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# Dental fear in Australia: who's afraid of the dentist?

JM Armfield,\* AJ Spencer,\* JF Stewart\*

## Abstract

**Background:** This study aimed to describe both the prevalence of dental fear in Australia and to explore the relationship between dental fear and a number of demographic, socio-economic, oral health, insurance and service usage variables.

**Methods:** A telephone interview survey of a random sample of 7312 Australian residents, aged five years and over, from all states and territories.

**Results:** The prevalence of high dental fear in the entire sample was 16.1 per cent. A higher percentage of females than males reported high fear (HF). Adults aged 40–64 years old had the highest prevalence of high dental fear with those adults aged 80+ years old having the least. There were also differences between low fear (LF) and HF groups in relation to socio-economic status (SES), with people from higher SES groups generally having less fear. People with HF were more likely to be dentate, have more missing teeth, be covered by dental insurance and have a longer time since their last visit to a dentist.

**Conclusions:** This study found a high prevalence of dental fear within a contemporary Australian population with numerous differences between individuals with HF and LF in terms of socio-economic, socio-demographic and self-reported oral health status characteristics.

**Key words:** Dental fear, prevalence, socio-economic status.

**Abbreviations and acronyms:** ARIA = Accessibility/Remoteness Index of Australia; HF = high fear; LF = low fear; PAL = primary approach letter; SES = socio-economic status.

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## INTRODUCTION

Despite advances in both pain control and patient management, dental fear remains a serious issue for patients and dental clinicians. Associations have been found between dental fear and less frequent dental visiting, poorer oral health, and greater functional impairment.<sup>1-7</sup> It has been suggested that dental anxiety and fear may be a central aspect of a cycle of dental disadvantage.<sup>2</sup>

Dental fear may be distinguished from dental anxiety by the situational boundaries within which it occurs. Fear is generally regarded as a physiological, behavioural and emotional response to a feared stimulus whereas anxiety is a feeling of dread or worry focused on, yet temporally prior to, exposure to a feared stimulus. Fear and anxiety are highly related and are often used interchangeably in the fear literature.

The prevalence of fears has been found to vary in content, pattern and level of fear across different cultures and across different populations.<sup>8</sup> Estimates of childhood dental fear, for instance, have been found to vary from 3 to 43 per cent in different populations.<sup>9</sup> Although there are no reported prevalence figures for childhood dental fear in Australia, Thomson and colleagues have published data from 1995 which found that 14.9 per cent of adults could be classified as having high dental anxiety.<sup>2</sup> Other estimates of the prevalence of dental fear in the Australian community, based on information from a diverse range of sources, has yielded a prevalence of dental fear within the range 10–15 per cent.<sup>10</sup>

Although a considerable body of research has focused on the origin, consequences and treatment implications of dental fear, only recently have efforts begun to examine the profile of people with high levels of dental fear.<sup>11</sup> Nonetheless, there have been incidental reports of differences in the characteristics of dentally anxious and non-anxious people from a number of studies.

A consistent finding in relation to the characteristics of fearful people is that females have a greater prevalence of fear and more extreme fear than do males.<sup>12-14</sup> These findings have also been borne out in relation to dental fear<sup>15-18</sup> with some studies showing fear prevalence approximately twice as high for females as for males.<sup>12</sup>

Another commonly reported variable with a relationship to fear is age. Although results from the published literature on the association between age and dental fear are inconsistent, younger people have generally been found to be more anxious than older people.<sup>19</sup> However, conflicting results can be found and there is some evidence that younger adults have the least fear of any adult age group.<sup>3,20,21</sup> In Australia, for example, the highest prevalence of fear has been found

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for adults aged 35–44 years (19.7 per cent) with younger adults (18–34 years) having a lower prevalence (15.1 per cent).<sup>2</sup>

While socio-economic gradients are rife in relation to health outcomes, there is less evidence of differences in dental fear by socio-economic status. In general, it appears that people from lower socio-economic backgrounds have higher fear,<sup>18,22,23</sup> although some studies have failed to find a relationship between education and dental fear.<sup>6,20</sup> There is also evidence that socio-economic status may be related only to moderate levels of dental anxiety. Moore *et al.* found both low education and low income to be risk factors for moderate dental anxiety, however, these variables were not significantly related to extreme dental anxiety.<sup>24</sup>

Other studies have identified a plethora of further variables related to the prevalence of high dental fear. However, while this body of research provides insight into some of the correlates of dental fear, there remains a paucity of data on dental fear within an Australian context. The general aim of this study, therefore, was to explore, within a contemporary Australian population, the characteristics of those people who are afraid of going to the dentist. In addition, we sought to update and reconfirm population prevalence estimates for dental fear for children, as well as adults.

## MATERIALS AND METHODS

This paper reports cross-sectional findings from the 2002 National Dental Telephone Interview Survey<sup>25</sup> which used computer-assisted telephone interviews of a random sample of Australian residents aged five years and over. Telephone numbers for the survey were sampled by random selection from the then most recent edition of an electronic ‘white pages’ listing. Separate samples were selected from five mainland state capitals – Sydney, Melbourne, Brisbane, Perth and Adelaide – as well as the rest-of-state corresponding to each of those capitals. Finally, samples were drawn for Tasmania and the two mainland territories of the Northern Territory and the Australian Capital Territory. This resulted in 13 separate samples or strata.

In order to reach unlisted telephone numbers, a single random digit was added to the end of each sampled telephone number. These new numbers were back matched to the electronic white pages to obtain addresses where possible. Numbers for which there was a matching phone number in the white pages directory were regarded as ‘listed’ numbers, while those without a matching phone number and corresponding address listing were regarded as ‘unlisted’ numbers. The target number of participants was 400 for each mainland territory, 450 for Tasmania and 600 for each of the 10 remaining strata.

Survey methods were based on methods advocated by Dillman.<sup>26</sup> Approximately 10 days prior to dialling the sampled telephone numbers, a primary approach letter (PAL) was mailed to the address that accompanied each listed sampled telephone number.

The PAL explained the purpose of the study and encouraged participation. Each sampled telephone number was initially called up to six times. Where no answer was obtained after six calls, the number was abandoned. When telephone interviewers contacted a household a standard procedure was followed to establish that the household was within scope and to randomly select the target person: (1) telephone numbers that did not serve a residential dwelling were excluded; (2) if only one person resided at the dwelling they were selected as the target person; (3) if more than one person resided at the dwelling, information was obtained on both the resident who had the most recent birthday as well as the resident with the next birthday coming, and the target person was selected based on a random selection of either person by a computer. When a sampled person was identified for any dwelling, up to six additional calls were made in an attempt to contact that person.

Participants in the study were asked a structured list of questions that followed one of three schedules. Schedule 1 interviews were administered to persons aged 16 years or more who agreed to participate and were able to answer the questions. Schedule 2 interviews were conducted for selected persons aged at least five years but less than 16 years, and were answered by a person who lived in the household and aged 16 years or more (proxy interview). Schedule 3 interviews were conducted for selected persons aged 16 years or more, but were answered by an adult other than the selected person in instances where the selected person was unable to communicate (e.g., due to illness, language barriers, or if the selected person was away from the household for more than six weeks). A small number of interviews were also conducted in Italian, Greek, Cantonese, Mandarin, Arabic, Vietnamese and Polish where appropriate. The series of questions were based on previous rounds of the National Dental Telephone Interview Survey. The questions and interview procedures were pilot tested on a random selection of Adelaide households with any modifications made prior to formal data collection. All interviewers were trained and interviews were conducted in the presence of a supervisor.

To assess dental fear, participants were asked the question ‘are you afraid of going to the dentist?’, with the four response categories being ‘not at all’, ‘a little’, ‘yes, quite’, and ‘yes, very’. The single item Dental Anxiety Question has previously been found to be reliable and possess good validity.<sup>27,28</sup> The expression ‘quite’ is elsewhere defined as referring to ‘a considerable extent or degree’<sup>29</sup> and is here taken as contrasting to the response ‘a little’. It is therefore considered to be a more extreme positive endorsement than a theoretical mid-point response. For the purposes of the current study, participants who rated themselves as ‘quite’ or ‘very’ afraid were classified as ‘high fear’ while participants who responded ‘not at all’ or ‘a little’ were classified as ‘low fear’.

**Table 1. Comparison of NDTIS 2002 sample characteristics with population statistics derived for Australia from the 2001 national census**

| Characteristic         | NDTIS 2002 (%) | Australia 2001 (%) |
|------------------------|----------------|--------------------|
| Age                    |                |                    |
| 5–11 years             | 10.9           | 10.7               |
| 12–17 years            | 8.7            | 9.1                |
| 18–24 years            | 10.0           | 10.1               |
| 25–44 years            | 32.2           | 31.9               |
| 45–64 years            | 24.8           | 24.7               |
| 65+ years              | 13.4           | 13.6               |
| Male                   | 49.5           | 49.2               |
| Household income       |                |                    |
| <\$20 000 per year*    | 21.1           | 21.2               |
| Employed               | 61.5           | 56.6               |
| Speaks English at home | 91.2           | 84.0               |
| Born in Australian     | 78.8           | 76.8               |

\*Australia 2001 figure refers to household income <\$400 per week which translates to <\$20 800 per year.

Weights were calculated for all data. This was done for two purposes: first, to account for differing sampling probabilities due to the sampling design and second, to ensure that the sample for each stratum more accurately represented the population of the corresponding stratum, using post-stratification by age and sex. All results presented subsequently used weighted data. The intention of weighting the data was to yield estimates of prevalence that could be generalized to the Australian population.

Ethical consent for the study was obtained from The University of Adelaide Ethics Committee. Participants were informed of their rights to refuse to answer any question and were assured that they would not be identifiable in regards to the results of the study.

## RESULTS

A total of 24 938 unique telephone numbers were called resulting in 7312 participants providing completed interviews. Large proportions of the unlisted numbers were either out of service ( $n=6596$ ), out of scope ( $n=3923$ ) or resulted in a non-contact ( $n=3414$ ). Of those people contacted, there were 3966 refusals yielding an overall participation rate of 64.8 per cent. As a result of the random digit substitution, a total of 21.3 per cent of participants were from an unlisted household. For all strata the participation rate was higher among listed numbers than among unlisted numbers. Participation rates ranged from 56.2 per cent in the Sydney stratum to 74.4 per cent in the Tasmania stratum.

A total of 913 proxy interviews were conducted for children and 348 for adults. For children, almost 20 per cent of proxy interviews were by fathers or male guardians and approximately 80 per cent by mothers or female guardians. For adults interviewed by proxy, 48 were edentulous and 300 dentate. No adult proxies received the question relating to dental fear due to previously noted inconsistencies in reporting fear for other adults.

A comparison of the sample characteristics with those of the Australian population as derived from the

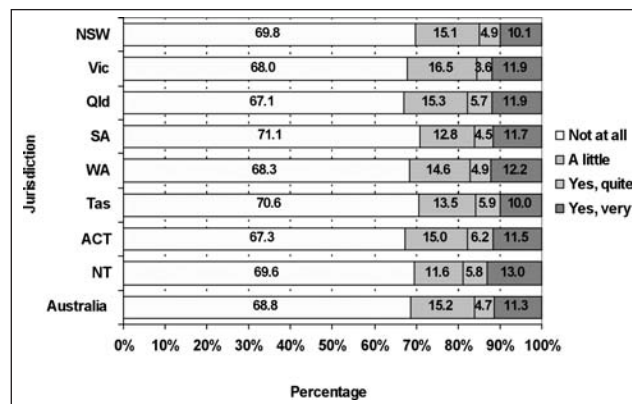


Fig 1. Response by state and territory to the question 'How afraid are you of going to the dentist?'

2001 national census reveal that the sample respondents are representative of the Australian population (Table 1).

In response to the question 'are you afraid of the dentist?', 68.8 per cent of participants responded 'not at all', 15.2 per cent responded 'a little', 4.8 per cent said 'yes, quite', and 11.3 per cent stated 'yes, very'. Classifying people responding to the two highest fear categories as indicating high fear, 16.1 per cent of the Australian population had high dental fear.

Across Australia there were few differences in self-reported dental fear by state and territory (Fig 1). Although New South Wales had the lowest percentage of people with high dental fear, and the Northern Territory had the highest percentage, these differences were not statistically significant ( $\chi^2=5.58$ ,  $p>0.05$ ).

There were 489 edentulous individuals in the sample representing 6.7 per cent of all cases. A significantly higher prevalence of dental fear was indicated by the dentate than by people who were edentulous. Overall, while 18 per cent of dentate people had high dental fear, only 7.8 per cent of edentulous people reported high fear ( $\chi^2=29.64$ ,  $p<0.001$ ). This finding was evident across all age groups (Fig 2). An analysis of just the edentulous showed a relationship between the length of time edentulous and fear. Those who reported low fear had been edentulous, on average, 10 years longer than people reporting high fear (33.81 compared to 23.73 years respectively) and this difference was statistically

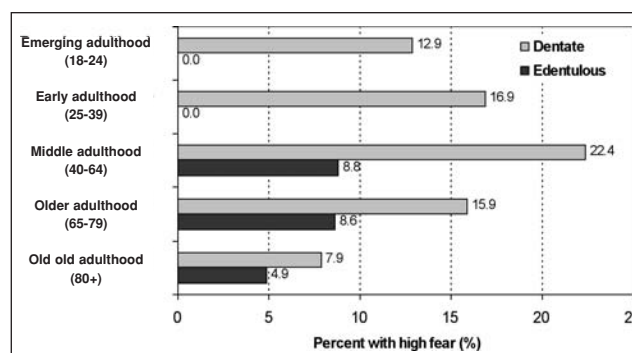


Fig 2. Prevalence of high dental fear by age for dentate and edentulous people.

**Table 2. Prevalence of high dental fear by sociodemographic characteristics**

| Socio-demographic characteristic       | Weighted <i>n</i> | High fear (%) | 95% CI    |
|--|-------------------|---------------|-----------|
| Sex‡                                   |                   |               |           |
| Male                                   | 3156              | 12.2          | 11.0,13.4 |
| Female                                 | 3287              | 20.9          | 19.5,22.3 |
| Residential location                   |                   |               |           |
| Major cities                           | 4324              | 16.5          | 15.2,17.8 |
| Inner regional                         | 1322              | 17.5          | 15.6,19.4 |
| Outer regional                         | 663               | 14.6          | 12.5,16.7 |
| Remote                                 | 83                | 18.1          | 13.1,23.1 |
| Very remote                            | 23                | 21.7          | 11.3,32.1 |
| Indigenous status                      |                   |               |           |
| Aboriginal or Torres Strait Islander   | 134               | 20.1          | 13.5,26.7 |
| Non-Indigenous                         | 6300              | 16.5          | 15.6,17.4 |
| Language spoken at home                |                   |               |           |
| Speaks language other than English     | 770               | 16.0          | 12.8,19.2 |
| Speaks English                         | 5674              | 16.7          | 15.7,17.7 |
| Generation of Australian*              |                   |               |           |
| 1st generation (born overseas)         | 1437              | 17.3          | 15.2,19.4 |
| 2nd generation (parents born overseas) | 1346              | 13.8          | 11.8,15.8 |
| 3rd+ generation                        | 4093              | 16.4          | 15.2,17.6 |
| Age‡                                   |                   |               |           |
| Childhood (<13 years)                  | 873               | 10.5          | 8.2,12.8  |
| Adolescence (13–17 years)              | 516               | 9.5           | 6.7,12.3  |
| Emerging adulthood (18–24 years)       | 681               | 12.9          | 10.2,15.6 |
| Early adulthood (25–39 years)          | 1662              | 16.9          | 14.9,18.9 |
| Middle adulthood (40–64 years)         | 2104              | 22.4          | 20.7,24.1 |
| Older adulthood (65–79 years)          | 517               | 15.9          | 13.2,18.6 |
| Old old adulthood (80+ years)          | 89                | 7.9           | 3.1,12.7  |

\* $p < 0.05$ , † $p < 0.01$ , ‡ $p < 0.001$ .

significant ( $t=3.30$ ,  $p=0.001$ ). As edentulousness may be a significant confounder between fear and a number of other variables the remaining analyses were conducted using only dentate people.

Dental fear prevalence by socio-demographic characteristics for dentate people is presented in Table 2. Consistent with most research looking at sex differences in fear, this study found a higher percentage of females than males reporting high dental fear. Almost 12 per cent of males reported high fear, compared with approximately 20 per cent of females. Indeed, of those people with high dental fear, almost two-thirds were female. Differences by residential location (as measured by the Accessibility/Remoteness Index of Australia (ARIA)),<sup>30</sup> Indigenous status, and language spoken at home were not statistically significant. However, there were significant differences by generation. Second generation Australians (i.e., people who were born in Australia but whose parents were born overseas) had a lower prevalence of high dental fear than either first generation Australians or third and subsequent generation Australians.

In this study, age was divided up into seven categories based on developmental psychology research. The results show an increase in reported dental fear up to 'middle adulthood', i.e., for those aged 40–64 years (Table 2). The percentage of people with high dental fear declines sharply in older adulthood and is lowest for those adults classed as 'old old', i.e., 80 years and over.

Some researchers have found age differences between males and females in relation to dental fear. However, other than a widening of the gap between males and females during early adulthood, the trend in prevalence

of high dental fear across the life span was found to vary little between males and females in this study, with the interaction between age and sex not being significant ( $F=1.37$ ,  $p > 0.05$ ) (Fig 3).

As shown in Table 3, there was a clear gradient in the prevalence of dental fear across income categories. Apart from the lowest income group (<\$20 000), which was comprised of a disproportionately high percentage of older, lower-fear adults, there was a consistent relationship between higher household income and lower prevalence of high fear. People from households with a combined income of up to \$40 000 had 43.4 per cent higher prevalence than people from households with an income in excess of \$80 000 per annum.

In terms of unemployment status, the highest prevalence of dental fear was found among those categorized as unemployed while the lowest prevalence was for people in full-time employment (Table 3).

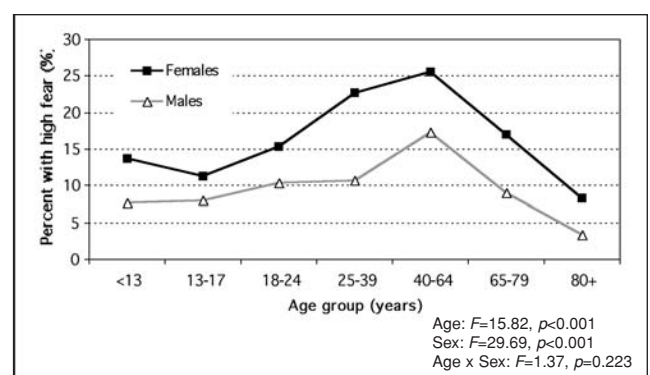


Fig 3. Prevalence of dental fear by age and sex.



**Table 3. Prevalence of high dental fear by socio-economic characteristics**

| Socio-demographic characteristic | Weighted <i>n</i> | High fear (%) | 95% CI    |
|----------------------------------|-------------------|---------------|-----------|
| Income‡                          |                   |               |           |
| <\$20 000                        | 1014              | 19.3          | 17.2,21.4 |
| \$20 000–<\$40 000               | 1304              | 19.4          | 17.3,21.5 |
| \$40 000–<\$60 000               | 1352              | 15.9          | 13.9,17.9 |
| \$60 000–<\$80 000               | 877               | 14.3          | 11.8,16.8 |
| >\$80 000                        | 1182              | 13.5          | 11.2,15.8 |
| Employment status‡               |                   |               |           |
| Unemployed                       | 857               | 24.2          | 21.4,27.0 |
| Part-time                        | 1002              | 20.6          | 18.0,23.2 |
| Full-time                        | 2299              | 17.1          | 15.5,18.7 |
| Student/retired                  | 2231              | 11.4          | 10.1,12.7 |
| Home ownership*                  |                   |               |           |
| Rents accommodation              | 1277              | 19.0          | 16.9,21.1 |
| Currently purchasing             | 2059              | 15.9          | 14.2,17.6 |
| Owens accommodation outright     | 2970              | 16.0          | 14.7,17.3 |
| Tertiary education‡              |                   |               |           |
| No tertiary education            | 3353              | 15.2          | 14.0,16.4 |
| CAE/Certificate/Nursing etc.     | 1785              | 21.3          | 19.4,23.2 |
| University – Degree/Diploma      | 1172              | 14.3          | 12.2,16.4 |
| University – Masters/PhD         | 133               | 9.0           | 3.6,14.4  |

\**p*<0.05, †*p*<0.01, ‡*p*<0.001.

Unemployed here refers to people who were either unemployed but looking for work, not employed and not looking for work, or performing unpaid household work. People who were neither employed or unemployed (i.e, students or people who were retired) had a low prevalence of dental fear.

In regards to home ownership, prevalence of high dental fear was highest for people who rented and least for those who were currently purchasing or owned their home outright, with these differences being statistically significant (Table 3). For tertiary education, again a relationship with SES was found, with the highest prevalence of fear for people who had received non-university tertiary education (21.3 per cent) and the lowest prevalence among that group of people who had received postgraduate university qualifications (9 per cent). Non-university tertiary qualifications included trade certificates, College of Advanced Education or TAFE degrees, or teachers' college and nursing degrees.

Oral health status was derived from a self-reported count of missing and remaining teeth for each arch. This method has been previously shown to have good reliability.<sup>31</sup> In both arches, people with high fear had

more teeth missing than people with low fear and conversely, therefore, fewer teeth remaining than people with low fear (Fig 4). These results were statistically significant for both the maxillary (*F*=26.3, *p*<0.001) and mandibular arches (*F*=10.2, *p*=0.001).

The relationships between dental fear and insurance and service usage characteristics are shown in Table 3. Excluding edentulous individuals, there was a significant relationship between whether people had private dental insurance and the prevalence of high dental fear ( $\chi^2=6.54$ , *p*=0.011). However, although there appeared to be a relationship between dental fear and length of time since insurance was taken up, with higher prevalence of dental fear among those who took up insurance within the last year and those who took up insurance more than 10 years ago, these differences were not statistically significant. Finally, there was no significant difference between dental fear groups in whether the insurance cover was single or family cover.

There were significant differences in service usage between dentate people with high and low fear (Table 4). A clear linear relationship was found between time since last visit and the prevalence of dental fear ( $\chi^2=66.39$ , *p*<0.001), with fear prevalence increasing from 14.2 per cent for those people who visited in the previous 12 months to 31 per cent for those who last visited more than 10 years previously. In terms of the location of the last visit, dentate people who had made their last dental visit with a technician, at a clinic operated by a health insurance fund, or at the School Dental Service had the lowest prevalence of high dental fear. In contrast, people who visited either a private or a public clinic demonstrated the highest prevalence of dental fear. As 86 per cent of dental visits were last made at either a private or public clinic, a separate analysis of attendance by dental fear by these visit sites was conducted. There was no statistically significant difference in the prevalence of high dental fear between those people who had last visited at a private clinic (17.1 per cent) in comparison to

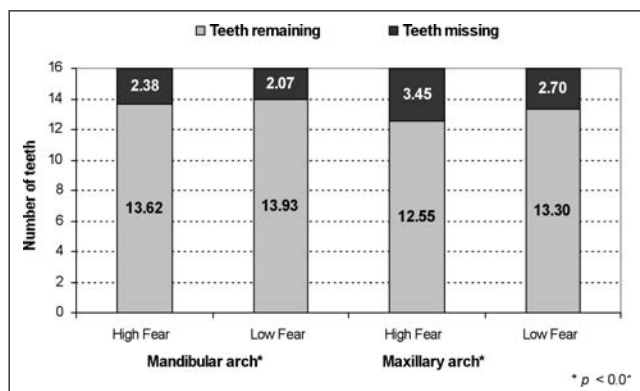


Fig 4. Mean numbers of missing and remaining teeth by dental fear for the mandibular and maxillary arches.

**Table 4. Prevalence of high dental fear by insurance and service usage characteristics**

| Insurance and service usage characteristic | Weighted <i>n</i> | High fear (%) | 95% CI    |
|--|-------------------|---------------|-----------|
| Insurance coverage*                        |                   |               |           |
| Has private dental insurance               | 2974              | 15.6          | 14.3,16.9 |
| Does not have private dental insurance     | 3354              | 18.0          | 16.7,19.3 |
| Length of time since taking up insurance   |                   |               |           |
| < 1 year ago                               | 208               | 17.8          | 11.4,24.2 |
| 1–5 years ago                              | 685               | 12.8          | 9.8,15.8  |
| 5–10 years ago                             | 416               | 16.1          | 11.9,20.2 |
| 10+ years ago                              | 1592              | 16.5          | 14.6,18.4 |
| Type of insurance                          |                   |               |           |
| Single                                     | 552               | 16.5          | 13.5,19.5 |
| Family                                     | 2411              | 15.4          | 13.7,17.1 |
| Time since last visit‡                     |                   |               |           |
| <12 months                                 | 4019              | 14.2          | 13.1,15.3 |
| 1 year – <2 years                          | 1140              | 18.9          | 16.6,21.2 |
| 2 years – <5 years                         | 722               | 20.6          | 17.7,23.5 |
| 5 years – <10 years                        | 294               | 21.1          | 16.4,25.8 |
| 10+ years                                  | 213               | 31.0          | 25.2,36.8 |
| Site of last dental visit†                 |                   |               |           |
| Private                                    | 4858              | 17.1          | 16.0,18.2 |
| Public                                     | 639               | 19.7          | 16.8,22.6 |
| School                                     | 673               | 11.7          | 9.2,14.2  |
| Technician                                 | 21                | 19.0          | 3.6,34.4  |
| Health fund                                | 84                | 10.7          | 2.7,18.7  |
| Defence force                              | 31                | 12.9          | 3.1,22.7  |
| Other                                      | 42                | 16.7          | 2.9,30.5  |

\* $p < 0.05$ , † $p < 0.01$ , ‡ $p < 0.001$

those who last visited a public dental service (19.7 per cent) ( $\chi^2 = 2.68$ ,  $p > 0.05$ ).

## DISCUSSION

This study found a population prevalence of dental fear of 16.4 per cent for adults and 10.3 per cent for children, yielding an overall prevalence of 16.1 per cent. This is comparable to the 14.9 per cent reported by Thomson *et al.*<sup>2</sup> from 1995 and the estimate of 10–15 per cent provided by Francis and Stanley.<sup>10</sup> The second aim of this study, however, was to sketch a profile of those people in Australia with high dental fear. We attempted to answer the question: ‘Who is afraid of the dentist?’ Although it is important to keep in mind the generalizations that such a question must inevitably seed, the results presented here enable us to explore an answer nonetheless.

First, females, more so than males, are afraid of the dentist. This result effectively replicates the findings of Thomson *et al.* who found the prevalence of high dental anxiety to be 10 and 19 per cent for males and females respectively.<sup>2</sup> Research has found that women report higher fear in relation to specific stimuli (such as fear of the needle and fear of the drill) than do males,<sup>15</sup> and this, coupled with reported lower pain thresholds and less tolerance for pain,<sup>32–35</sup> may explain such a finding. Such research underlines the importance of not only good pain control measures in the dental surgery but the need to mitigate a client’s negative perceptions.<sup>11</sup> An alternative explanation of sex differences in fear comes from psychological literature that has found that women may be more open to expressing fears than are men.<sup>36</sup> Although exception has been taken to the claim by some researchers that men are more likely to lie in fear surveys than females,<sup>37</sup> it may still be that males are

more likely to express fear through alternate emotional manifestations such as anger or impatience.<sup>11</sup>

Differences in fear prevalence were also seen between different age groups. This is not surprising given the often considerable changes that take place across the human life span. Not only do biological changes occur with age but people of different ages are exposed to different social and cultural events and these transpire at different cognitive and emotional stages. Within this context, this study found that the middle adulthood age group, i.e., those aged between 40 and 64 years, had almost twice the prevalence of high fear as the other age groups combined. Middle adulthood is often considered to represent a period of change and may be associated with physical decline, increased illness, and a growing awareness of one’s own mortality. Life stress may also result from mid-career reassessment, job stress, job loss, and job burnout.<sup>38</sup> Interestingly, however, the findings here differ from other reports. Holtzman *et al.* found fear and anxiety in a US metropolitan region to decrease with increasing age<sup>15</sup> while Thomson *et al.* in a national Australian study found the highest prevalence of fear in the 35–44-year-old age group.<sup>2</sup> One way to reconcile these Australian findings is to take a cohort perspective. Adults aged 35–44 years old in the Thomson *et al.* study would have been aged 42–51 years in the current study. Effectively, those individuals with high fear in the 35–44-year-old age group in 1995 may have ‘moved up’ into the next age group. Future studies will be needed to determine whether this is, in fact, the case.

Considerable evidence was found that people from low socio-economic backgrounds have a higher prevalence of dental fear. Socio-economic status was effectively a marker for a raft of behavioural, social,

economic and psychological covariates. People from lower socio-economic backgrounds experience poorer physical health, more psychological problems and have reduced access to resources.<sup>39-41</sup> Although health differentials are frequently found by socio-economic status, there was no reason to assume that there would be a relationship between socio-economic status and dental fear. However, the current findings are consistent with evidence that people from lower SES backgrounds have poorer dental health.<sup>42-44</sup> Whether this contributes to differences in dental treatment and subsequently to increased fear remains to be investigated.

This study found oral health status to be related to dental fear. Dentate people were found to have significantly higher prevalence of dental fear than the edentulous. It should be noted, however, that dentate status is closely related to age, with older adults with less fear more likely to be edentulous. The percentage of edentulous people in this study increased from 6 per cent among 40–64 year olds, to 30 per cent among 65–80 year olds to 50 per cent for 80+ year olds. Whether the relationship with dental fear is therefore a matter of cognitive and emotional changes occurring with age or the consequences of possible full clearances earlier in life remains to be investigated. It is certainly possible that people who are edentulous might experience dental visits in a qualitatively different manner to dentate people, which helps to explain the dramatic difference in fear prevalence between dentate and edentulous people. Edentulous people are more likely to visit for replacement of dentures and clinical procedures that do not include some key fear stimuli such as needles and drills.

For those people who have retained some teeth, there was a clear difference between people with high and low fear in disease experience with people with high fear having fewer teeth remaining than people with low fear. With research showing the aetiology of dental fear for many people to be via a direct conditioning pathway,<sup>45-48</sup> it seems likely that those people who have had more teeth extracted are more likely to have had unpleasant or painful experiences which would translate into higher fear prevalence.

Given the association between high dental fear and time since last dental visit, it was expected that people with high fear would be less likely to have dental insurance. Yet, few differences were found here between insurance coverage and dental fear prevalence, with only a small difference evident after controlling for dentate status. An explanation for this might lie in the related finding that insurance coverage is poorly related to service use.<sup>49</sup> Another possibility is that the level of insurance coverage of people with high fear is balanced by the higher treatment needs of these people.

Given both the reasonably high prevalence of dental fear in the population and the associated impact of dental fear, there are clear clinical implications for oral health professionals in terms of both fear identification and treatment. It is important that dentists and allied

staff anticipate and are trained to identify anxious patients. Fearful patients should either be identified by verbal cues or body language, or more formally via a question as part of a screening or initial patient questionnaire. An open-ended question might then be used as a follow-up to ascertain which aspects of dental visits they find particularly fear-evoking. Surprisingly, however, in the UK only 20 per cent of dentists identified as having a special interest in treating patients with dental anxiety used dental anxiety assessment questionnaires for adults and only 17 per cent were found to use child dental anxiety assessment questionnaires.<sup>50</sup> Given the current apparent limited use of fear assessment questionnaires, it might perhaps be more judicious to assume each new patient to be fearful and treat them accordingly until evidence to the contrary was established. Patients exhibiting behaviours such as cancelling appointments or delaying scheduled recalls may be displaying fear-related symptoms.

Following identification, a fearful patient may require extra or special measures to ensure successful completion of a course of care. Such measures may involve providing extra control in relation to the dental procedures, providing more information, taking breaks during the procedure, use of distraction techniques, and more efficient anaesthesia. Patients with dental fears who refuse or consistently delay needed treatment might be referred to a cognitive or behavioural specialist such as a psychologist to help them overcome their fear.

In summary, this study found that the greatest prevalence of high dental fear occurred for people who were female, in middle adulthood, from low socio-economic circumstances, who were dentate, visited the dentist less often and who had fewer remaining teeth. Indeed, 40–64-year-old dentate females with a family income of less than \$40 000 per year and with fewer than 12 teeth remaining in either arch had a prevalence of high dental fear of 37 per cent. This is of particular relevance given that this represents a very common demographic cluster encountered in the public sector dental service while in private sector clinics middle-aged dentate females make up the most common patient demographic cluster. Therefore, there needs to be continued vigilance and awareness by treating dentists of the high levels of dental fear likely in their patient population and the possible ramifications of that fear on their patient's future disease and future dental attendance patterns.

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