |
| **2003** | 19,819,854 |
| **2004** | 20,014,601 |
| **2005** | 20,206,197 |
| **2006** | 20,394,485 |
| **2007** | 20,579,409 |
| **2008** | 20,760,455 |
| **2009** | 20,938,534 |
| **2010** | 21,114,601 |
| **2011** | 21,288,783 |
| **2012** | 21,461,193 |
| **2013** | 21,631,670 |
| **2014** | 21,800,280 |
| **2015** | 21,967,115 |

Source: Australian Bureau of Statistics (ABS) 2000a

## Appendix E: Recruitment vectors for sensitivity analysis of dentist labour force projections (see Figure 8)

| | Average number of recruits per year | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **420** | | **440** | | **460** | | **480** | | **500** | | **520** | | **540** | | **560** | |
| **Age group (years)** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** |
| 20–24 | 93 | 62 | 97 | 65 | 102 | 68 | 106 | 71 | 111 | 74 | 115 | 77 | 120 | 80 | 124 | 83 |
| 25–29 | 40 | 31 | 42 | 32 | 44 | 34 | 46 | 35 | 48 | 37 | 50 | 38 | 52 | 40 | 53 | 41 |
| 30–34 | 26 | 20 | 28 | 21 | 29 | 22 | 30 | 23 | 32 | 24 | 33 | 25 | 34 | 26 | 35 | 27 |
| 35–39 | 23 | 18 | 24 | 19 | 25 | 20 | 26 | 20 | 27 | 21 | 29 | 22 | 30 | 23 | 31 | 24 |
| 40–44 | 23 | 16 | 24 | 17 | 25 | 18 | 26 | 19 | 27 | 19 | 29 | 20 | 30 | 21 | 31 | 22 |
| 45–49 | 16 | 8 | 17 | 8 | 18 | 8 | 19 | 9 | 19 | 9 | 20 | 10 | 21 | 10 | 22 | 10 |
| 50–54 | 9 | 3 | 10 | 4 | 10 | 4 | 11 | 4 | 11 | 4 | 12 | 4 | 12 | 4 | 13 | 5 |
| 55–59 | 9 | 2 | 10 | 2 | 10 | 2 | 11 | 2 | 11 | 2 | 12 | 2 | 12 | 2 | 13 | 2 |
| 60–64 | 8 | — | 8 | — | 8 | — | 9 | — | 9 | — | 10 | — | 10 | — | 10 | — |
| 65–69 | 10 | 1 | 11 | 1 | 11 | 1 | 12 | 1 | 12 | 1 | 13 | 1 | 13 | 1 | 14 | 1 |
| 70+ | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **Total** | **259** | **161** | **271** | **169** | **283** | **177** | **296** | **184** | **308** | **192** | **320** | **200** | **333** | **207** | **345** | **215** |

## Appendix F: Projected number of dental visits supplied (millions) by sex and age, high supply scenario, 2000 to 2015

| Age group | Projected number of dental visits supplied (millions) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| | | | | | | | | **Male dentists** | | | | | | | | |
| 20–29 | 1.35 | 1.38 | 1.42 | 1.44 | 1.47 | 1.48 | 1.49 | 1.50 | 1.51 | 1.52 | 1.52 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 |
| 30–39 | 3.97 | 3.87 | 3.79 | 3.73 | 3.69 | 3.66 | 3.65 | 3.64 | 3.64 | 3.65 | 3.66 | 3.67 | 3.68 | 3.69 | 3.70 | 3.71 |
| 40–49 | 7.41 | 7.40 | 7.36 | 7.28 | 7.19 | 7.08 | 6.96 | 6.85 | 6.74 | 6.64 | 6.54 | 6.45 | 6.37 | 6.30 | 6.25 | 6.19 |
| 50–59 | 4.98 | 5.17 | 5.34 | 5.50 | 5.65 | 5.77 | 5.87 | 5.95 | 6.01 | 6.06 | 6.08 | 6.09 | 6.08 | 6.07 | 6.04 | 6.01 |
| 60+ | 2.16 | 2.22 | 2.29 | 2.37 | 2.46 | 2.56 | 2.66 | 2.76 | 2.86 | 2.96 | 3.06 | 3.15 | 3.24 | 3.33 | 3.40 | 3.47 |
| **Total** | **19.87** | **20.04** | **20.19** | **20.33** | **20.45** | **20.55** | **20.64** | **20.71** | **20.77** | **20.82** | **20.86** | **20.89** | **20.91** | **20.92** | **20.92** | **20.92** |
| | | | | | | | | **Female dentists** | | | | | | | | |
| 20–29 | 1.04 | 1.06 | 1.07 | 1.08 | 1.09 | 1.10 | 1.11 | 1.11 | 1.12 | 1.12 | 1.12 | 1.12 | 1.12 | 1.12 | 1.13 | 1.13 |
| 30–39 | 1.59 | 1.60 | 1.61 | 1.62 | 1.63 | 1.65 | 1.67 | 1.68 | 1.69 | 1.71 | 1.72 | 1.73 | 1.74 | 1.75 | 1.76 | 1.76 |
| 40–49 | 1.23 | 1.31 | 1.39 | 1.46 | 1.53 | 1.58 | 1.64 | 1.68 | 1.73 | 1.77 | 1.80 | 1.84 | 1.87 | 1.89 | 1.92 | 1.94 |
| 50–59 | 0.43 | 0.51 | 0.59 | 0.67 | 0.75 | 0.82 | 0.89 | 0.96 | 1.02 | 1.08 | 1.14 | 1.20 | 1.25 | 1.30 | 1.35 | 1.39 |
| 60+ | 0.10 | 0.11 | 0.12 | 0.13 | 0.15 | 0.16 | 0.19 | 0.21 | 0.23 | 0.26 | 0.29 | 0.32 | 0.34 | 0.37 | 0.40 | 0.43 |
| **Total** | **4.40** | **4.59** | **4.78** | **4.97** | **5.15** | **5.32** | **5.48** | **5.64** | **5.79** | **5.94** | **6.07** | **6.20** | **6.32** | **6.44** | **6.54** | **6.64** |
| | | | | | | | | **All dentists** | | | | | | | | |
| 20–29 | 2.39 | 2.44 | 2.49 | 2.53 | 2.56 | 2.58 | 2.60 | 2.62 | 2.63 | 2.64 | 2.64 | 2.65 | 2.65 | 2.65 | 2.66 | 2.66 |
| 30–39 | 5.56 | 5.47 | 5.39 | 5.35 | 5.32 | 5.31 | 5.31 | 5.32 | 5.34 | 5.36 | 5.38 | 5.40 | 5.42 | 5.44 | 5.45 | 5.47 |
| 40–49 | 8.64 | 8.72 | 8.75 | 8.74 | 8.71 | 8.66 | 8.60 | 8.53 | 8.47 | 8.40 | 8.34 | 8.29 | 8.24 | 8.20 | 8.16 | 8.14 |
| 50–59 | 5.41 | 5.68 | 5.94 | 6.18 | 6.39 | 6.59 | 6.76 | 6.91 | 7.03 | 7.14 | 7.22 | 7.29 | 7.34 | 7.37 | 7.39 | 7.40 |
| 60+ | 2.26 | 2.33 | 2.41 | 2.50 | 2.61 | 2.72 | 2.85 | 2.97 | 3.10 | 3.22 | 3.35 | 3.47 | 3.59 | 3.70 | 3.80 | 3.90 |
| **Total** | **24.26** | **24.63** | **24.97** | **25.29** | **25.59** | **25.87** | **26.12** | **26.35** | **26.56** | **26.76** | **26.93** | **27.09** | **27.23** | **27.35** | **27.46** | **27.56** |

Note: Projection of the number of practising dentists was based on medium wastage vector and the projection of the number of visits was based on high supply scenario.

## Appendix G: Projected number of dental visits supplied (millions) by sex and age, medium supply scenario, 2000 to 2015

| Age group | Projected number of dental visits supplied (millions) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| **Male dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 1.33 | 1.35 | 1.37 | 1.38 | 1.38 | 1.38 | 1.38 | 1.37 | 1.36 | 1.35 | 1.34 | 1.33 | 1.31 | 1.30 | 1.29 | 1.27 |
| 30–39 | 3.93 | 3.79 | 3.67 | 3.57 | 3.50 | 3.43 | 3.39 | 3.35 | 3.31 | 3.28 | 3.26 | 3.23 | 3.21 | 3.18 | 3.16 | 3.13 |
| 40–49 | 7.38 | 7.34 | 7.26 | 7.15 | 7.02 | 6.89 | 6.75 | 6.60 | 6.47 | 6.34 | 6.22 | 6.11 | 6.01 | 5.91 | 5.83 | 5.76 |
| 50–59 | 4.95 | 5.11 | 5.26 | 5.39 | 5.50 | 5.59 | 5.66 | 5.71 | 5.73 | 5.74 | 5.74 | 5.72 | 5.68 | 5.64 | 5.58 | 5.52 |
| 60+ | 2.14 | 2.18 | 2.23 | 2.29 | 2.36 | 2.44 | 2.51 | 2.58 | 2.66 | 2.73 | 2.79 | 2.86 | 2.91 | 2.96 | 3.00 | 3.04 |
| **Total** | **19.73** | **19.77** | **19.78** | **19.78** | **19.76** | **19.73** | **19.68** | **19.61** | **19.53** | **19.44** | **19.34** | **19.23** | **19.12** | **18.99** | **18.86** | **18.73** |
| **Female dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 1.04 | 1.05 | 1.06 | 1.07 | 1.08 | 1.08 | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 | 1.08 | 1.08 | 1.08 | 1.08 | 1.07 |
| 30–39 | 1.58 | 1.58 | 1.58 | 1.59 | 1.59 | 1.60 | 1.61 | 1.61 | 1.62 | 1.62 | 1.62 | 1.63 | 1.63 | 1.63 | 1.62 | 1.62 |
| 40–49 | 1.22 | 1.28 | 1.35 | 1.40 | 1.45 | 1.49 | 1.52 | 1.55 | 1.57 | 1.59 | 1.60 | 1.61 | 1.62 | 1.63 | 1.63 | 1.64 |
| 50–59 | 0.43 | 0.51 | 0.59 | 0.66 | 0.73 | 0.80 | 0.86 | 0.92 | 0.98 | 1.04 | 1.09 | 1.14 | 1.18 | 1.22 | 1.26 | 1.29 |
| 60+ | 0.10 | 0.11 | 0.12 | 0.13 | 0.15 | 0.17 | 0.19 | 0.22 | 0.24 | 0.27 | 0.30 | 0.33 | 0.36 | 0.39 | 0.43 | 0.46 |
| **Total** | **4.37** | **4.54** | **4.70** | **4.85** | **5.00** | **5.13** | **5.26** | **5.38** | **5.50** | **5.60** | **5.70** | **5.79** | **5.87** | **5.95** | **6.02** | **6.08** |
| **All dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 2.37 | 2.40 | 2.43 | 2.45 | 2.46 | 2.47 | 2.46 | 2.46 | 2.45 | 2.44 | 2.42 | 2.41 | 2.40 | 2.38 | 2.36 | 2.35 |
| 30–39 | 5.51 | 5.37 | 5.25 | 5.16 | 5.09 | 5.03 | 4.99 | 4.96 | 4.93 | 4.90 | 4.88 | 4.86 | 4.83 | 4.81 | 4.78 | 4.75 |
| 40–49 | 8.59 | 8.62 | 8.60 | 8.55 | 8.47 | 8.37 | 8.26 | 8.15 | 8.04 | 7.93 | 7.82 | 7.72 | 7.63 | 7.54 | 7.46 | 7.39 |
| 50–59 | 5.38 | 5.62 | 5.85 | 6.05 | 6.23 | 6.39 | 6.52 | 6.63 | 6.72 | 6.78 | 6.82 | 6.85 | 6.86 | 6.86 | 6.84 | 6.82 |
| 60+ | 2.24 | 2.29 | 2.35 | 2.43 | 2.51 | 2.60 | 2.70 | 2.80 | 2.90 | 3.00 | 3.10 | 3.19 | 3.27 | 3.36 | 3.43 | 3.50 |
| **Total** | **24.10** | **24.31** | **24.48** | **24.63** | **24.76** | **24.86** | **24.94** | **25.00** | **25.03** | **25.05** | **25.045** | **25.03** | **24.99** | **24.94** | **24.88** | **24.81** |

Note: Projection of the number of practising dentists was based on medium wastage vector and the projection of the number of visits was based on medium supply scenario.

## Appendix H: Projected number of dental visits supplied (millions) by sex and age, low supply scenario, 2000 to 2015

| Age group | Projected number of dental visits supplied (millions) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (years) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| **Male dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 1.32 | 1.32 | 1.32 | 1.31 | 1.30 | 1.29 | 1.27 | 1.25 | 1.22 | 1.20 | 1.18 | 1.15 | 1.13 | 1.10 | 1.08 | 1.05 |
| 30–39 | 3.89 | 3.71 | 3.55 | 3.42 | 3.31 | 3.22 | 3.14 | 3.07 | 3.01 | 2.95 | 2.90 | 2.84 | 2.79 | 2.74 | 2.69 | 2.64 |
| 40–49 | 7.34 | 7.27 | 7.16 | 7.02 | 6.86 | 6.70 | 6.53 | 6.37 | 6.21 | 6.05 | 5.91 | 5.78 | 5.66 | 5.54 | 5.44 | 5.35 |
| 50–59 | 4.93 | 5.06 | 5.18 | 5.28 | 5.36 | 5.41 | 5.45 | 5.47 | 5.47 | 5.45 | 5.41 | 5.36 | 5.30 | 5.23 | 5.16 | 5.07 |
| 60+ | 2.12 | 2.14 | 2.18 | 2.22 | 2.27 | 2.32 | 2.37 | 2.42 | 2.46 | 2.51 | 2.55 | 2.58 | 2.61 | 2.63 | 2.65 | 2.66 |
| **Total** | **19.59** | **19.50** | **19.38** | **19.25** | **19.10** | **18.94** | **18.76** | **18.57** | **18.37** | **18.16** | **17.94** | **17.72** | **17.49** | **17.25** | **17.02** | **16.78** |
| **Female dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 1.04 | 1.04 | 1.05 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.05 | 1.05 | 1.04 | 1.04 | 1.03 | 1.03 |
| 30–39 | 1.57 | 1.57 | 1.56 | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 | 1.54 | 1.54 | 1.53 | 1.53 | 1.52 | 1.51 | 1.50 | 1.49 |
| 40–49 | 1.20 | 1.26 | 1.30 | 1.34 | 1.37 | 1.39 | 1.41 | 1.42 | 1.42 | 1.43 | 1.42 | 1.42 | 1.41 | 1.40 | 1.39 | 1.38 |
| 50–59 | 0.43 | 0.51 | 0.58 | 0.65 | 0.71 | 0.78 | 0.83 | 0.89 | 0.94 | 0.99 | 1.04 | 1.08 | 1.11 | 1.15 | 1.18 | 1.21 |
| 60+ | 0.11 | 0.11 | 0.12 | 0.14 | 0.15 | 0.17 | 0.20 | 0.22 | 0.25 | 0.28 | 0.32 | 0.35 | 0.38 | 0.42 | 0.45 | 0.49 |
| **Total** | **4.34** | **4.48** | **4.62** | **4.74** | **4.85** | **4.96** | **5.05** | **5.14** | **5.22** | **5.29** | **5.36** | **5.42** | **5.47** | **5.51** | **5.55** | **5.59** |
| **All dentists** | | | | | | | | | | | | | | | | |
| 20–29 | 2.35 | 2.36 | 2.37 | 2.37 | 2.37 | 2.35 | 2.33 | 2.31 | 2.28 | 2.26 | 2.23 | 2.20 | 2.17 | 2.14 | 2.11 | 2.08 |
| 30–39 | 5.46 | 5.27 | 5.11 | 4.98 | 4.87 | 4.77 | 4.69 | 4.62 | 4.55 | 4.49 | 4.43 | 4.37 | 4.31 | 4.25 | 4.19 | 4.13 |
| 40–49 | 8.55 | 8.53 | 8.46 | 8.36 | 8.23 | 8.09 | 7.94 | 7.78 | 7.63 | 7.48 | 7.33 | 7.20 | 7.07 | 6.95 | 6.83 | 6.73 |
| 50–59 | 5.36 | 5.57 | 5.76 | 5.92 | 6.07 | 6.19 | 6.29 | 6.36 | 6.41 | 6.44 | 6.45 | 6.44 | 6.42 | 6.38 | 6.33 | 6.28 |
| 60+ | 2.23 | 2.25 | 2.30 | 2.35 | 2.42 | 2.49 | 2.56 | 2.64 | 2.72 | 2.79 | 2.86 | 2.93 | 3.00 | 3.05 | 3.10 | 3.15 |
| **Total** | **23.93** | **23.98** | **24.00** | **23.99** | **23.95** | **23.89** | **23.81** | **23.71** | **23.59** | **23.45** | **23.302** | **23.14** | **22.96** | **22.77** | **22.57** | **22.36** |

Note: Projection of the number of practising dentists was based on medium wastage vector and the projection of the number of visits was based on low supply scenario.

## Appendix I: Recruitment vectors for sensitivity analysis of the dental therapist labour force projections (see Figure 11)

| Age group (years) | Average number of recruits per year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 20–24 | 15 | 18 | 20 | 23 | 25 | 28 | 30 | 33 |
| 25–29 | 21 | 25 | 28 | 32 | 35 | 39 | 42 | 46 |
| 30–34 | 15 | 18 | 20 | 23 | 25 | 28 | 30 | 33 |
| 35–39 | 9 | 11 | 12 | 14 | 15 | 17 | 18 | 20 |
| 40–44 | — | — | — | — | — | — | — | — |
| **Total** | **60** | **70** | **80** | **90** | **100** | **110** | **120** | **130** |

## Appendix J: Recruitment vectors for sensitivity analysis of the dental hygienist labour force projections (see Figure 12)

| Age group (years) | Average number of recruitment per year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 20–24 | 11 | 12 | 14 | 16 | 18 | 19 | 21 | 23 |
| 25–29 | 11 | 12 | 14 | 16 | 18 | 19 | 21 | 23 |
| 30–34 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 35–39 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 |
| 40–44 | — | — | — | — | — | — | — | — |
| **Total** | **30** | **35** | **40** | **45** | **50** | **55** | **60** | **65** |

## Appendix K: Recruitment vectors for sensitivity analysis of the dental prosthetist labour force projections (see Figure 13)

| Age group (years) | Average number of recruitment per year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 20–24 | — | — | — | — | — | — | — | — |
| 25–29 | 5 | 6 | 8 | 9 | 11 | 12 | 14 | 15 |
| 30–34 | 5 | 6 | 8 | 9 | 11 | 12 | 14 | 15 |
| 35–39 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 40–44 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Total** | **15** | **20** | **25** | **30** | **35** | **40** | **45** | **50** |