

Dentists' practice activity in Australia

1983–84 to 1998–99

DS Brennan, AJ Spencer



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**Dentists' Practice Activity
in Australia:
1983–84 to 1998–99**

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1 Introduction

Despite improvements in the oral health of the Australian population over recent decades, dental problems have persisted as a common health complaint. In contrast to the widespread nature of dental problems and the frequent use of dental services, there has been limited routine monitoring of dentists' practice activity. By providing periodic monitoring of dentists' practice activity since the early 1980s, The Longitudinal Study of Dentists' Practice Activity has filled this gap in public health information. This report is based on data collected for The Longitudinal Study of Dentists' Practice Activity over the 15-year period from 1983–84 to 1998–99.

1.1 Background

The majority of dentists work independently in the private sector (Szuster & Spencer 1997). Prior to the introduction of The Longitudinal Study of Dentists' Practice Activity the main source of information on dentists' practice activity came from Australian Dental Association (ADA) Dental Practice Surveys that have been conducted sporadically since the 1960s. These surveys provide a valuable source of data for historical purposes and cross-validation of some measures of practice activity but due to the broad scope of items collected, they have a limited focus on practice activity measurement. They are restricted to ADA members and their conduct and reporting have been limited in the last decade or so. The Longitudinal Study of Dentists' Practice Activity has provided a regular source of monitoring data since its introduction in 1983, with a focus on detailed collection of practice activity measures drawn from the comprehensive sampling frame of dental registers. An interest in the monitoring of dentists' practice activity relates to the widespread nature of dental problems and frequent use of dental services, and the changes in factors such as oral health status and population demographics which may be expected to be reflected in changes in dental practice. These trends in oral health, use of services and population demographics are outlined below.

Dental problems

Dental problems are very common in the population, ranked as the fourth most frequent illness condition, behind headache, hypertension and colds (Spencer & Lewis 1988a). This suggests that recurrent problems with single teeth are common. In 1995 dental problems were the fourth most frequently reported condition among children from birth to 14 years, affecting 6% of boys and 7% of girls (AIHW 1998).

With just over 19 million decayed teeth, dental caries was the most prevalent condition affecting health reported in the Australian population in 1996. It is estimated that there were almost 11 million newly decayed teeth in 1996, making dental caries the second most commonly occurring condition after upper respiratory tract infections (AIHW 2000).

Most of the Australian population has some mild gum disease at any given time. Only a small proportion of Australians has severe gum disease affecting at least one sextant of their teeth. Of the population aged 10 years or more in 1987–88, 22% had

periodontally healthy mouths, 11% showed bleeding gums on probing as their worst periodontal status, 34% had calculus, 15% had periodontal pockets 4–5 mm, 3% had periodontal pockets 6 mm or more and 13% were edentulous (Barnard 1993).

Use of dental services

While children tend to have the highest use of dental services as a result of their coverage by school dental services throughout Australia, the use of dental services has increased among adults in Australia. For example, among persons aged 65 years or more the percentage of persons who had visited in the previous 12 months increased from 21.5 % in 1979 (ABS 1979), to 40.9 % in 1993 (DSRU 1993) and to 61.3% for dentate persons in 1999 (Carter et al. 2001). An increase has also been observed in the number of visits made by patients who attend for dental care, from an average of 1.9 visits per year in 1979 (ABS 1979) to 2.0 in 1987–88 (Barnard 1993) and 2.4 in both 1994 (Carter et al. 1994) and 1999 (Carter et al. 2001).

Changes in oral health

Oral health in Australia has shown considerable improvement over recent decades. For example, among children the number of deciduous decayed, missing and filled teeth (dmft) among 6-year-olds declined from 3.13 in 1977 to 2.16 in 1989, and to 1.50 in 1997; and the number of permanent decayed, missing and filled teeth (DMFT) among 12-year-olds declined from 4.79 in 1977 to 1.50 in 1989 and to 0.86 in 1997 (Spencer et al. 1994a; Armfield et al. 2000).

Oral health trends in the population have also indicated a decline in tooth loss over recent decades, with the percentage of persons with no natural teeth among those aged 65 years or more decreasing from 66.6% in 1979 (ABS 1979) to 40.0% in 1994 (Carter et al. 1994) and 33.4% in 1999 (Carter et al. 2001).

Demographic trends

Changes in oral health status can be considered in relation to changes in population demographics for Australia. Trends indicate that the population will grow, that the numbers of children and young adults will change only minimally, and that there will be substantial increases in the numbers of middle-aged and older adults for the coming several decades (ABS 1990). The operation of such trends will maintain the pool of children and young adults at risk of oral disease, while resulting in an increase in the pool of middle to older-aged adults in potential need of dental services because of oral diseases (NHMRC Expert Advisory Panel 1993).

Overview

The environment for dental service provision in Australia can be viewed as involving changes in oral health status. These changes tend to be improvements but, as a consequence, there will also be increases in the pool of teeth at risk of oral disease. Parallel to changes in oral health are demographic changes, which involve an increased pool of middle- to older-aged adults who, through retaining more teeth as the level of edentulism declines, will become the focus of dental needs and services. Increasing numbers of older patients who are retaining their teeth may have complex treatment

needs that require more services and take longer to complete. Such changes in oral health, demographics and use of services are expected to affect the practice activity of dentists.

1.2 Aims

The Longitudinal Study of Dentists' Practice Activity has a number of research aims, including the following:

- analyse age, period and cohort effects on dentist practice patterns
- examine the mix of services provided in relation to dentist and patient characteristics, and trends over time
- investigate the role of women in the profession with an emphasis on anticipating likely trends as the proportion of women dentists increases over the next 10–20 years
- quantify the workforce participation and productivity of dentists and the association between patterns of time devoted to work and productivity (e.g. patients treated per hour) and characteristics of the individual dentist, the practice within which the dentist works and the community in which the practice is located.

The specific aims of this report are to:

- describe trends in dentists' practice activity over the 1983–84 to 1998–99 period
- report on patterns of service provision in 1998–99.

2 Methods

The Longitudinal Study of Dentists' Practice Activity is based on a random sample of dentists in Australia. A longitudinal component is maintained by including those dentists sampled in previous waves of the study, but who are still registered, in subsequent waves of the study. A sample supplementation procedure at each wave selects dentists who were not registered at the previous wave. This sampling procedure provides representative cross-sectional samples at each wave of the study but also maintains a longitudinal component.

2.1 Sampling

The Longitudinal Study of Dentists' Practice Activity is based on a random sample of 10% of male dentists and 40% of female dentists. The higher sampling fraction of female dentists was initially selected in 1983 for the baseline data collection due to the lower number of female compared to male dentists in Australia. This allows for stratified analyses of male and female dentists, but biases the combined estimates; hence, weighting is required for analyses that are not stratified by sex of dentist.

Dental registers in each State or Territory of Australia were used as the sampling frame for each wave of the study. Dentists registered at overseas addresses were excluded. Registers were cross-checked and, where dentists were registered on multiple registers, they were only included for sampling purposes on their home address State or Territory register.

2.2 Mode of collection

Data were collected by mailed self-complete questionnaires following the procedures of the Total Design Method (Dillman 1978, 1991; Salant & Dillman 1994). The initial mailing of the questionnaire included a letter of support from the President of the Australian Dental Association. In subsequent waves of the study a primary approach letter was sent prior to the questionnaire and included a summary report of the main findings from the previous wave of the study. Questionnaires were identified by code numbers, and despatch and return control registers were maintained to enable follow-up mailings of replacement questionnaires to non-respondents.

The questionnaire was structured into two sections. Section A comprised check boxes and short-answer responses to a range of questions covering demographics, educational background, practice type and practice activity. Section B included a service log of a typical clinical day.

2.3 Data items

The data items collected are summarised in Tables 2.1 and 2.2.

Table 2.1: Data items collected in Section A of the questionnaire by wave of study

	Wave of study			
	1983–84	1988–89	1993–94	1998–99
Dentist background characteristics				
Demographics (sex, year of birth & country of birth)	Y	Y	Y	Y
Year & school of BDS Sc graduation	Y	Y	Y	Y
Area of activity				
Principal area (general practice/specialist/other)	Y	Y	Y	Y
Other area (yes/no; nature of activity; hrs/wk; wks/yr)	Y	Y	Y	Y
Specialist (specialty area)	Y	Y	Y	Y
Practice type				
Postcode of practice	Y	Y	Y	Y
Private (solo/partner/associate/assistant/other)	Y	Y	Y	Y
Number of other dentists	Y	Y	Y	Y
Consultation with management professionals (yes/no)	Y	N	N	N
Salaried (hospital/school dental/armed services/etc.)	Y	Y	Y	Y
Current practice experience				
Patients per day/preferred no. of patients per day	Y/N	Y/Y	Y/Y	Y/Y
New patients (yes/no)	Y	Y	Y	Y
Total hours per day worked/preferred hours per day	Y/N	Y/N	Y/Y	Y/N
Hours per day chairside/preferred hours per day	Y/N	Y/N	Y/Y	Y/N
Days per week/preferred days per week	Y/N	Y/N	Y/Y	Y/N
Hours per week	Y	N	N	N
Weeks per year/preferred weeks per year	Y/N	Y/N	Y/Y	Y/N
Reason if <35 hours per week (home duties/illness/etc.)	Y	Y	Y	Y
Expected time practising next year (same/more/less)	Y	Y	Y	Y
Busyness (as busy/less busy/busier)	Y	Y	Y	Y
Waiting time for appointment	Y	Y	Y	Y
Recall system (yes/no)	Y	N	N	N
Another dentist required in your area (yes/no)	Y	Y	Y	N
Practice resources				
Total number of surgeries	Y	Y	Y	Y
Number of fully equipped surgeries & surgeries used	Y	Y	Y	Y
Number of X-ray units & whether Panorex units	Y/Y	Y/Y	Y/Y	Y/Y
Personnel				
Non-certificated chairside assistants (no. & hrs/week)	Y	Y	Y	Y
Certificated chairside assistants (no. & hrs/week)	Y	Y	Y	Y
Dental hygienists (no. & hrs/week)	Y	Y	Y	Y
Dental therapists (no. & hrs/week)	Y	Y	Y	Y
Lab. technicians (no. & hrs/week)	Y	Y	Y	Y
Secretary/receptionists (no. & hrs/week)	Y	Y	Y	Y
Office manager (no. & hrs/week) / other (no. & hrs/wk)	Y/N	N/Y	N/Y	N/Y
No. of patients treated per week by dental therapist(s)	Y	Y	Y	Y
No. of patients treated per week by dental hygienist(s)	Y	Y	Y	Y
Currently seeking personnel (yes/no & what type)	Y	Y	Y	N
Difficulty recruiting personnel (yes/no & type)	Y	Y	Y	N
Miscellaneous				
Fluoridation status of your patients' water supply	Y	N	N	N
Expected retirement age	Y	N	N	N
Activity outside dentistry (yes/no & type)	N	Y	Y	Y
Sole earner of family income (yes/no)	N	Y	Y	Y
No. of people dependent on income & age of children	N	Y	Y	Y
Gross practice revenue	Y	Y	N	N
Fees for selected item codes (011, 112, 311, 512, 719)	Y	Y	Y	Y

Y: Yes & N: No

Over successive waves of the study the content of the data items has changed to reflect emphasis on different research questions. The ability to increase the size and complexity of the questionnaire is limited by the effect that such changes have on response burden. Hence, there has been a balancing of deletion and addition of data items. The major changes that have occurred include more emphasis on aspects such as activity outside of dentistry and numbers of dependents in Section A, and greater focus on visit characteristics and oral health status in Section B.

Table 2.2: Data items collected in Section B of the questionnaire by wave of study

	Wave of study			
	1983–84	1988–89	1993–94	1998–99
Typical day summary (surgeries used)				
No. of surgeries used	Y	Y	N	N
No. of surgeries used by therapists or hygienists	Y	N	N	N
Typical day summary (time worked)				
Total chairside time (dentist/assist./therap. or hyg.)	Y/Y/Y	Y/N/N	N/N/N	N/N/N
Total non-chairside time (dentist/assist./therap. or hyg.)	Y/Y/Y	Y/N/N	N/N/N	N/N/N
Lunch, free time, etc. (dentist/assist./therap. or hyg.)	Y/Y/Y	Y/N/N	N/N/N	N/N/N
Total hours in office (dentist/assist./therap. or hyg.)	Y/Y/Y	Y/N/N	N/N/N	N/N/N
Typical day summary (patients seen)				
Number of patients seen ^(a)	Y	Y	N	N
Patient demographics				
Sex of patient	Y	Y	Y	Y
Age of patient ^(b)	Y	Y	Y	Y
Treatment				
Dental item code	Y	Y	Y	Y
Filling code (initial/replacement/etc.)	N	N	N	Y
Time per treatment (dentist)	Y	Y	Y	Y
Time per treatment (chairside assistant)	Y	N	N	N
Time per treatment (hygienists or therapists)	Y	N	N	N
Visit details				
Insurance status	N	N	Y	Y
Reason for course of treatment	N	N	Y	Y
New patient (yes/no)	N	N	N	Y
Postcode of patient	N	N	N	Y
Oral health status				
Number of natural teeth	N	N	Y	Y
Dental diagnosis	N	N	Y	Y
Number of decayed teeth	N	N	N	Y

(a) The number of patients seen can be derived from the log.

(b) Age groups were collected in 1983–84 and 1988–89 while actual age was collected in 1993–94 and 1998–99.

Y: Yes & N: No

Some of these data items formed the basis of the practice activity and service provision measures, which are the main dependent variables reported. Further details on how these measures were recorded and derived are presented in the following sections.

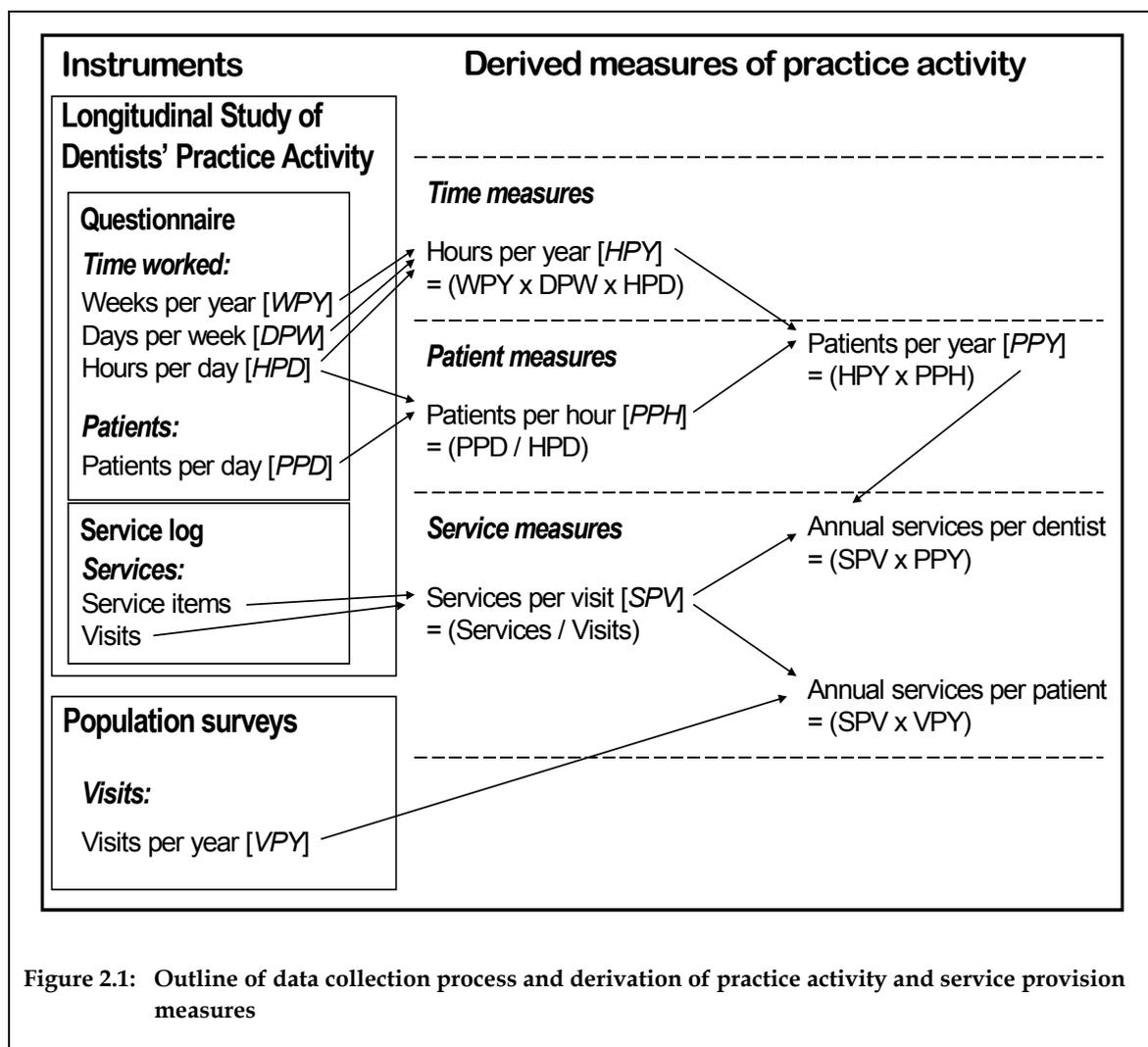
2.4 Practice activity measures

Respondents completed questions related to their current practice experience. Practitioners provided estimates of the number of patients treated per day, and the number of hours per day, days per week and weeks per year devoted to work.

From these estimates three key dependent variables—hours per year, patient visits per hour and patient visits per year—were calculated as follows:

- hours per year = (hours per day) x (days per week) x (weeks per year)
- patient visits per hour = (patients per day) ÷ (hours per day)
- patient visits per year = (patient visits per hour) x (hours per year).

A schematic outline of the data collection process and derivation of the practice activity measures is presented in Figure 2.1, which also shows how the service provision measures were collected and their relationship to the practice activity measures and population survey data.



2.5 Service provision measures

Practitioners recorded the types of services provided over one to two self-selected typical days of practice. The number of patients sampled by each dentist varied according to their typical level of activity. The data reported here are restricted to private general practitioners. Dentists were free to choose which days to include in their service log. Only sampled dentists within any group practice provided data. Dentists were instructed to record for each patient treated on their selected typical days the services provided regardless of whether or how they were charged to the patient. A patient may have received a number of services per visit across the range of 10 main areas of service. Services were classified into main areas of service following the Australian Dental Association's *Schedule of Dental Services* (1992). Extraction services correspond to the area listed as oral surgery in the Schedule.

Three key measures of service provision were calculated as follows:

- Rates of services per visit were produced by dividing counts of services provided by dentists by the number of visits.
- Annual services per dentist were calculated by multiplying the rate of services per visit by the practice activity measure of patient visits per year.
- Annual services per patient were calculated by multiplying the rate of services per visit by the number of annual visits per patient, based on estimates of annual visits from Australian population surveys in 1979 (ABS 1979) and 1987–88 (Barnard 1993); and National Dental Telephone Interview Surveys (Carter et al. 1994) in 1994 and 1999 (Carter et al. 2001).

2.6 Weighting

The data were weighted using the estimated number of practising private general practice dentists at December 1983 and 1988 (Barnard 1987, 1989), together with the age and sex distribution of dentists from the 1981 and 1986 population censuses of Australia (AIH 1988a, 1988b) and dental board registration statistics from 1992 (AIHW 1994), and 1994 (Szuster & Spencer 1997). This weighted measure of practice activity is representative of the age and sex distribution of Australian private practice dentists at each time.

3 Validation of service provision data collection

3.1 Background: collecting service data

Unbiased estimates of services provided in the private sector require a sample survey approach. One such approach is to use dentist estimates of the percentage of their work by aggregated areas of service items (Bader & Kaplan 1983). A more objective measure, which can capture service provision at the level of individual service items (ADA 1996), consists of using logs to record a sample of patient visits. Service logs have been used in the USA (Konrad & DeFriese 1981) and Australia (Spencer & Lewis 1989; Spencer, Szuster & Brennan 1994; Brennan et al. 1998a). However, the intensive, time consuming nature of service logs requires trade-offs in their size to avoid problems with response rates and compliance (Sudman 1985; Dillman 1991). Methodological issues arising from such approaches include the interpretation of one-day logs and representativeness of self-selected typical days. The aim of this validation study was to compare services collected on a typical day with those collected over the remainder of a 10-day period.

3.2 Approach: use of service logs

A total of 50 private general practitioners who responded to the initial mailing stage in the 1993–94 wave of the Longitudinal Study of Dentists' Practice Activity were selected as a convenience sample. This sample included most States/Territories (New South Wales 13, Victoria 13, Queensland 10, Western Australia 7, South Australia 5, Australian Capital Territory 1, Northern Territory 1). Dentists were asked to record 10 days of service provision in a service log and nominate a self-selected typical day from among the 10 days. One mailing was performed and dentists were offered a \$50 cheque to compensate for completing the log.

3.3 Results from a typical day

Of the 50 dentists sampled, 4 were excluded as they could not be contacted during the survey period. Responses were received from 30 dentists, giving a response rate of 65.2%. Table 3.1 compares mean services per 100 visits from each main area of service between the self-selected typical day nominated by each dentist and the remaining 9 days from the service log. Mean services were similar for the typical versus remaining days of the service log, with no significant differences at the $\alpha = 0.05$ level (paired t-test). However, variability was greater for the nominated typical day compared to the remaining sampled days.

Table 3.1: Services per 100 visits – self-selected typical day and remaining 9 days

	Typical day		Remaining days		P ^(a)	Rate Ratio (95% CI) ^(b)
	Mean	(95% CI)	Mean	(95% CI)		
Main area of service						
Restorative	763	(591–935)	653	(573–733)	0.08	1.11 (0.98–1.26)
Diagnostic	586	(519–653)	587	(536–638)	0.99	0.97 (0.85–1.11)
Preventive	352	(252–452)	316	(257–375)	0.46	1.04 (0.87–1.25)
Extraction	67	(36–98)	94	(72–116)	0.13	0.78 (0.54–1.14)
Endodontic	137	(63–211)	131	(88–174)	0.85	1.07 (0.81–1.43)
Crown & bridge	62	(17–107)	55	(30–80)	0.73	1.12 (0.72–1.76)
Prosthodontic	80	(29–131)	96	(69–123)	0.54	0.82 (0.57–1.17)
General/misc.	51	(12–90)	51	(29–73)	0.99	1.01 (0.64–1.60)
Periodontic	20	(16–24)	26	(6–46)	0.45	0.76 (0.37–1.58)
Orthodontic	31	(4–58)	18	(2–34)	0.07	1.66 (0.98–2.81)
Total services	2,148	(1,928–2,368)	2,027	(1,882–2,172)	0.07	1.03 (0.96–1.10)

(a) t-test.

(b) Poisson regression.

The variability around the mean is greater for the typical day estimates compared to the remaining days. This greater variability may be accounted for by sample size (i.e. the typical day estimates are based on 1 day x 30 dentists = 30 days, while the remaining sample is based on 9 days x 30 dentists = 270 days). Lack of significant differences between the means could reflect lack of power associated with the small sample size. Rate ratios derived from Poisson regressions of each service rate for the typical day compared to the remaining days provides a measure of effect size. These indicate little difference in total rates between the two samples, but there was a slight tendency to overestimate restorative and crown and bridge services and underestimate extraction and prosthodontic services. The largest differences occurred for the low rate of provision areas of periodontic and orthodontic services.

Table 3.2 shows mean services by the number of cumulative days of sampling effort. These estimates indicate there was generally only small variation in central tendency (i.e. means) even between one-day and two-day cumulative sampling. However, the variability (i.e. standard errors) of the estimates tended to decrease as the sampling effort increased.

The interpretation of these results is presented in Section 6.1.

Table 3.2: Services per 100 visits by cumulative sampling days

	Day 1		Days 1–2		Days 1–5		Days 1–10	
	Mean	(SE)	Mean	(SE)	Mean	(SE)	Mean	(SE)
Main area of service								
Restorative	741	(84)	712	(57)	676	(48)	665	(45)
Diagnostic	500	(40)	567	(37)	602	(28)	587	(24)
Preventive	320	(45)	321	(34)	307	(29)	320	(29)
Extraction	151	(40)	111	(20)	101	(14)	91	(10)
Endodontic	128	(29)	131	(27)	151	(25)	132	(23)
Crown & bridge	71	(20)	68	(20)	50	(12)	56	(13)
Prosthodontic	104	(28)	90	(20)	85	(15)	94	(14)
General/misc.	40	(14)	44	(13)	44	(12)	51	(11)
Periodontic	44	(27)	39	(19)	29	(11)	25	(9)
Orthodontic	29	(14)	22	(11)	21	(9)	19	(9)
Total services	2,127	(116)	2,105	(93)	2,065	(79)	2,040	(76)

4 Practice activity trends: 1983–84 to 1998–99

This section reports on trends in dental practice activity over the period 1983–84 to 1998–99. The response to the study over the four waves is presented first, followed by the characteristics of the dentists and, lastly, a description of changes in measures of practice activity such as time devoted to work and number of visits provided. The focus will be restricted to dentists in private general practice.

4.1 Response

The Longitudinal Study of Dentists' Practice Activity has been conducted four times at 5-year intervals since 1983. At all four waves of the study a response rate in excess of 70% was obtained, ranging from 71.2% in 1998–99 to 75.5% in 1988–89. Table 4.1 shows the sample supplementation components at each time. This shows how the sample is supplemented by practitioners who are new to the dental registers at each wave, while maintaining those who were sampled previously and have remained registered. The number included within each sample component has decreased over time as practitioners have come off the dental registers for reasons such as retirement.

Table 4.1: Response by sample components over time

		Sample components over time				Total
		1983	1988	1993	1998	
1983–84	Sampled	1,033	—	—	—	1,033
	Contacted	994	—	—	—	994
	Responded	730	—	—	—	730
	Response (%)	73.4	—	—	—	73.4
1988–89	Sampled	795	371	—	—	1,166
	Contacted	784	349	—	—	1,133
	Responded	584	271	—	—	855
	Response (%)	74.5	77.7	—	—	75.5
1993–94	Sampled	635	295	282	—	1,212
	Contacted	609	261	235	—	1,105
	Responded	454	184	179	—	817
	Response (%)	74.5	70.5	76.2	—	73.9
1998–99	Sampled	538	260	244	374	1,416
	Contacted	517	248	232	327	1,324
	Responded	372	161	155	255	943
	Response (%)	72.0	64.9	66.8	78.0	71.2

Response = no. contacted / no. responded

4.2 Characteristics of dentists

The majority of dentists in Australia (81.4% of practising dentists) work in the private sector and the predominant area (84.6% of practising dentists) is general practice (Szuster & Spencer 1997). Therefore, the findings presented in this report are restricted to private general dental practitioners.

Age and sex distribution of dentists

The unweighted age and sex distribution of responding private general practitioners is presented in Table 4.2. In total there were 367 dentists from 1983–84, 481 from 1988–89, 441 from 1993–94 and 489 from 1998–99, with higher percentages of younger female compared with male dentists. In general the distribution of respondents matches the reported distribution for the population of dentists collected through registration statistics (Szuster & Spencer 1997). The majority of male dentists are in the 30–39 and 40–49 years age groups while the majority of female dentists are in the 20–29 and 30–39 years age groups. However, due to the higher sampling fraction of female dentists there are greater numbers of female dentists than would be expected from a random sample of dentists.

Table 4.2: Age and sex distribution of responding private general dental practitioners by time of study

	1983–84		1988–89		1993–94		1998–99	
	Male	Female	Male	Female	Male	Female	Male	Female
Age of dentist	%	%	%	%	%	%	%	%
20–29 years	13.1	37.7	13.2	37.9	12.8	27.5	10.7	28.5
30–39 years	30.9	36.5	34.5	38.4	30.3	45.5	26.1	39.9
40–49 years	22.3	14.1	25.3	12.4	28.5	18.0	31.0	25.0
50–59 years	23.1	8.2	12.8	8.5	15.3	6.0	21.5	6.1
60+ years	10.6	3.5	14.1	2.8	13.1	3.0	10.7	0.4
Total (n)	282	85	304	177	274	167	261	228

Weighting

The weighting procedure described in Methods (Section 2) adjusts the distribution of respondents to reflect the sex ratio of the dentist population, and also adjusts for any minor differences in age distribution between the respondents and the dentist population.

All further findings presented in this report are based on weighted data, with the exception of the patient age and sex distribution presented in Table 5.1, Section 5.1.

Place of graduation of dentists

Table 4.3 presents place of graduation by time of study. At each wave of the study the highest percentage of dentists graduated from Sydney, followed by Melbourne and Brisbane. Over 10% of the dentists had graduated at an overseas dental school, a higher percentage than from either Adelaide or Perth at each wave of the study.

Table 4.3: Place of graduation of responding private general dental practitioners by time of study

	Time of study			
	1983–84	1988–89	1993–94	1998–99
Place of graduation	%	%	%	%
Overseas	11.9	11.9	14.3	13.3
Sydney	39.0	32.5	32.3	32.9
Melbourne	18.4	21.3	18.0	16.9
Brisbane	15.7	16.1	14.8	17.4
Adelaide	7.9	11.0	12.4	10.1
Perth	7.2	7.2	8.2	9.4

Type of practice of dentists

Table 4.4 presents type of practice by time of study. The highest percentage of dentists was in solo practice at each wave of the study, ranging from 46.2% to 52.4%. The percentage of dentists in associateships ranged between 17.0% and 22.5%. The percentage of dentists working as assistants was higher in subsequent waves of the study, ranging from 17.9% to 20.4%, compared to the baseline of 11.3% in 1983–84. The percentage of dentists classified in the ‘other’ category declined at each wave of the study from 5.0% in 1983–84 to 0.8% in 1998–99.

Table 4.4: Type of practice of responding private general dental practitioners by time of study

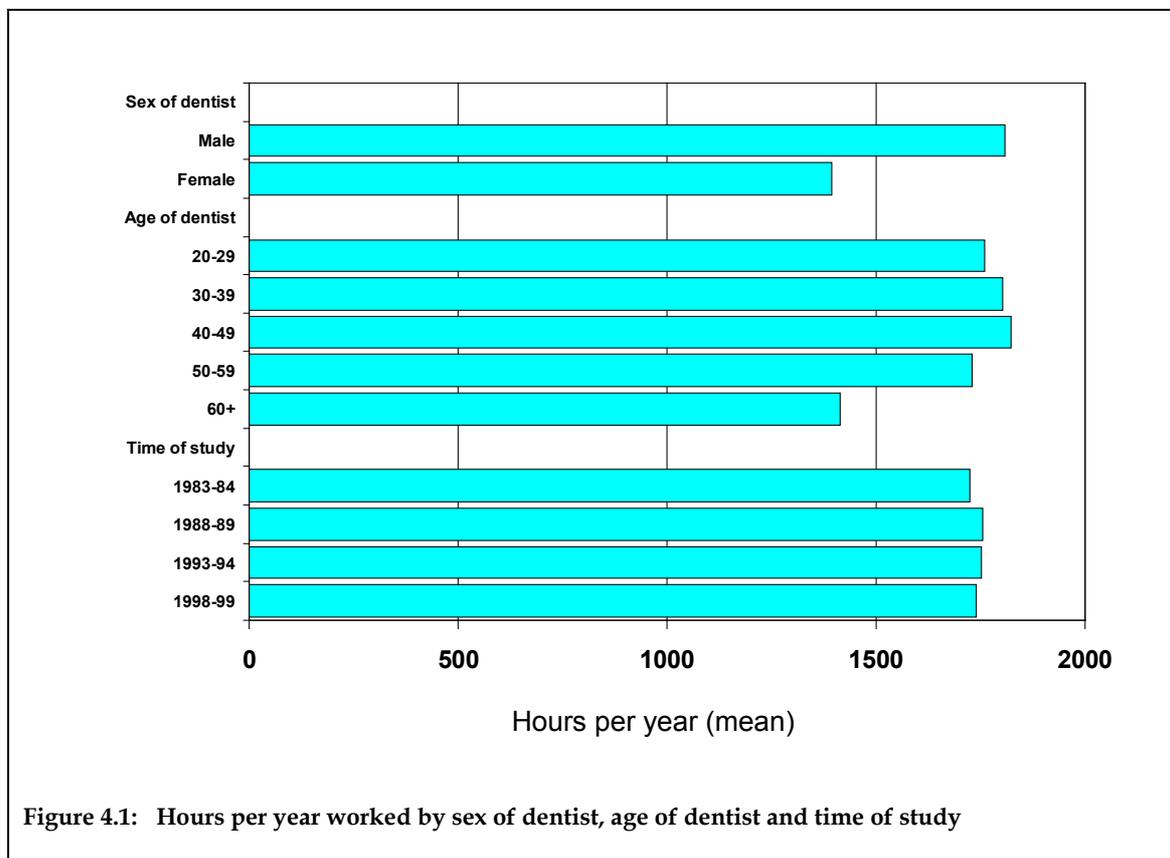
	Time of study			
	1983–84	1988–89	1993–94	1998–99
Type of practice	%	%	%	%
Solo	47.3	46.2	48.1	52.4
Partnership	13.8	14.2	13.6	10.1
Associateship	22.5	17.2	18.8	17.0
Assistant	11.3	20.4	17.9	20.0
Other	5.0	2.0	1.5	0.8

4.3 Trends in practice activity

In this section trends in practice activity are presented across the period 1983–84 to 1998–99. The first part of this section looks at the practice activity measures of hours per year worked, and the number of patients per hour and patient visits per year supplied by dentists. The second part of the section looks at the service provision measures of total numbers of services provided per dentist as a rate per visit, a rate per year and a rate per patient per year.

Practice activity measures

The mean number of hours per year worked is presented in Figure 4.1 by sex of dentist, age of dentist and time of study, and is also listed in Table 4.5. Male dentists had a higher mean number of hours per year worked than female dentists. Hours per year worked were lowest among dentists aged 60 years or more. There was no change in the number of hours worked per year over the time of the study.



The mean number of patient visits supplied by a dentist per hour is presented in Figure 4.2 by sex of dentist, age of dentist and time of study and is also listed in Table 4.5. Male dentists supplied a higher mean number of patient visits per hour than female dentists. The mean number of patient visits per hours increased across age groups up to 50–59 years. The mean number of patient visits supplied per hour declined across the four waves of the study period.

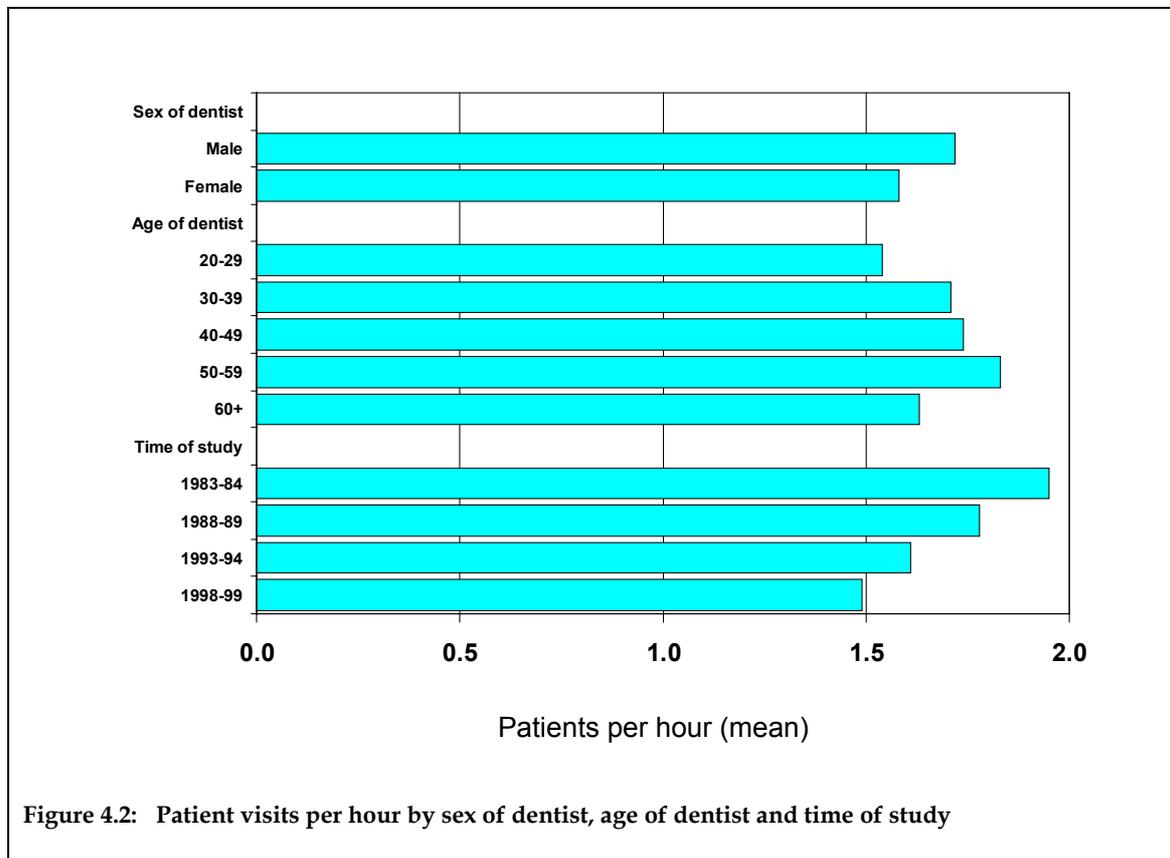


Figure 4.2: Patient visits per hour by sex of dentist, age of dentist and time of study

Figure 4.3 presents the mean number of patient visits supplied by a dentist per year by sex of dentist, age of dentist and time of study, and is also listed in Table 4.5. Male dentists supplied a higher number of patient visits per year than female dentists. The mean number of patient visits per year was highest among dentists in the 40–49 and 50–59 years age groups. The mean number of patient visits supplied by dentists per year declined across the four waves of the study period.

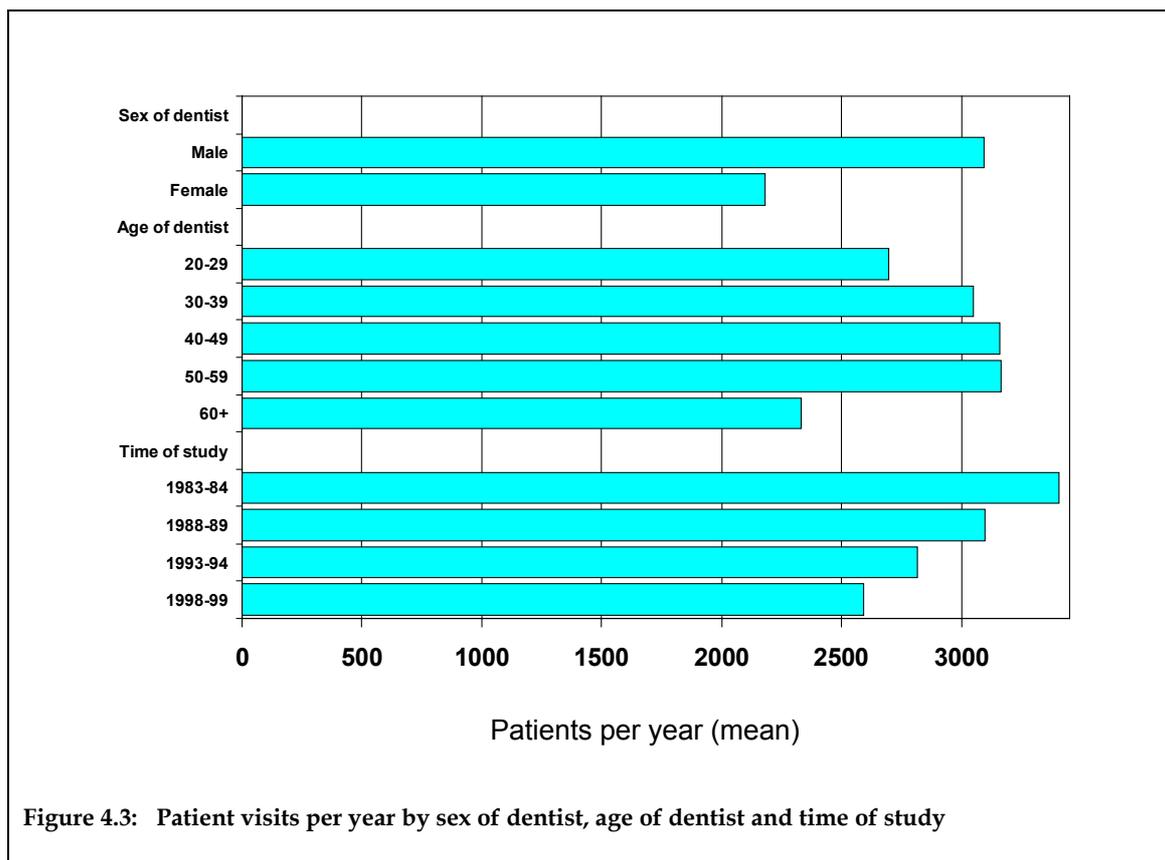


Figure 4.3: Patient visits per year by sex of dentist, age of dentist and time of study

Table 4.5 shows practice activity measures by age of dentist, sex of dentist and time of study, as depicted graphically in Figures 4.1 to 4.3.

Table 4.5: Mean practice activity measures by sex of dentist, age of dentist and time of study

	Hours per year		Patient visits per hour		Patient visits per year	
	Mean	(SE)	Mean	(SE)	Mean	(SE)
Sex of dentist	**		**		**	
Male	1,806	(16)	1.72	(0.02)	3,091	(42)
Female	1,395	(26)	1.58	(0.02)	2,181	(49)
Age of dentist	**		**		**	
20–29 years	1,760	(33)	1.54	(0.02)	2,695	(61)
30–39 years	1,802	(25)	1.71	(0.02)	3,048	(59)
40–49 years	1,824	(25)	1.74	(0.03)	3,160	(67)
50–59 years	1,729	(34)	1.83	(0.04)	3,163	(97)
60+ years	1,414	(44)	1.63	(0.06)	2,333	(121)
Time of study	NS		**		**	
1983–84	1,726	(27)	1.95	(0.04)	3,405	(82)
1988–89	1,756	(26)	1.78	(0.03)	3,097	(65)
1993–94	1,752	(29)	1.61	(0.02)	2,816	(61)
1998–99	1,740	(28)	1.49	(0.03)	2,589	(58)

** (P<0.05); NS (not statistically significant) using one-way ANOVA.

The statistical significance of these results was also analysed in multivariate models. The differences by sex of dentist persisted for hours per year worked and patient visits per year supplied by dentists after controlling for the effects of age of dentist and time of study. The differences by age of dentist persisted for hours per year worked and patient visits per hour supplied by dentists after controlling for the effects of sex of

dentist and time of study. The differences by time of study persisted for patient visits supplied per hour and per year after controlling for the effects of age of dentist and time of study.

Service provision measures: aggregate services

The mean number of services per visit is presented in Figure 4.4 by sex of dentist, age of dentist and time of study and is also listed in Table 4.6. The mean number of services per visit was higher for female compared to male dentists. Dentists aged 50–59 and 60 years or older provided a lower rate of services per visit compared to younger dentists. The number of services per visit increased across the four waves of the study period.

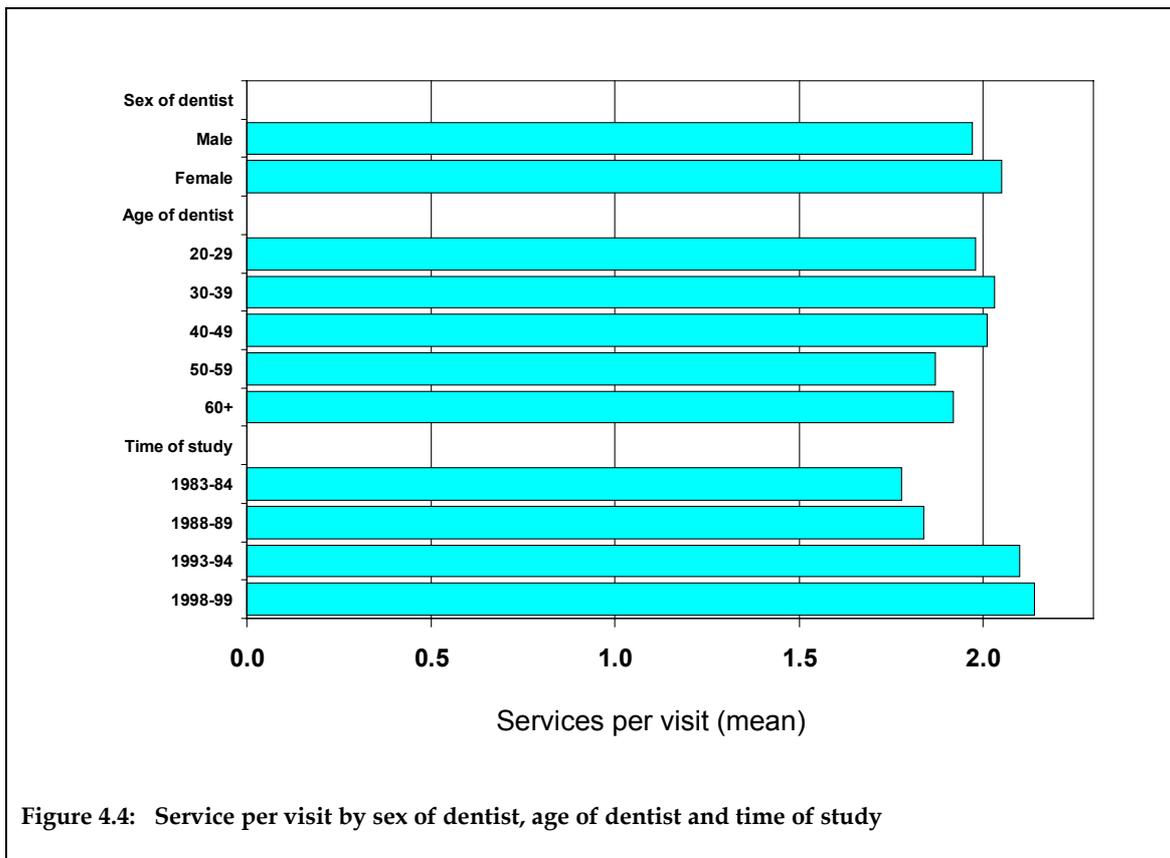


Figure 4.4: Service per visit by sex of dentist, age of dentist and time of study

The mean number of annual services per dentist is presented in Figure 4.5 by sex of dentist, age of dentist and time of study, and is also listed in Table 4.6. The mean number of annual services provided by a dentist was higher for male dentists compared to female dentists. The mean number of annual services per dentist was highest for dentists aged 40–49 years and lowest for dentists aged 60 years or older. There was no clear trend over time in the mean number of annual services per dentist, with lower values in 1988–89 and 1998–99 and higher values in 1983–84 and 1993–94.

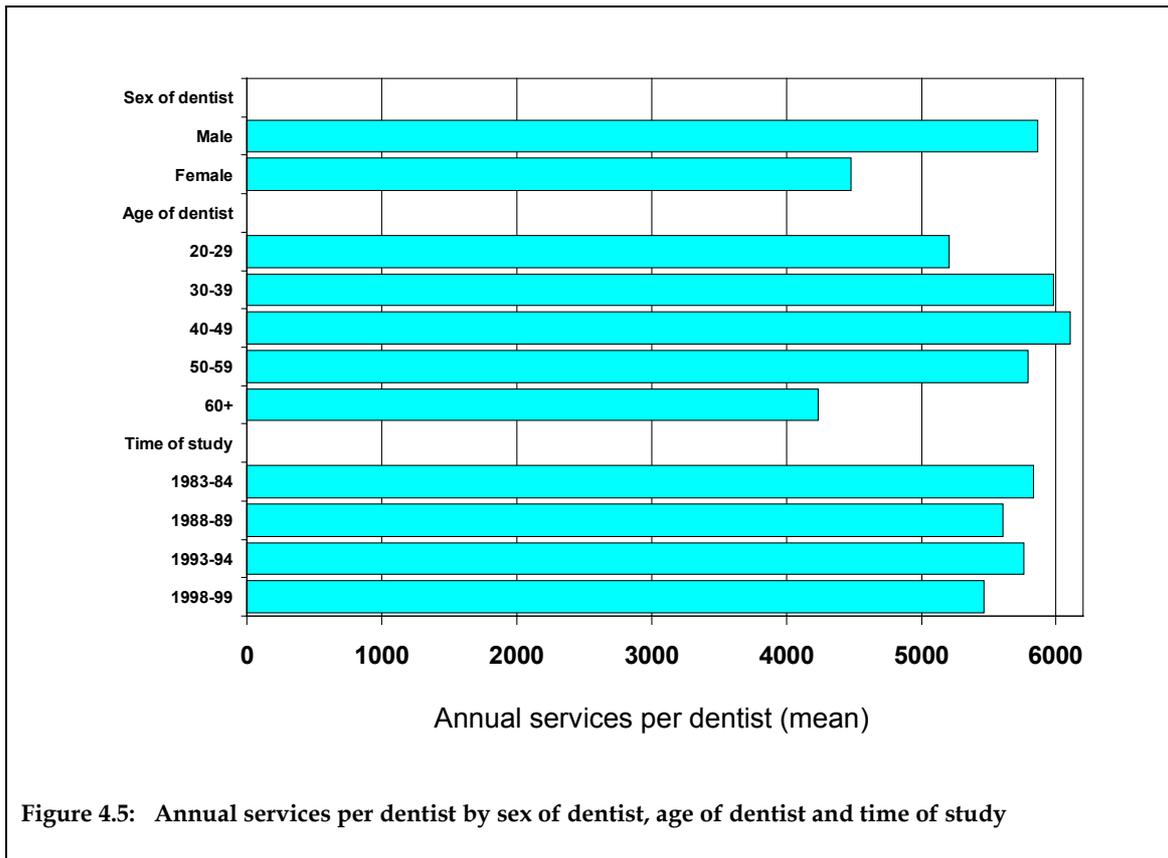


Figure 4.5: Annual services per dentist by sex of dentist, age of dentist and time of study

The mean number of annual services per patient is presented in Figure 4.6 by sex of dentist, age of dentist and time of study, and is also listed in Table 4.6. The mean number of annual services provided by dentists per patient was higher for female compared to male patients. The highest mean number of annual services per patient was supplied by dentists in the 30-39 and 40-49 years age groups. The mean number of annual services per patient increased across each wave of the study period, but was markedly higher in the last two waves.

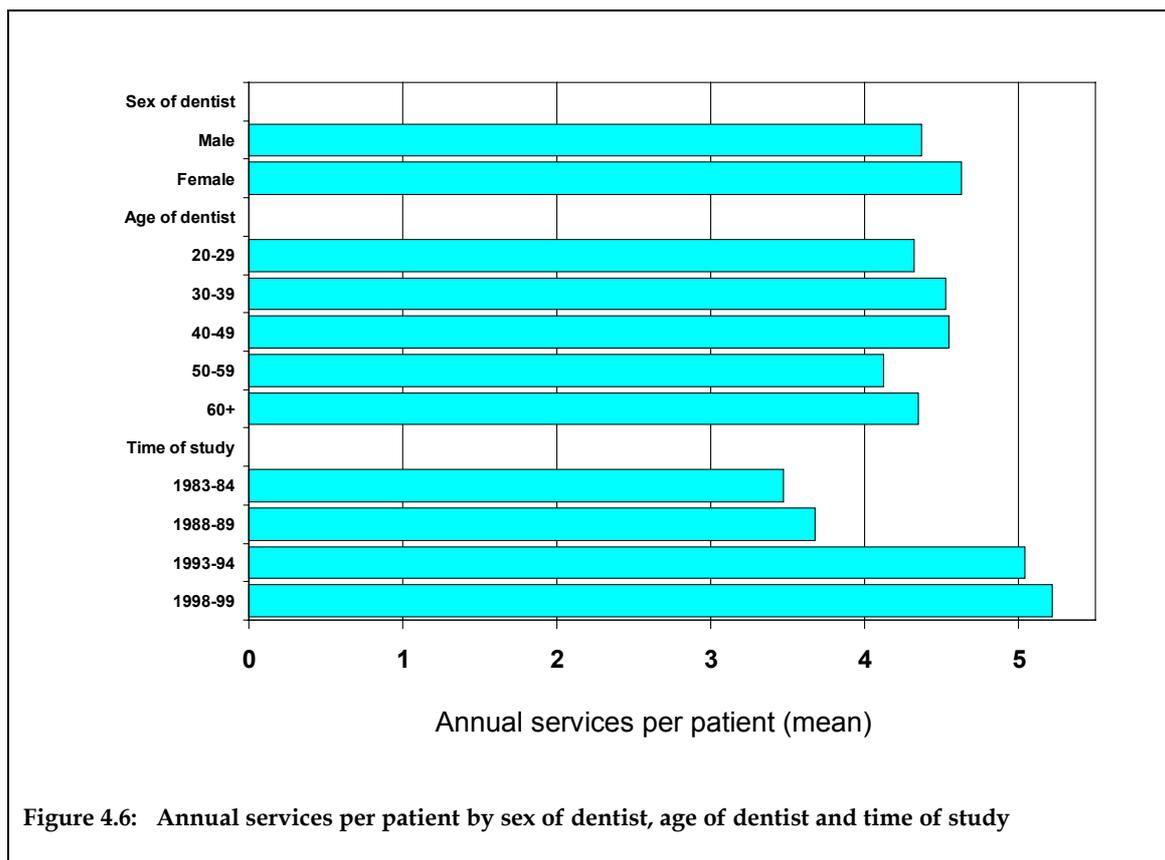


Figure 4.6: Annual services per patient by sex of dentist, age of dentist and time of study

Table 4.6 shows service provision measures by sex of dentist, age of dentist and time of study, as depicted graphically in Figures 4.4 to 4.6.

Table 4.6: Mean service provision measures by sex of dentist, age of dentist and time of study

	Services per visit ^(a)		Annual services per dentist ^(b)		Annual services per patient ^(b)	
	Mean	(SE)	Mean	(SE)	Mean	(SE)
Sex of dentist	**		**		*	
Male	1.97	(0.02)	5,862	(84)	4.37	(0.05)
Female	2.05	(0.03)	4,477	(114)	4.63	(0.07)
Age of dentist	**		**		**	
20–29 years	1.98	(0.03)	5,209	(134)	4.32	(0.09)
30–39 years	2.03	(0.02)	5,982	(118)	4.53	(0.06)
40–49 years	2.01	(0.03)	6,105	(142)	4.55	(0.08)
50–59 years	1.87	(0.04)	5,794	(188)	4.12	(0.10)
60+ years	1.92	(0.08)	4,240	(230)	4.35	(0.20)
Time of study	**		NS		**	
1983–84	1.78	(0.03)	5,832	(147)	3.47	(0.06)
1988–89	1.84	(0.02)	5,607	(123)	3.68	(0.05)
1993–94	2.10	(0.03)	5,766	(134)	5.04	(0.08)
1998–99	2.14	(0.03)	5,463	(145)	5.22	(0.08)

(a) Poisson regression.

(b) Ordinary least squares regression.

*(P<0.05), **(P<0.01); NS (Not statistically significant).

The statistical significance of the findings was also analysed in multivariate models. The only difference between male and female dentists that persisted after controlling for age of dentist and time of study was the higher number of annual services per dentist provided by male compared with female dentists. Statistically significant variation by age of dentist persisted for all three measures of service provision after controlling for sex of dentist and time of study. The same pattern over time was observed after controlling for sex of dentist and age of dentist, with significant increases over time in rates of service per visit and number of annual services provided by dentists per patient, and no change over time in the number of annual services provided per dentist.

Service provision measures: main areas of services

Having looked at trends in aggregate services this section looks at trends over time in the component main areas of service. Figure 4.7 and Table 4.7 show that the distribution of services per visit by time of study was dominated by restorative, diagnostic and preventive services. Major trends over time include increased rates per visit of diagnostic, preventive and endodontic services.

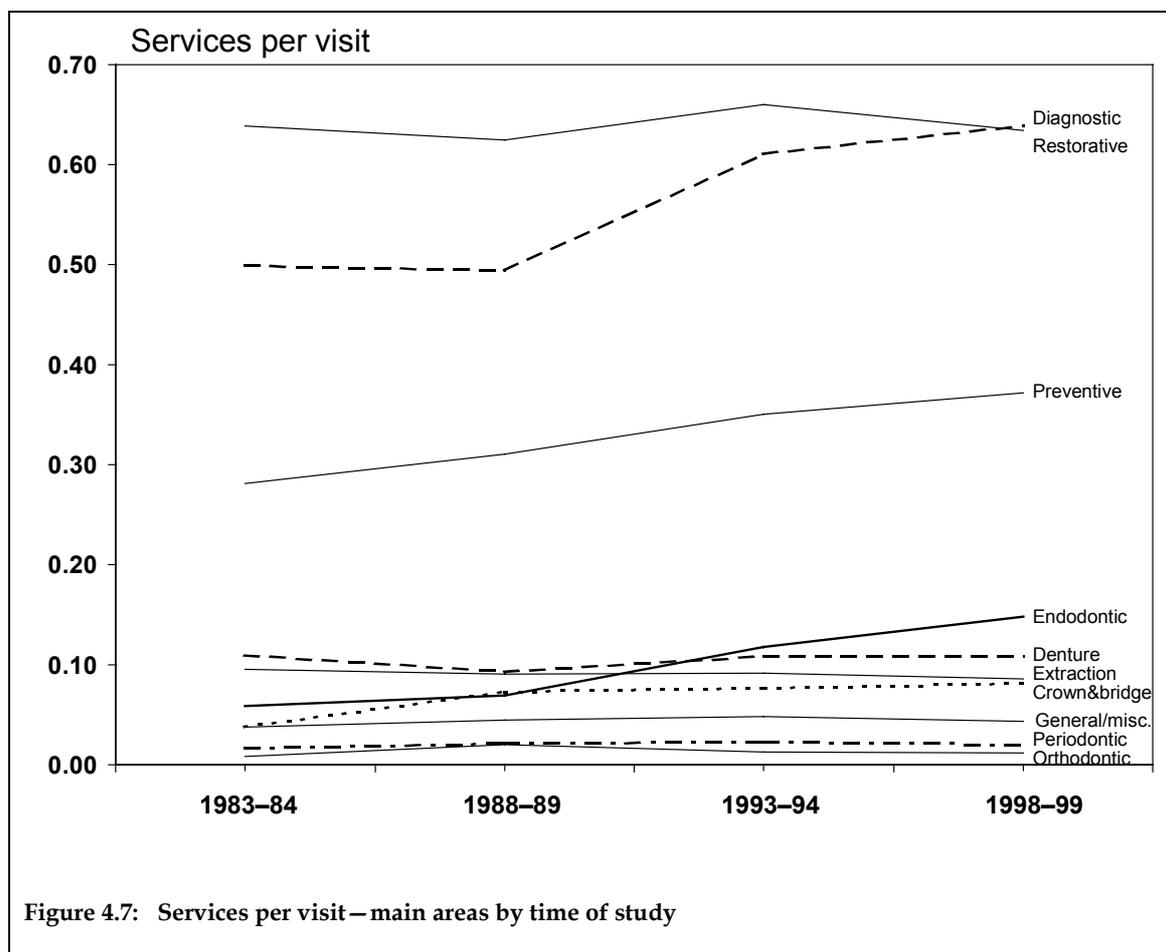


Table 4.7 shows that, in addition to the significant increases over time for diagnostic, preventive and endodontic services, there were increased rates of crown and bridge services. Changes also occurred over time for restorative, prosthodontic, general/ miscellaneous and orthodontic services but there were no clear trends for these main areas of service.

Table 4.7: Services per visit – main areas by time of study

Main area of service	Time of study			
	1983–84	1988–89	1993–94	1998–99
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Restorative*	0.639 (0.021)	0.625 (0.016)	0.660 (0.022)	0.633 (0.018)
Diagnostic**	0.499 (0.015)	0.495 (0.013)	0.610 (0.015)	0.638 (0.018)
Preventive**	0.282 (0.016)	0.310 (0.013)	0.351 (0.014)	0.372 (0.017)
Prosthodontic*	0.109 (0.007)	0.092 (0.006)	0.109 (0.009)	0.109 (0.011)
Extraction	0.095 (0.009)	0.090 (0.006)	0.091 (0.006)	0.086 (0.008)
Endodontic**	0.059 (0.005)	0.069 (0.004)	0.118 (0.007)	0.148 (0.010)
Crown & bridge**	0.038 (0.004)	0.073 (0.007)	0.077 (0.008)	0.081 (0.008)
General/misc.*	0.038 (0.004)	0.045 (0.004)	0.048 (0.004)	0.044 (0.004)
Periodontic	0.017 (0.005)	0.021 (0.003)	0.022 (0.004)	0.020 (0.003)
Orthodontic**	0.009 (0.002)	0.020 (0.004)	0.013 (0.002)	0.012 (0.003)

*(P<0.05), **(P<0.01) Poisson regression.

Figure 4.8 and Table 4.8 present the mean number of annual services per dentist in each main area of service by time of study. The distribution of annual services per dentist was dominated by restorative, diagnostic and preventive services. The major trends over time included decreased numbers of annual restorative services per dentist and increased numbers of endodontic services.

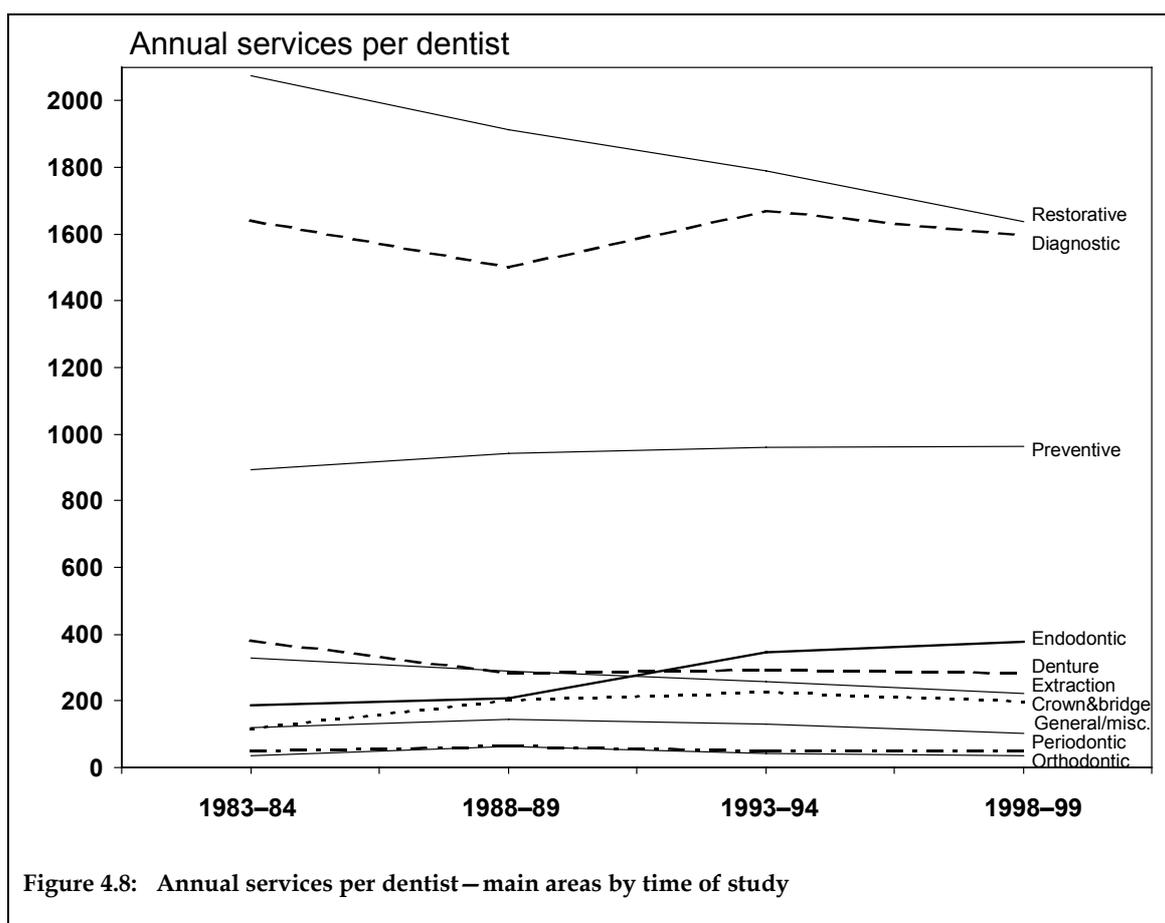


Figure 4.8: Annual services per dentist – main areas by time of study

In addition to the significant increase in endodontic services and decrease in restorative services, Table 4.8 shows that there were also significant decreases in the number of annual prosthodontic and extraction services per dentist. There was also some increase

in the provision of crown and bridge services since the first wave of the study in 1983–84 despite the lower number of crown and bridge services in 1998–99 compared to 1988–89 and 1993–94.

Table 4.8: Annual services per dentist – main areas by time of study

Main area of service	Time of study			
	1983–84 Mean (SE)	1988–89 Mean (SE)	1993–94 Mean (SE)	1998–99 Mean (SE)
Restorative**	2,076 (75)	1,913 (60)	1,791 (59)	1,639 (63)
Diagnostic	1,642 (60)	1,500 (50)	1,670 (48)	1,595 (51)
Preventive	893 (56)	940 (44)	959 (49)	962 (52)
Prosthetic*	382 (28)	282 (20)	294 (22)	281 (29)
Extraction**	330 (34)	291 (20)	258 (16)	222 (19)
Endodontic**	186 (15)	209 (13)	345 (20)	379 (26)
Crown & bridge**	118 (14)	201 (21)	226 (28)	198 (19)
General/misc.	120 (13)	144 (16)	129 (11)	104 (10)
Periodontic	50 (17)	63 (10)	49 (8)	50 (7)
Orthodontic	35 (8)	64 (13)	44 (7)	34 (8)

*(P<0.05), **(P<0.01) Ordinary least squares regression.

Figure 4.9 and Table 4.9 present the mean number of annual services per patient in each main area of service by time of study. The distribution of annual services per patient was dominated by restorative, diagnostic and preventive services. The major trends over time included increased mean numbers of annual diagnostic, restorative, preventive and endodontic services.

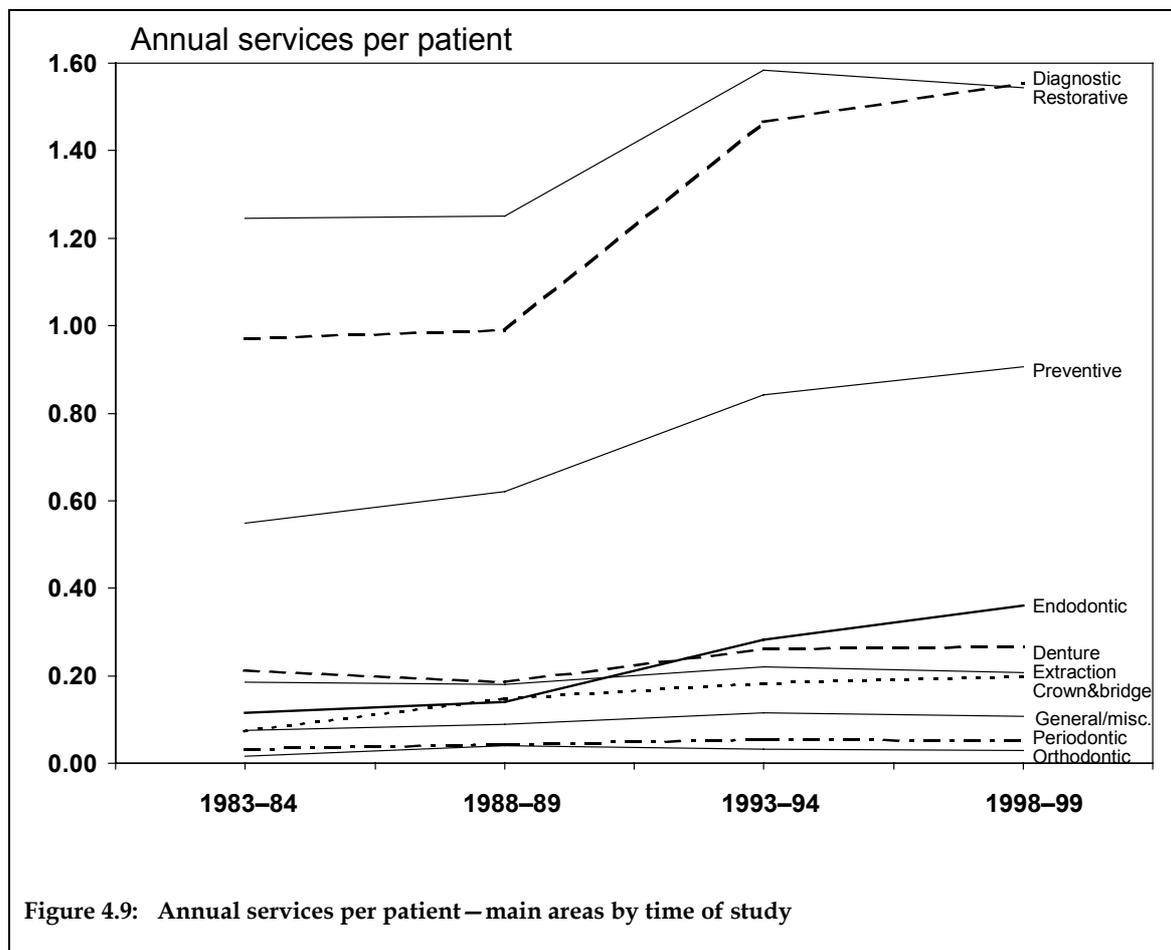


Figure 4.9: Annual services per patient – main areas by time of study

Table 4.9 shows that both restorative and diagnostic services were higher in the last two waves of the study period. Preventive and endodontic services exhibited a more consistent increase over the study period than restorative and diagnostic services. In addition to the increased provision of restorative, diagnostic, preventive and endodontic services, there was an increase in crown and bridge services across the four waves of the study period. The annual number of prosthodontic services per patient was also higher in the last wave of the study period in 1998–99 despite a decrease in 1988–89. General/miscellaneous services increased across the first three waves of the study period.

Table 4.9: Annual services per patient – main areas by time of study

	Time of study			
	1983–84	1988–89	1993–94	1998–99
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Main area of service				
Restorative**	1.244 (0.042)	1.250 (0.032)	1.585 (0.053)	1.543 (0.045)
Diagnostic**	0.970 (0.030)	0.989 (0.026)	1.467 (0.035)	1.554 (0.043)
Preventive**	0.547 (0.031)	0.621 (0.025)	0.842 (0.036)	0.906 (0.041)
Prosthodontic**	0.212 (0.013)	0.185 (0.012)	0.261 (0.022)	0.265 (0.026)
Extraction	0.185 (0.017)	0.181 (0.011)	0.220 (0.013)	0.208 (0.018)
Endodontic**	0.115 (0.009)	0.139 (0.008)	0.283 (0.016)	0.361 (0.023)
Crown & bridge**	0.073 (0.008)	0.147 (0.015)	0.184 (0.019)	0.198 (0.018)
General/misc.*	0.074 (0.008)	0.089 (0.008)	0.116 (0.010)	0.107 (0.011)
Periodontic	0.033 (0.010)	0.042 (0.007)	0.053 (0.009)	0.050 (0.008)
Orthodontic	0.017 (0.003)	0.040 (0.007)	0.032 (0.005)	0.029 (0.006)

*(P<0.05), **(P<0.01) Ordinary least squares regression

5 Service patterns: 1998–99

This section looks at patterns of service provision in 1998–99 in terms of the characteristics of patients, visits and services provided. The focus is restricted to patterns of dental service provision in private general practice.

5.1 Characteristics of patients

Characteristics of patients treated by private general dental practitioners in 1998–99 are examined. These include the age and sex distribution of patients, their dentate status, and the number of teeth present and number of decayed teeth.

Age and sex distribution of patients

Table 5.1 presents the unweighted age and sex distribution of patients. There were only small percentages of patients aged less than 5 years with the largest percentage of patients in the 25–44 years age group for both male and female patients.

All further findings are based on weighted data whereby the age and sex distribution of responding dentists who provided data on their patients is adjusted to the age and sex distribution of the population of Australian dentists, as outlined in Methods (Chapter 2).

Table 5.1: Age and sex distribution of patients

	Sex of patients				All	
	Male		Female			
	n	(%)	n	(%)	n	(%)
Age of patients						
<5 years	24	(1.1)	29	(1.1)	53	(1.1)
5–11 years	142	(6.5)	137	(5.0)	279	(5.7)
12–17 years	128	(5.9)	170	(6.2)	298	(6.1)
18–24 years	162	(7.5)	212	(7.7)	374	(7.6)
25–44 years	729	(33.6)	1,050	(38.3)	1,779	(36.2)
45–64 years	720	(33.2)	837	(30.5)	1,558	(31.7)
65+ years	267	(12.3)	309	(11.3)	576	(11.7)
Known	2,172		2,744		4,917	
Unknown	—		—		81	
Total	2,172		2,744		4,998	

Adjustment for clustering

The collection of patient-level data in service logs of a typical day involves the clustering of observations on patients within each dentist's records. Further analyses of patient-level data are adjusted for clustering within the primary sampling unit of dentists (StataCorp 1999).

Dentate status by age of patient

Table 5.2 shows dentate status by age of patient. Overall, the vast majority of patients were dentate (98.3%). The percentage of edentulous patients increased across older age groups, peaking in the 65+ years age group (8.4%).

Table 5.2: Dentate status by age of patient

Age of patient	Dentate status	
	Dentate	Edentulous
	Row %	Row %
<5 years	100.0	0.0
5–11 years	100.0	0.0
12–17 years	100.0	0.0
18–24 years	100.0	0.0
25–44 years	99.7	0.3
45–64 years	98.4	1.6
65+ years	91.6	8.4
All	98.3	1.8

Dentition status by age of patient

Table 5.3 presents dentition status by age of patient. Overall, the mean number of teeth was 24.8. The highest number of teeth was observed in the 18–24 years age group (28.9 teeth). The lower number of teeth observed in children reflects the smaller number of deciduous teeth and the exfoliation and replacement of the deciduous dentition by the permanent dentition. The decreasing number of teeth across successively older adult age groups reflects tooth loss for a range of possible reasons such as extraction due to oral diseases (e.g. caries, periodontal disease) or for orthodontic purposes, as well as other causes such as trauma.

The mean number of decayed teeth was 1.7 overall, with the highest numbers observed in the 18–24 years (2.3 decayed teeth) and 25–44 years (2.0 decayed teeth) age groups. These estimates of the number of decayed teeth reflect levels of oral disease among patients attending for care in private general practice and hence may be expected to differ from population estimates.

Table 5.3: Dentition status by age of patient – dentate patients

Age of patient	Number of teeth		Number of decayed teeth	
	Mean	(SE)	Mean	(SE)
<5 years	19.1	(0.5)	1.3	(0.4)
5–11 years	21.2	(0.6)	1.0	(0.1)
12–17 years	27.4	(0.3)	0.9	(0.2)
18–24 years	28.9	(0.2)	2.3	(0.2)
25–44 years	27.4	(0.1)	2.0	(0.1)
45–64 years	23.7	(0.2)	1.6	(0.1)
65+ years	18.6	(0.4)	1.2	(0.2)
All	24.8	(0.1)	1.7	(0.1)

Diagnosis by age of patient

Tables 5.4(a) and 5.4(b) present the highest ranked dental diagnoses by age of patient. Just over half of all patients have either recall/maintenance (25.3%) or caries (25.1%) as their diagnosis or condition. The next highest ranked diagnoses are pulpal/periapical infection (10.5%) and failed restoration (10.1%). Overall, these four highest ranked main diagnoses or conditions account for approximately 70% of the total. The percentage of patients attending for recall/maintenance tends to decline across successive older age groups of patients, caries peaks among patients aged 18–24 years and 25–44 years, while pulpal/periapical infection and failed restorations are highest among patients aged 25–44 years and 45–64 years.

Table 5.4(a): Distribution of most common diagnoses by age of patient

	Main diagnosis/condition			
	Recall / maintenance	Caries	Pulpal / periapical	Failed restoration
Age of patient	Row %	Row %	Row %	Row %
<5 years	61.3	23.0	4.7	0.0
5–11 years	57.4	20.7	6.7	2.1
12–17 years	45.9	19.5	1.7	0.5
18–24 years	30.4	35.9	8.8	4.0
25–44 years	23.1	30.4	12.9	10.5
45–64 years	19.1	20.8	10.9	14.3
65+ years	20.1	20.5	9.2	9.4
All	25.3	25.1	10.5	10.1

Denture problems (5.8%), cuspal fractures (5.5%), periodontal diseases (4.8%) and aesthetic problems (4.2%) comprise the next highest ranked diagnoses or conditions, which, in combination with recall/maintenance, caries, pulpal/periapical infection and failed restorations, account for just over 90% of the total. Denture problems peak among the oldest age group of patients, both cuspal fractures and periodontal diseases are highest among patients aged 25–44 years and older, while aesthetic problems peak in the 12–17 years age group of patients.

Table 5.4(b): Distribution of most common diagnoses by age of patient

	Main diagnosis/condition			
	Denture problem	Cuspal fracture	Periodontal disease	Aesthetic problem
Age of patient	Row %	Row %	Row %	Row %
<5 years	0.0	1.3	0.0	0.0
5–11 years	0.5	0.0	0.2	1.4
12–17 years	0.6	0.4	0.4	9.0
18–24 years	0.0	2.0	1.6	4.0
25–44 years	1.1	4.8	5.9	4.6
45–64 years	8.1	9.0	6.1	4.4
65+ years	20.2	5.1	5.0	3.1
All	5.8	5.5	4.8	4.2

5.2 Visit characteristics

This section presents the visit characteristics of reason for visit and dental insurance status of patients treated by private general practitioners.

Reason for visit by age of patient

The reason for visit is presented in Table 5.5 by age of patient. Check-ups were visits made where there was no dental problem, emergency visits were for dental problems involving relief of pain, and other dental problems were visits made for dental problems not involving relief of pain. Overall, the highest percentage of visits was for check-ups (41.1%) but there were also substantial percentages of emergency visits (28.6%) and visits made for other dental problems (30.3%). The percentage of check-up visits was higher among children than adults.

Table 5.5: Reason for visit by age of patient

	Reason for visit		
	Check-up	Emergency	Other dental problem
Age of patient	Row %	Row %	Row %
<5 years	63.0	20.4	16.6
5–11 years	68.5	20.6	11.0
12–17 years	57.9	11.4	30.7
18–24 years	46.5	29.7	23.8
25–44 years	39.9	32.4	27.6
45–64 years	35.3	30.6	34.1
65+ years	37.0	24.4	38.7
All	41.1	28.6	30.3

Insurance status by age of patient

Table 5.6 presents insurance status by age of patient. Nearly half of the visits were made by patients who had dental insurance (47.8%). The highest percentages of patients with no dental insurance were observed in the 18–24 years (69.5%) and 25–44 years (58.3%) age groups.

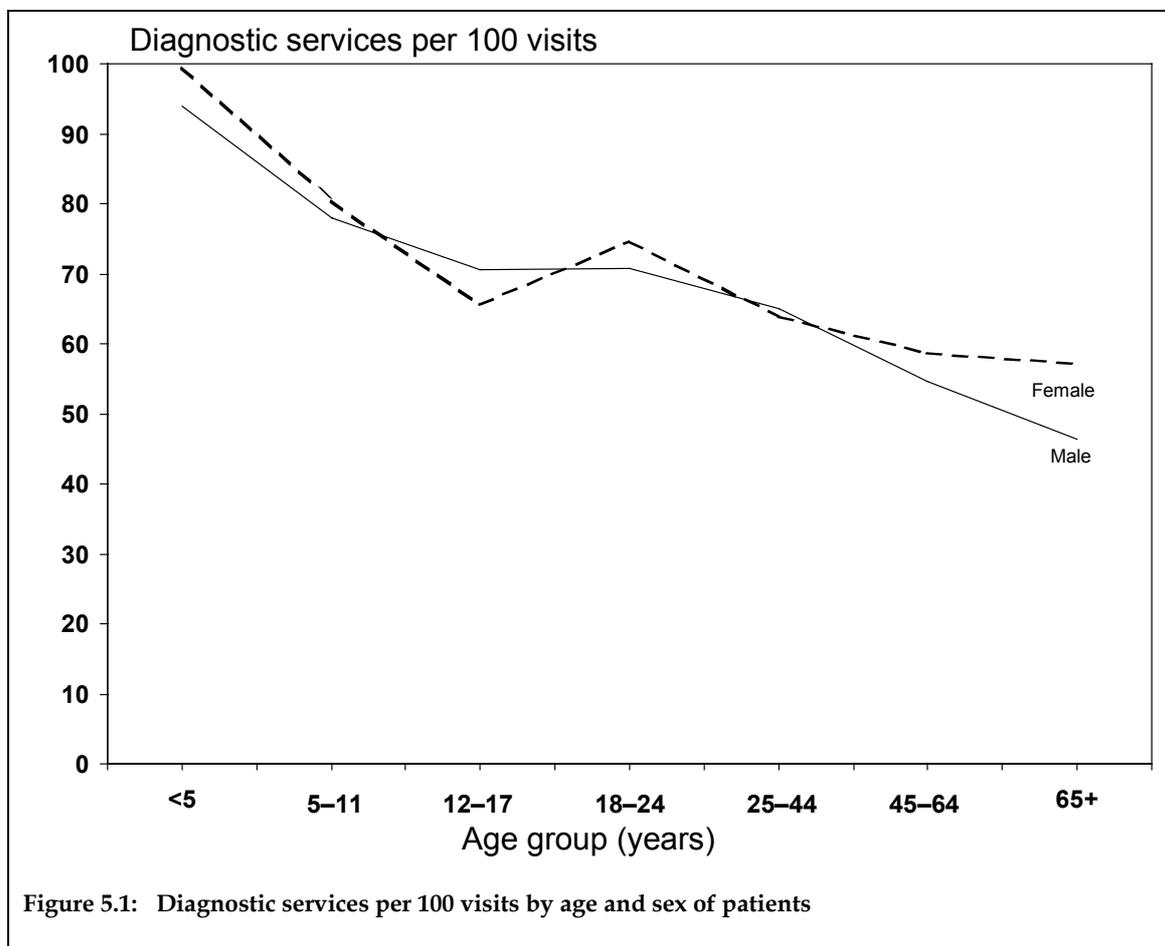
Table 5.6: Dental insurance status by age of patient

	Insurance status	
	Dental insurance	No dental insurance
Age of patient	Row %	Row %
<5 years	58.2	41.9
5–11 years	53.8	46.2
12–17 years	49.7	50.3
18–24 years	30.5	69.5
25–44 years	41.7	58.3
45–64 years	54.7	45.4
65+ years	52.6	47.4
All	47.8	52.2

5.3 Services provided

This section presents the rate of services per 100 visits for each of the 10 main areas of service by age and sex of patients treated in private general dental practice.

Diagnostic services by age and sex of patients

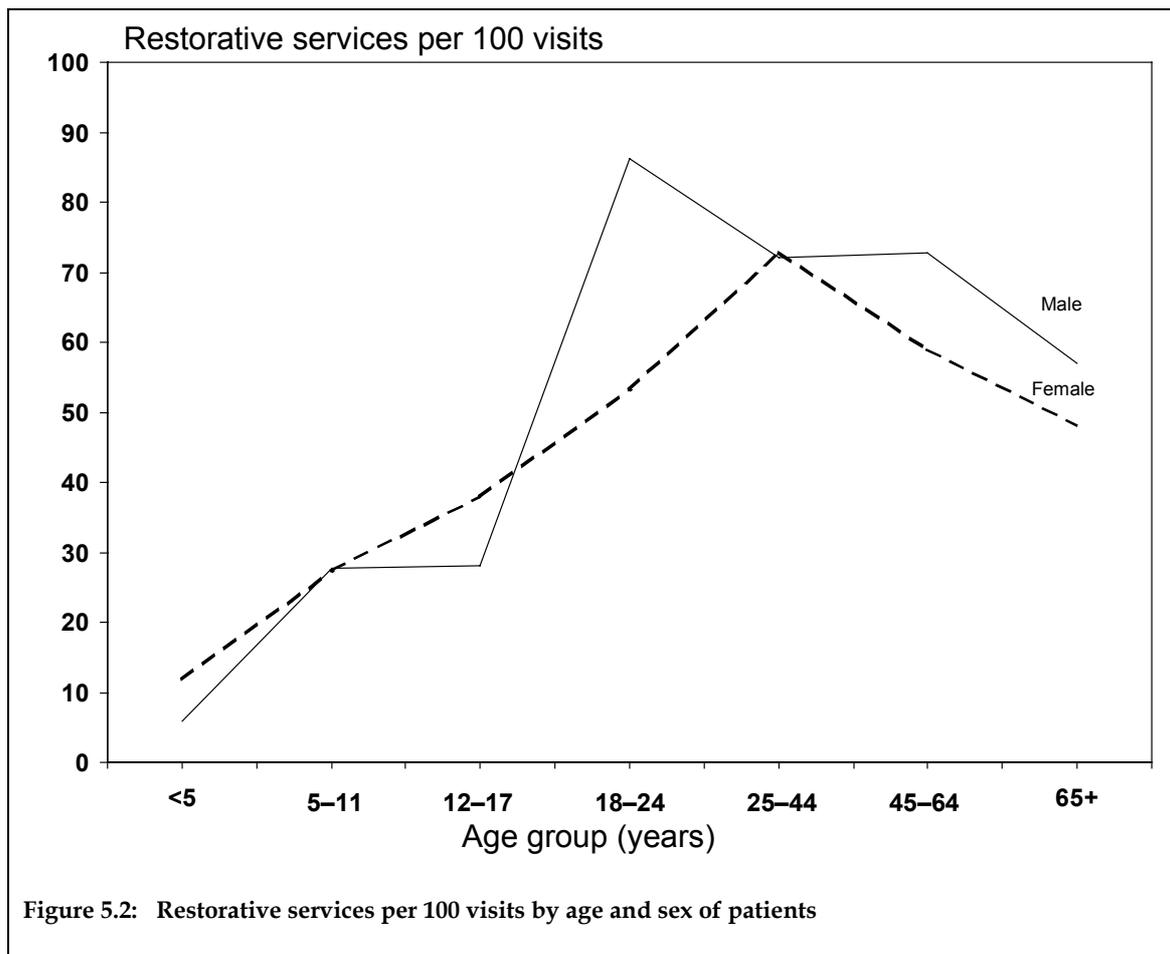


Overall, diagnostic services were provided at a rate of 61.7 per 100 visits (Table 5.7), with similar rates for male and female patients. Higher rates of diagnostic services per 100 visits were provided to younger patients (Figure 5.1).

Table 5.7: Diagnostic services per 100 visits by age and sex of patients

Age of patients	Sex of patients				All	
	Male		Female		Mean	(95% CI)
	Mean	(95% CI)	Mean	(95% CI)		
<5 years	93.9	(83.6–115.3)	99.5	(84.8–103.0)	96.5	(87.5–105.6)
5–11 years	78.0	(69.6–91.3)	80.5	(67.8–88.2)	79.2	(71.4–87.0)
12–17 years	70.6	(50.9–74.1)	62.5	(56.5–84.7)	66.0	(56.9–75.1)
18–24 years	70.7	(63.4–85.9)	74.7	(55.0–86.4)	72.9	(63.4–82.5)
25–44 years	65.0	(57.7–69.8)	63.8	(57.8–72.1)	64.3	(59.8–68.8)
45–64 years	54.7	(52.8–64.5)	58.7	(48.0–61.3)	57.2	(52.2–62.2)
65+ years	46.4	(44.9–69.2)	57.1	(36.1–56.8)	51.8	(43.1–60.5)
Total	60.4	(56.1–64.6)	62.7	(58.5–66.8)	61.7	(58.5–64.9)

Restorative services by age and sex of patients

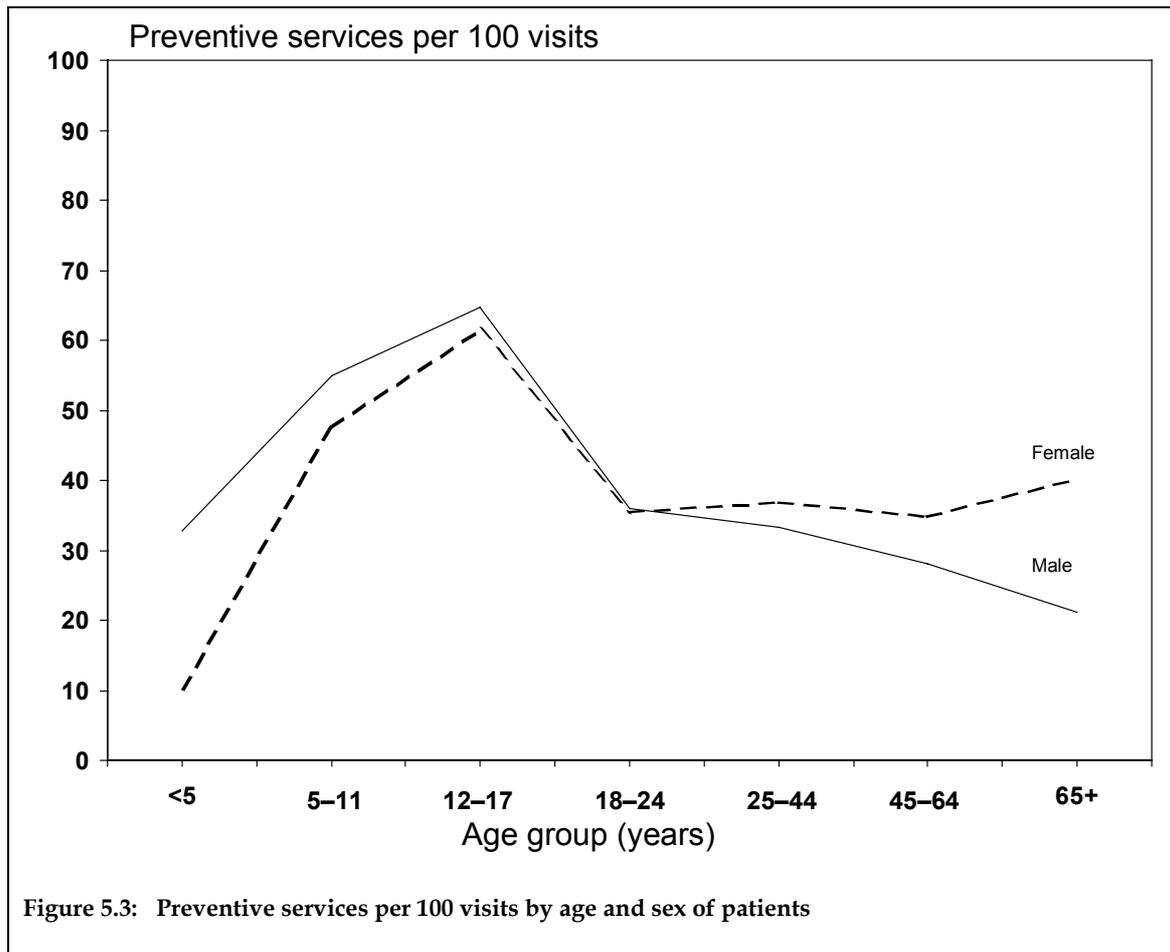


Restorative services per 100 visits are presented in Figure 5.2 and Table 5.8. Overall, restorative services were provided at a rate of 61.7 per 100 visits, with similar rates for male and female patients. Restorative services were provided at a lower rate to children and adolescents compared to adults.

Table 5.8: Restorative services per 100 visits by age and sex of patients

Age of patients	Sex of patients				All	
	Male		Female			
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
<5 years	5.9	(0.0–13.1)	11.9	(0.0–24.1)	8.8	(1.8–15.7)
5–11 years	27.8	(17.3–38.4)	27.4	(16.9–38.0)	27.7	(20.3–35.0)
12–17 years	28.0	(11.8–44.2)	38.0	(23.6–52.4)	33.7	(22.6–44.8)
18–24 years	86.3	(63.7–109.0)	53.2	(39.3–67.0)	67.7	(54.7–80.6)
25–44 years	72.1	(62.8–81.4)	72.9	(64.5–81.3)	72.6	(66.2–78.9)
45–64 years	72.7	(63.6–81.7)	59.0	(51.2–66.9)	65.4	(58.9–71.8)
65+ years	56.9	(45.0–68.8)	48.1	(37.1–59.0)	52.4	(44.3–60.5)
Total	64.9	(59.5–70.2)	59.1	(54.2–64.0)	61.7	(57.7–65.6)

Preventive services by age and sex of patients

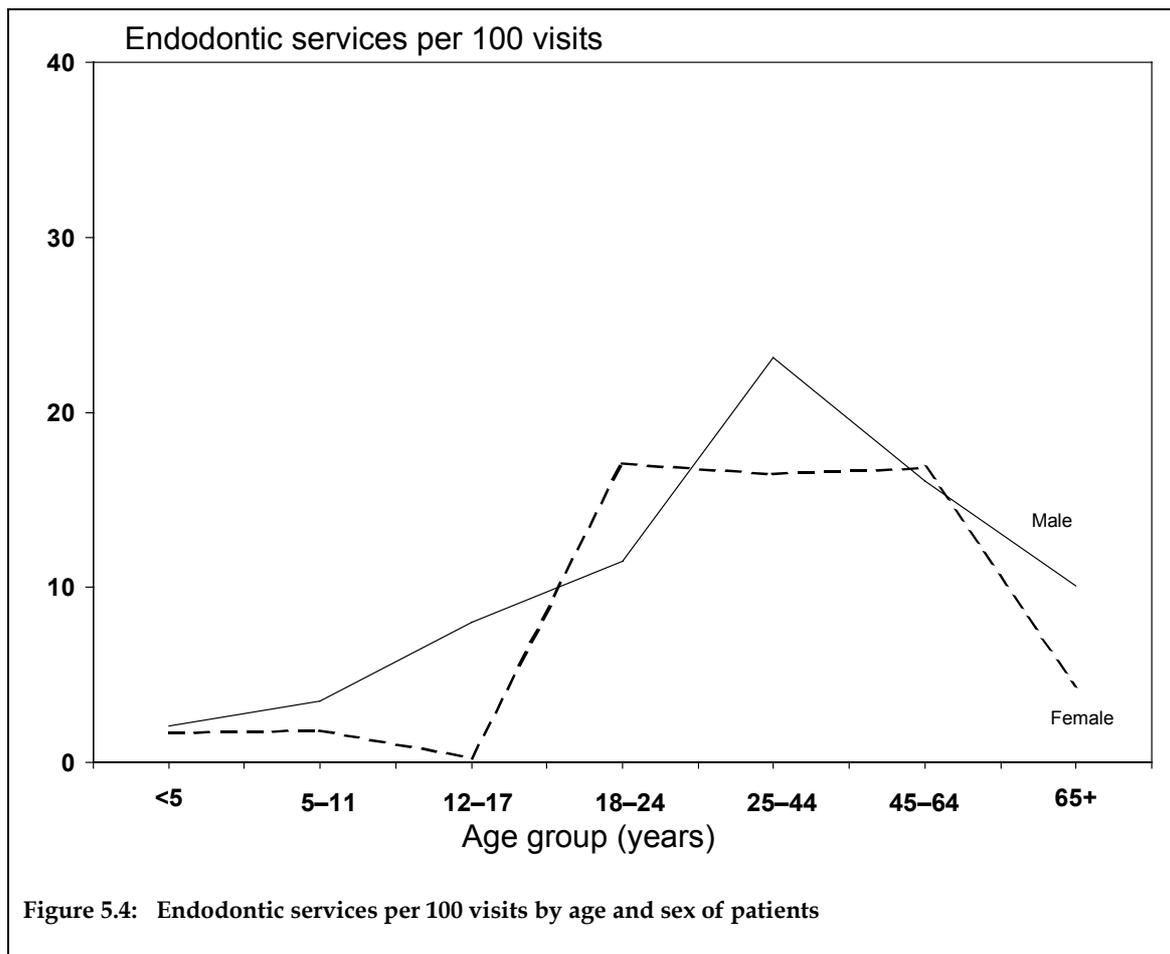


Preventive services per 100 visits are presented in Figure 5.3 and Table 5.9. Overall, preventive services were provided at a rate of 36.1 per 100 visits, with similar rates for male and female patients. The highest rate of preventive services was provided among patients aged 12–17 years, with lower rates among young children and adult patients.

Table 5.9: Preventive services per 100 visits by age and sex of patients

Age of patients	Sex of patients				All	
	Male		Female			
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
<5 years	32.8	(0.2–65.4)	10.3	(0.0–25.4)	22.1	(3.0–41.3)
5–11 years	55.0	(36.1–73.9)	47.5	(28.6–66.5)	51.5	(36.4–66.6)
12–17 years	64.7	(44.1–85.4)	61.5	(40.2–82.8)	62.9	(45.8–80.0)
18–24 years	36.0	(23.5–48.6)	35.4	(24.4–46.3)	35.7	(26.8–44.6)
25–44 years	33.3	(27.8–38.8)	36.8	(32.1–41.5)	35.3	(31.4–39.1)
45–64 years	28.1	(23.4–32.9)	34.8	(28.9–40.7)	31.8	(27.3–36.2)
65+ years	21.1	(14.0–28.1)	40.2	(27.9–52.6)	30.8	(23.3–38.3)
Total	33.7	(29.5–37.8)	38.0	(34.1–42.0)	36.1	(32.6–39.6)

Endodontic services by age and sex of patients

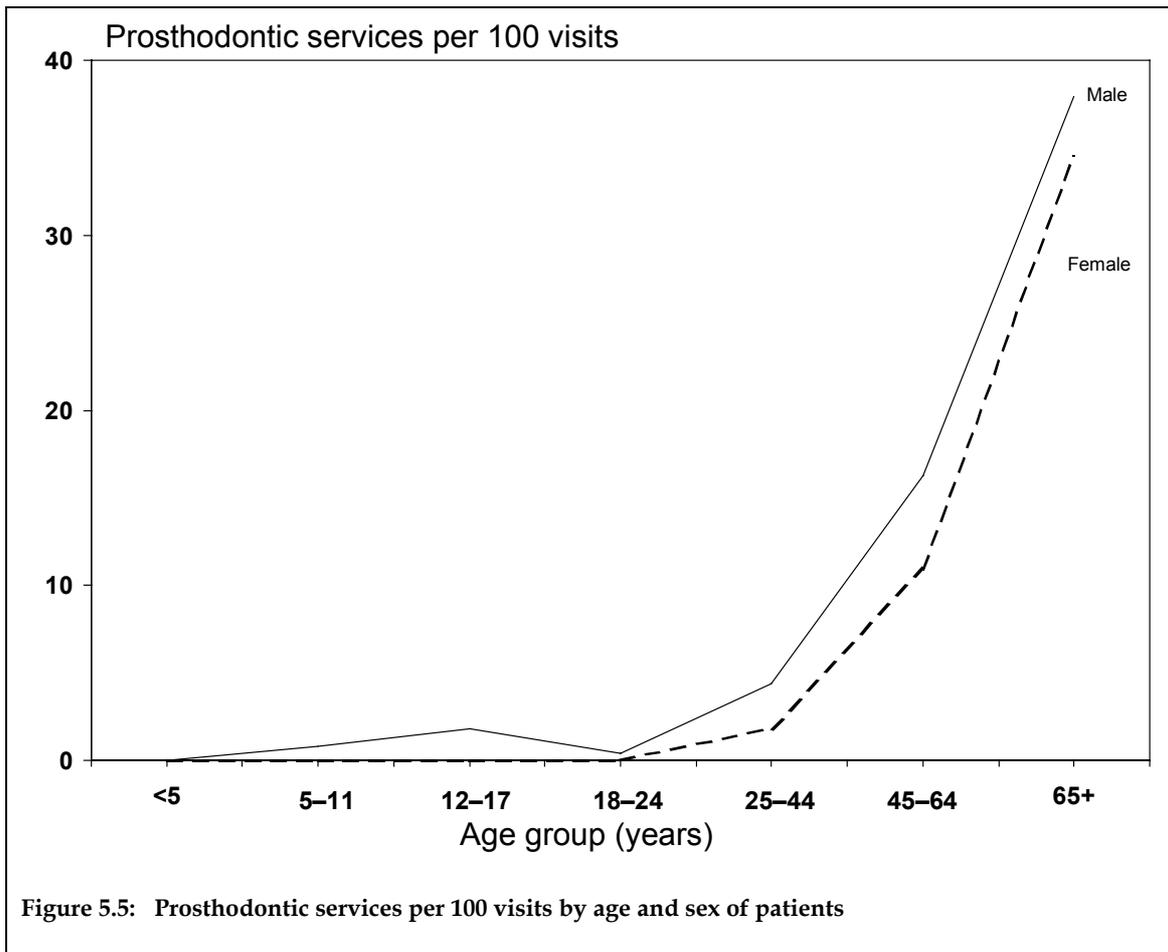


Endodontic services per 100 visits are presented in Figure 5.4 and Table 5.10. Overall, endodontic services were provided at a rate of 14.4 per 100 visits, with similar rates among male and female patients. The rate of endodontic services per 100 visits was highest among patients aged 25–44 and 45–64 years.

Table 5.10: Endodontic services per 100 visits by age and sex of patients

Age of patients	Sex of patients				All	
	Male		Female			
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
<5 years	2.1	(0.0–6.3)	1.7	(0.0–5.1)	1.9	(0.0–4.7)
5–11 years	3.5	(0.0–8.3)	1.8	(0.0–4.4)	2.7	(0.0–5.5)
12–17 years	8.0	(0.0–16.9)	0.3	(0.0–8.2)	3.6	(0.0–7.5)
18–24 years	11.5	(4.4–18.5)	17.1	(5.7–28.5)	14.7	(7.3–22.0)
25–44 years	23.1	(17.5–28.7)	16.5	(11.9–21.1)	19.3	(15.6–23.1)
45–64 years	16.1	(11.7–20.5)	16.8	(12.1–21.5)	16.4	(13.1–19.8)
65+ years	10.1	(4.5–15.7)	4.4	(1.2–7.6)	7.2	(4.1–10.3)
Total	15.6	(12.9–18.4)	13.3	(10.7–15.9)	14.4	(12.4–16.4)

Prosthodontic services by age and sex of patients

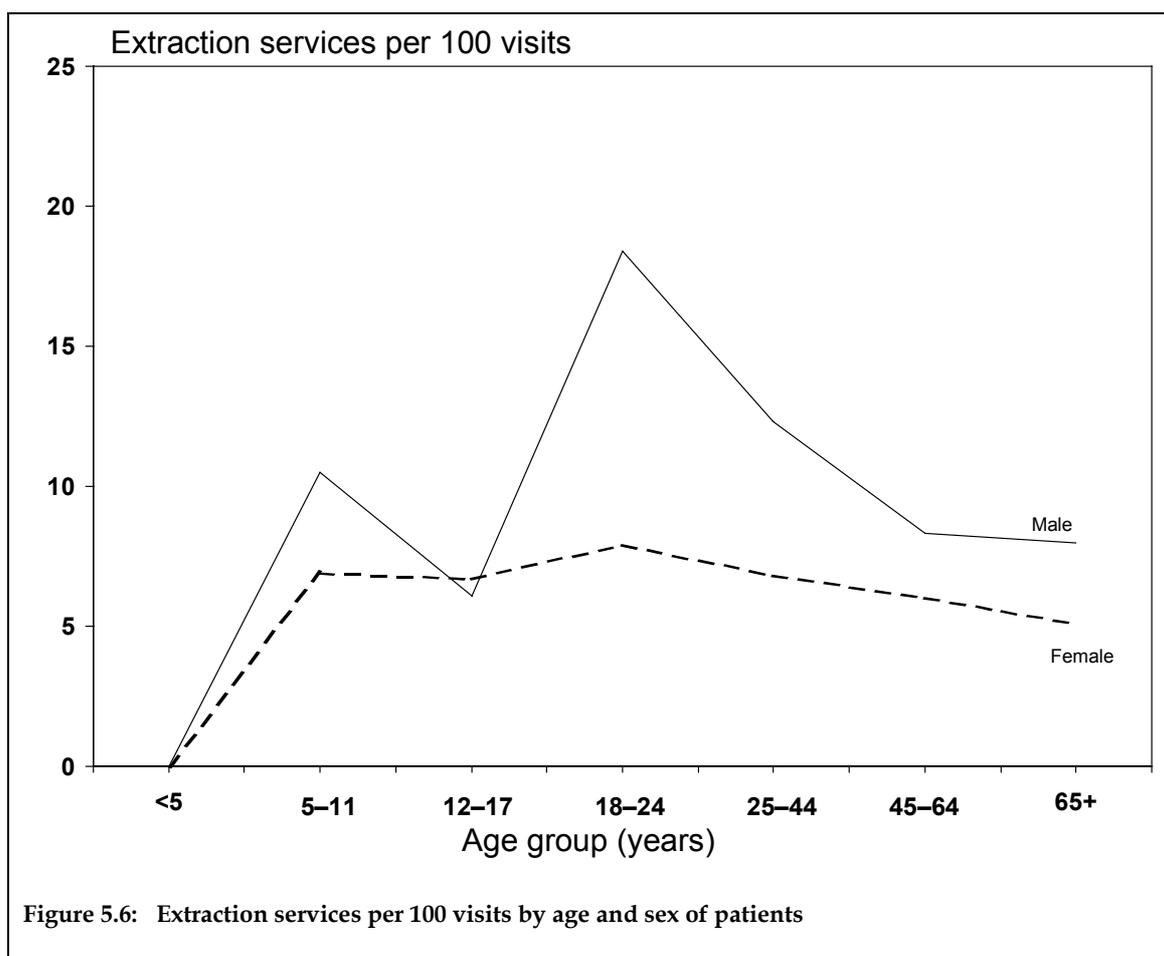


Prosthodontic services per 100 visits are presented in Figure 5.5 and Table 5.11. Overall, prosthodontic services were provided at a rate of 10.2 per 100 visits, with similar rates for male and female patients. The rate of prosthodontic services per 100 visits was low among children, adolescents and young adults. The highest rate of prosthodontic services per 100 visits was observed among patients aged 65 years or more.

Table 5.11: Prosthodontic services per 100 visits by age and sex of patients

Age of patients	Sex of patients				All	
	Male		Female			
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
<5 years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
5-11 years	0.8	(0.0-2.4)	0.0	(0.0-0.0)	0.4	(0.0-1.3)
12-17 years	1.8	(0.0-4.5)	0.0	(0.0-0.0)	0.8	(0.0-1.9)
18-24 years	0.4	(0.0-1.2)	0.0	(0.0-0.0)	0.2	(0.0-0.5)
25-44 years	4.4	(0.2-8.5)	1.8	(0.6-3.0)	2.9	(0.9-4.9)
45-64 years	16.3	(7.8-24.7)	10.9	(7.4-14.4)	13.4	(9.0-17.9)
65+ years	37.9	(22.0-53.7)	34.5	(22.6-46.4)	36.2	(26.1-46.3)
Total	12.3	(8.5-16.1)	8.5	(6.7-10.4)	10.2	(8.2-12.3)

Extraction services by age and sex of patients

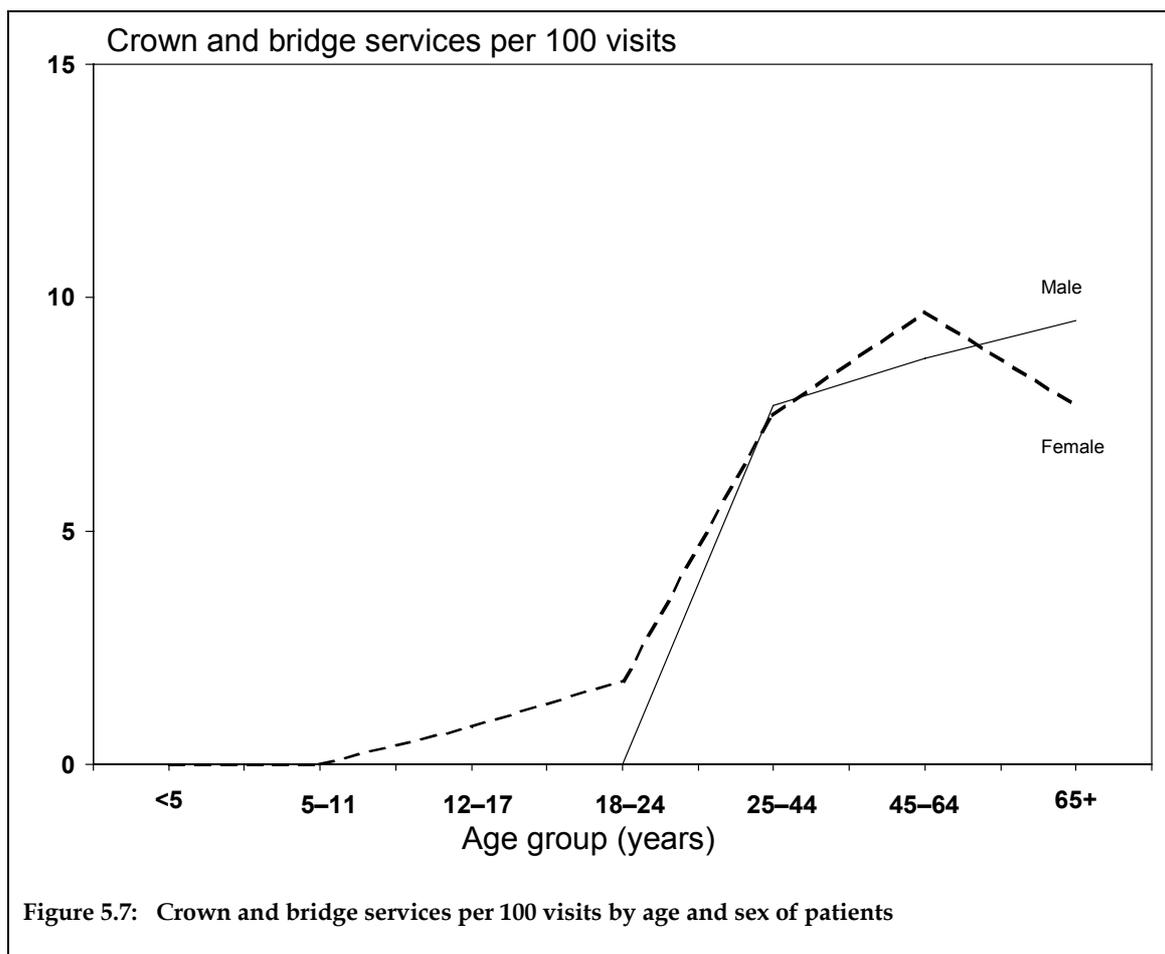


Extraction services per 100 visits are presented in Figure 5.6 and Table 5.12. Overall, extraction services were provided at a rate of 8.1 per 100 visits, with a higher rate of extraction services per 100 visits observed for male patients compared to female patients. No extractions were provided to young children aged less than 5 years, but there was little variation in extraction rates among older children, adolescents and adult patients, with the exception of a high extraction rate among 18-24-year-old males.

Table 5.12: Extraction services per 100 visits by age and sex of patients

Age of patients	Sex of patients					
	Male		Female		All	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
<5 years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
5-11 years	10.5	(2.4-18.6)	6.9	(1.6-12.8)	8.8	(3.8-13.8)
12-17 years	6.1	(0.3-11.9)	6.7	(1.4-11.9)	6.4	(2.5-10.3)
18-24 years	18.4	(5.5-31.2)	7.9	(1.5-14.4)	12.5	(5.7-19.3)
25-44 years	12.3	(8.6-15.9)	6.8	(4.6-9.0)	9.1	(7.2-11.1)
45-64 years	8.3	(5.4-11.3)	6.0	(3.5-8.5)	7.1	(5.1-9.1)
65+ years	8.0	(3.6-12.3)	5.1	(2.6-7.7)	6.5	(3.9-9.1)
Total	10.1	(8.0-12.2)	6.5	(5.2-7.8)	8.1	(6.9-9.4)

Crown and bridge services by age and sex of patients



Crown and bridge services per 100 visits are presented in Figure 5.7 and Table 5.13. Overall, crown and bridge services were provided at a rate of 7.1 per 100 visits, with little difference in crown and bridge rates per 100 visits between male and female patients. No crown and bridge services were provided to patients aged less than 5 or 5-11 years, and only low rates of crown and bridge services per 100 visits were provided to patients aged 12-17 and 18-24 years. The highest rate of crown and bridge services per 100 visits was provided to patients aged 25-44 years and older.

Table 5.13: Crown and bridge services per 100 visits by age and sex of patients

Age of patients	Sex of patients					
	Male		Female		All	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
<5 years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
5-11 years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
12-17 years	0.0	(0.0-0.0)	0.8	(0.0-2.3)	0.4	(0.0-1.3)
18-24 years	0.0	(0.0-0.0)	1.8	(0.0-3.7)	1.0	(0.0-2.1)
25-44 years	7.7	(4.3-11.1)	7.5	(4.1-10.9)	7.6	(4.9-10.3)
45-64 years	8.7	(5.7-11.7)	9.7	(6.0-13.4)	9.2	(6.8-11.6)
65+ years	9.5	(2.2-16.7)	7.7	(3.6-11.8)	8.6	(4.5-12.6)
Total	7.2	(5.2-9.2)	7.1	(5.3-9.0)	7.1	(5.7-8.6)

General/miscellaneous services by age and sex of patients

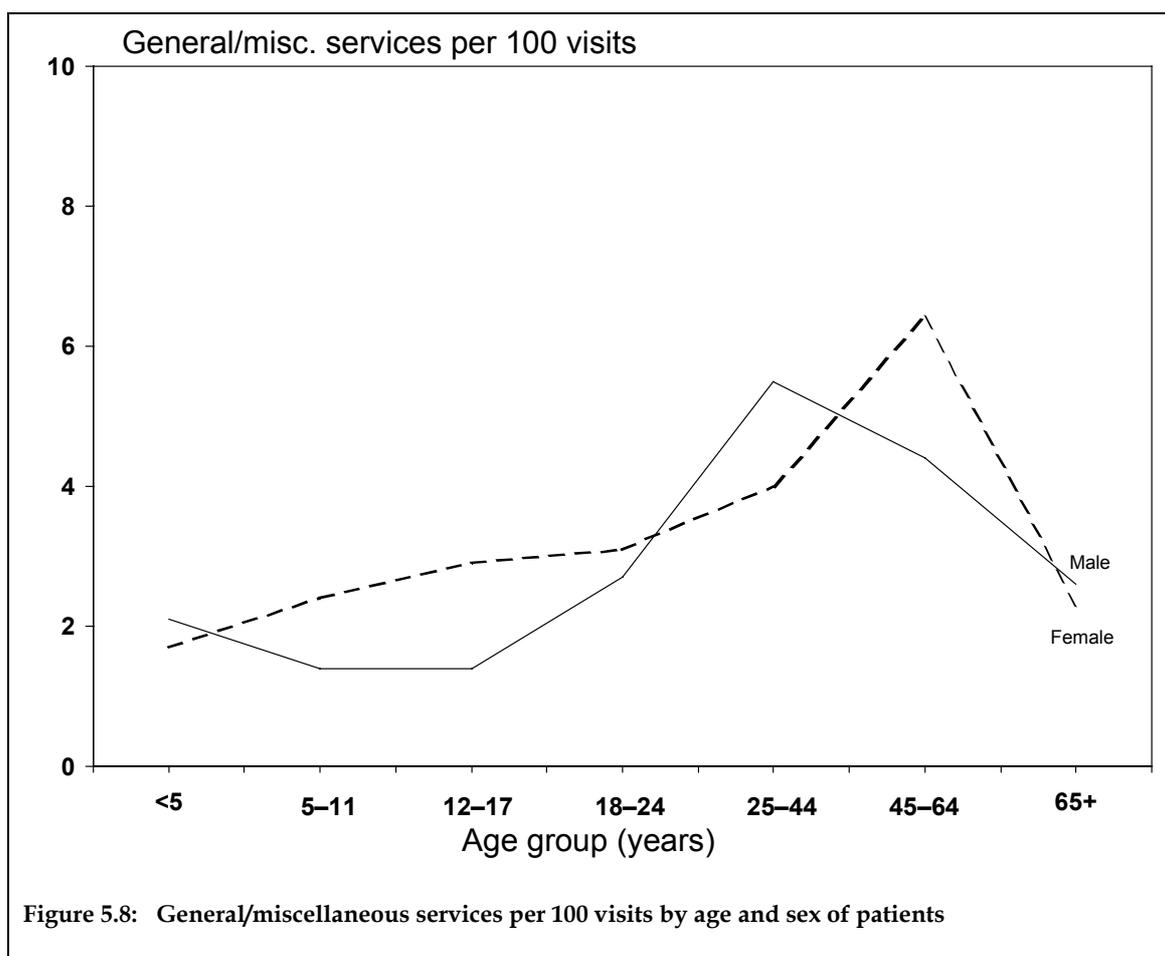


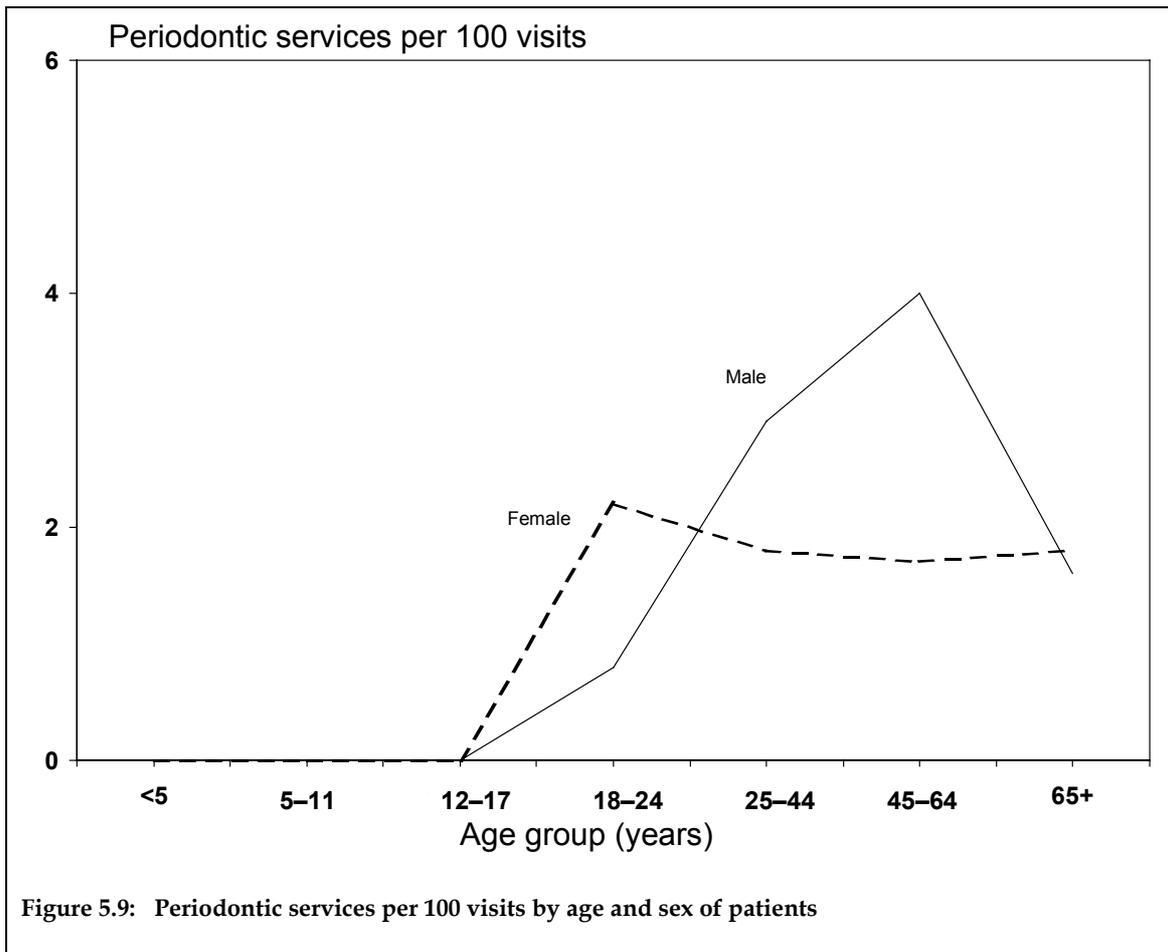
Figure 5.8: General/miscellaneous services per 100 visits by age and sex of patients

General/miscellaneous services per 100 visits are presented in Figure 5.8 and Table 5.14. Overall, general/miscellaneous services were provided at a rate of 4.3 per 100 visits, with little difference in the rate of general/miscellaneous services per 100 visits between male and female patients. Low rates of general/miscellaneous services were provided among all age groups of patients, with the highest rate observed among patients aged 45-64 years.

Table 5.14: General/miscellaneous services per 100 visits by age and sex of patients

Age of patients	Sex of patients				All	
	Male		Female		Mean	(95% CI)
	Mean	(95% CI)	Mean	(95% CI)		
<5 years	2.1	(0.0-6.3)	1.7	(0.0-5.1)	1.9	(0.0-4.7)
5-11 years	1.4	(0.0-3.7)	2.4	(0.0-4.8)	1.9	(0.2-3.6)
12-17 years	1.4	(0.0-3.6)	2.9	(0.0-6.7)	2.2	(0.0-4.6)
18-24 years	2.7	(0.0-5.4)	3.1	(0.7-5.5)	2.9	(1.1-4.7)
25-44 years	5.5	(2.7-8.3)	4.0	(2.4-5.5)	4.6	(3.1-6.2)
45-64 years	4.4	(2.3-6.5)	6.4	(4.1-8.8)	5.5	(3.7-7.2)
65+ years	2.6	(0.5-4.8)	2.3	(0.6-3.9)	2.4	(1.1-3.8)
Total	4.1	(2.8-5.4)	4.4	(3.3-5.5)	4.3	(3.4-5.2)

Periodontic services by age and sex of patients

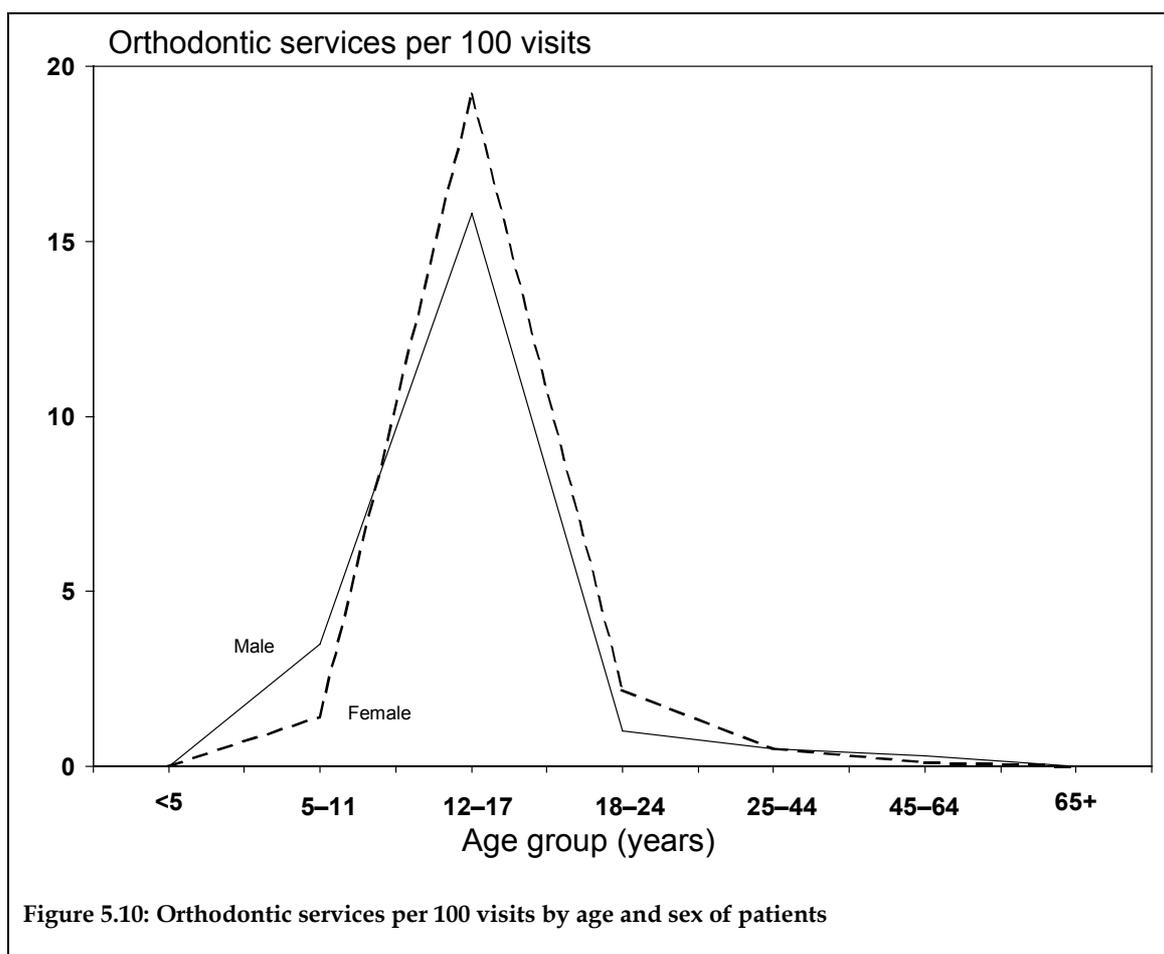


Periodontic services per 100 visits are presented in Figure 5.9 and Table 5.15. Overall, periodontic services were provided at a rate of 2.0 per 100 visits, with little difference in periodontic service rates per 100 visits between male and female patients, except for an unusually high rate among 45-64-year-old males. No periodontic services were provided to children or adolescent patients. Low rates were also observed among all adult patients, with the highest rate among patients aged 45-64 years.

Table 5.15: Periodontic services per 100 visits by age and sex of patients

Age of patients	Sex of patients				All	
	Male		Female			
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
<5 years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
5-11 years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
12-17 years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
18-24 years	0.8	(0.0-2.4)	2.2	(0.0-5.2)	1.6	(0.0-3.4)
25-44 years	2.9	(1.1-4.7)	1.8	(0.7-2.9)	2.3	(1.3-3.3)
45-64 years	4.0	(2.3-5.8)	1.7	(0.3-3.1)	2.8	(1.6-4.0)
65+ years	1.6	(0.0-3.5)	1.8	(0.2-3.4)	1.7	(0.4-2.9)
Total	2.5	(1.6-3.5)	1.6	(0.8-2.3)	2.0	(1.3-2.7)

Orthodontic services by age and sex of patients



Orthodontic services per 100 visits are presented in Figure 5.10 and Table 5.16. Overall, orthodontic services were provided at a rate of 1.5 per 100 visits, with little difference in orthodontic rates per 100 visits between male and female patients. No orthodontic services were provided to patients aged less than 5 years or to patients aged 65 years or more. Low rates of orthodontic services per 100 visits were provided to most other age groups, except for patients aged 12-17 years where the highest rate of orthodontic services per 100 visits was observed.

Table 5.16: Orthodontic services per 100 visits by age and sex of patients

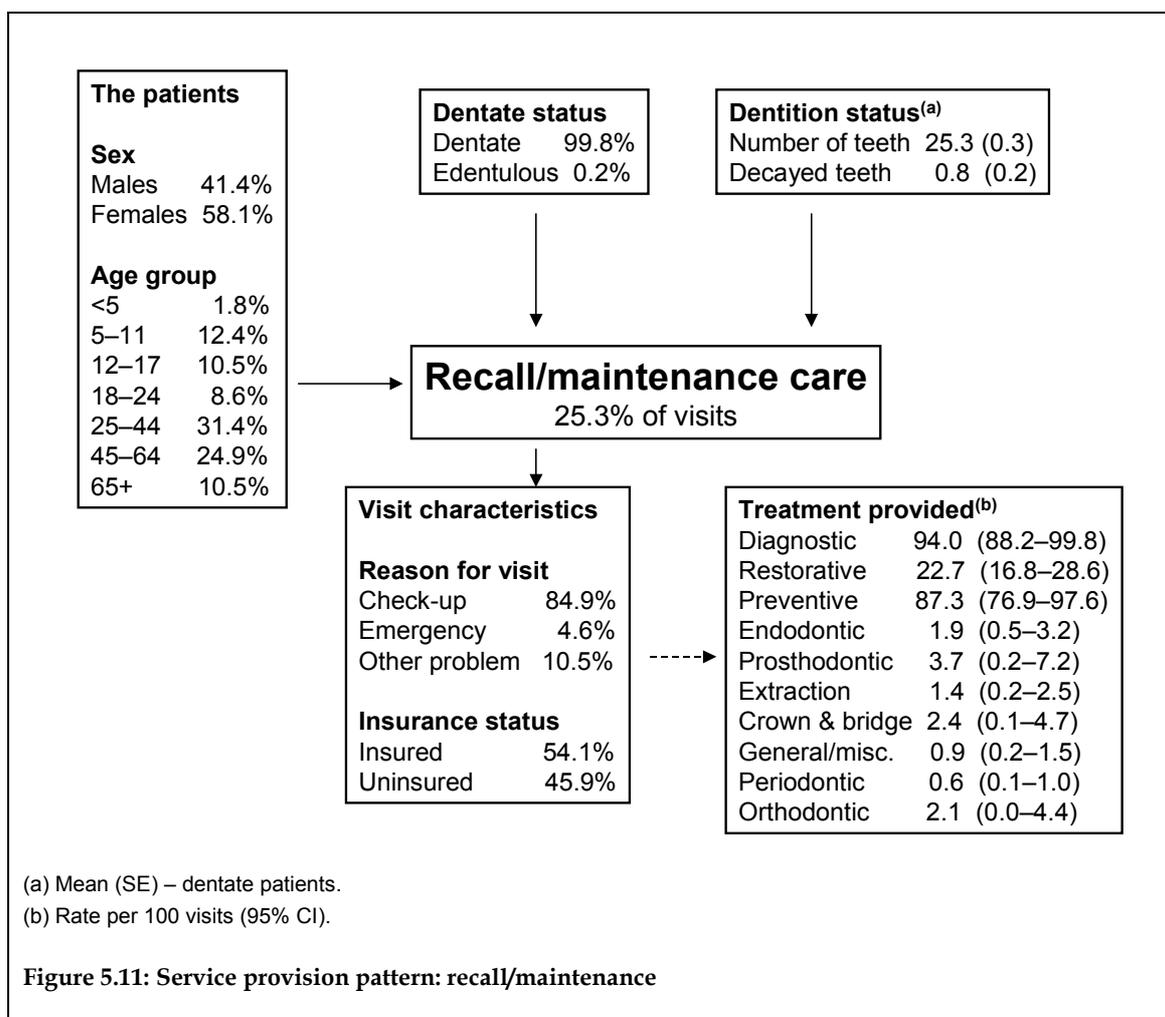
Age of patients	Sex of patients					
	Male		Female		All	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
<5 years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
5-11 years	3.5	(0.1-6.9)	1.4	(0.0-3.5)	2.5	(0.4-4.6)
12-17 years	15.8	(6.2-25.4)	19.2	(8.8-29.5)	17.7	(9.7-25.6)
18-24 years	1.0	(0.0-3.0)	2.2	(0.0-5.5)	1.7	(0.0-4.3)
25-44 years	0.5	(0.0-1.3)	0.5	(0.0-1.1)	0.5	(0.0-1.1)
45-64 years	0.3	(0.0-0.7)	0.1	(0.0-0.4)	0.2	(0.0-0.4)
65+ years	0.0	(0.0-0.0)	0.0	(0.0-0.0)	0.0	(0.0-0.0)
Total	1.4	(0.5-2.2)	1.6	(0.7-2.6)	1.5	(0.7-2.3)

5.4 Patterns of service provision

Patterns of service provision are presented in this section for the most common dental diagnoses.

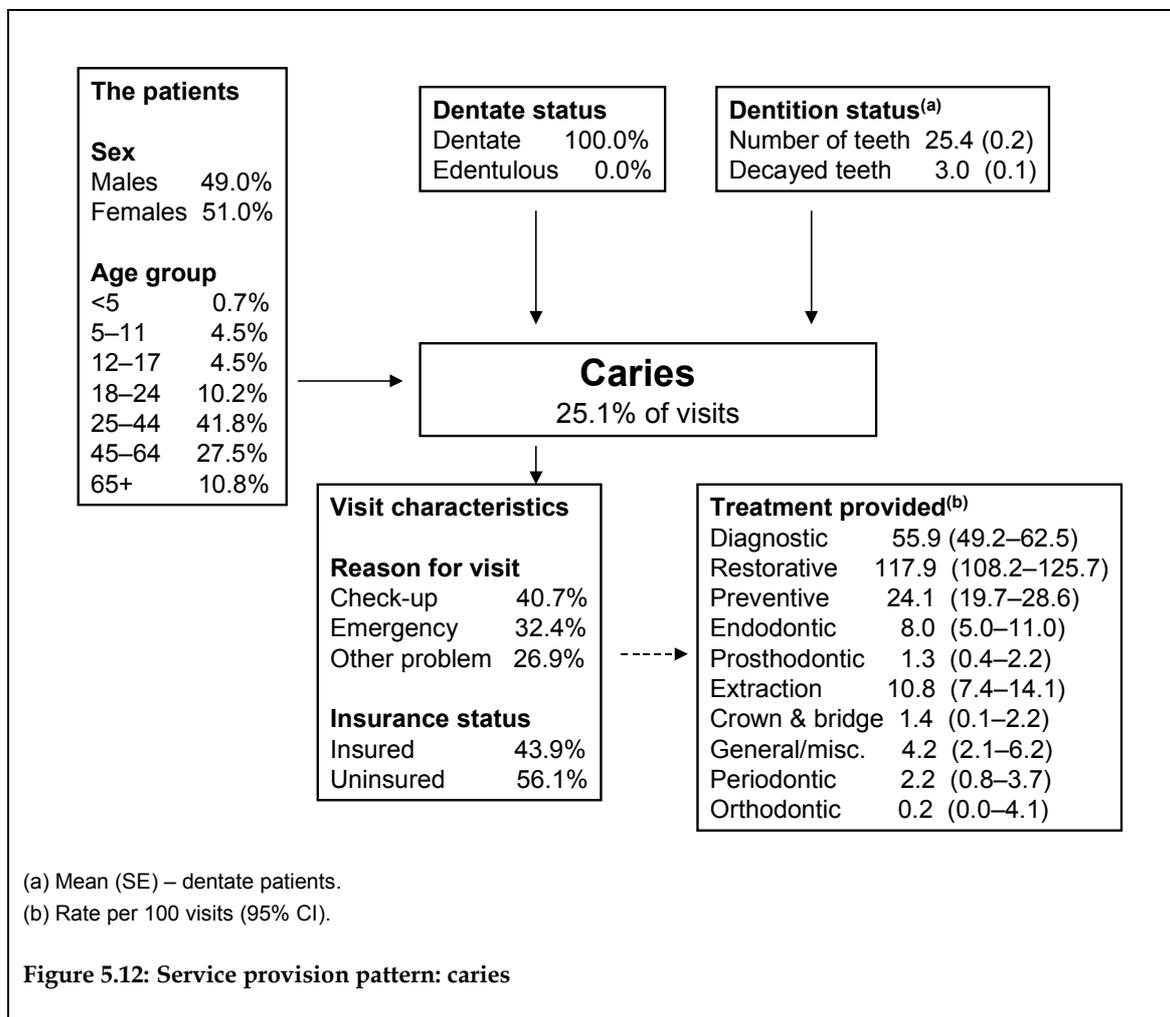
Recall/maintenance

The pattern of service provision is presented in Figure 5.11 for the main presenting condition of recall/maintenance care. Recall/maintenance care comprised 25.3% of visits. Of the patients attending for recall/maintenance care, the majority were female (58.1%) and 31.4% were aged 25–44 years. The majority were dentate (99.8%) and the dentate patients had a mean number of 25.3 teeth, of which 0.8 were decayed. The majority of visits were for check-ups (84.9%) and 54.1% of patients had dental insurance. Emergency visits were classified on the basis of requiring relief of pain. The small percentage (4.6%) of patients with emergency as the reason for visit reflects some patients having had pain when they attended for their recall visit. The treatment provided was dominated by diagnostic (94.0 services per 100 visits) and preventive services (87.3 services per 100 visits).



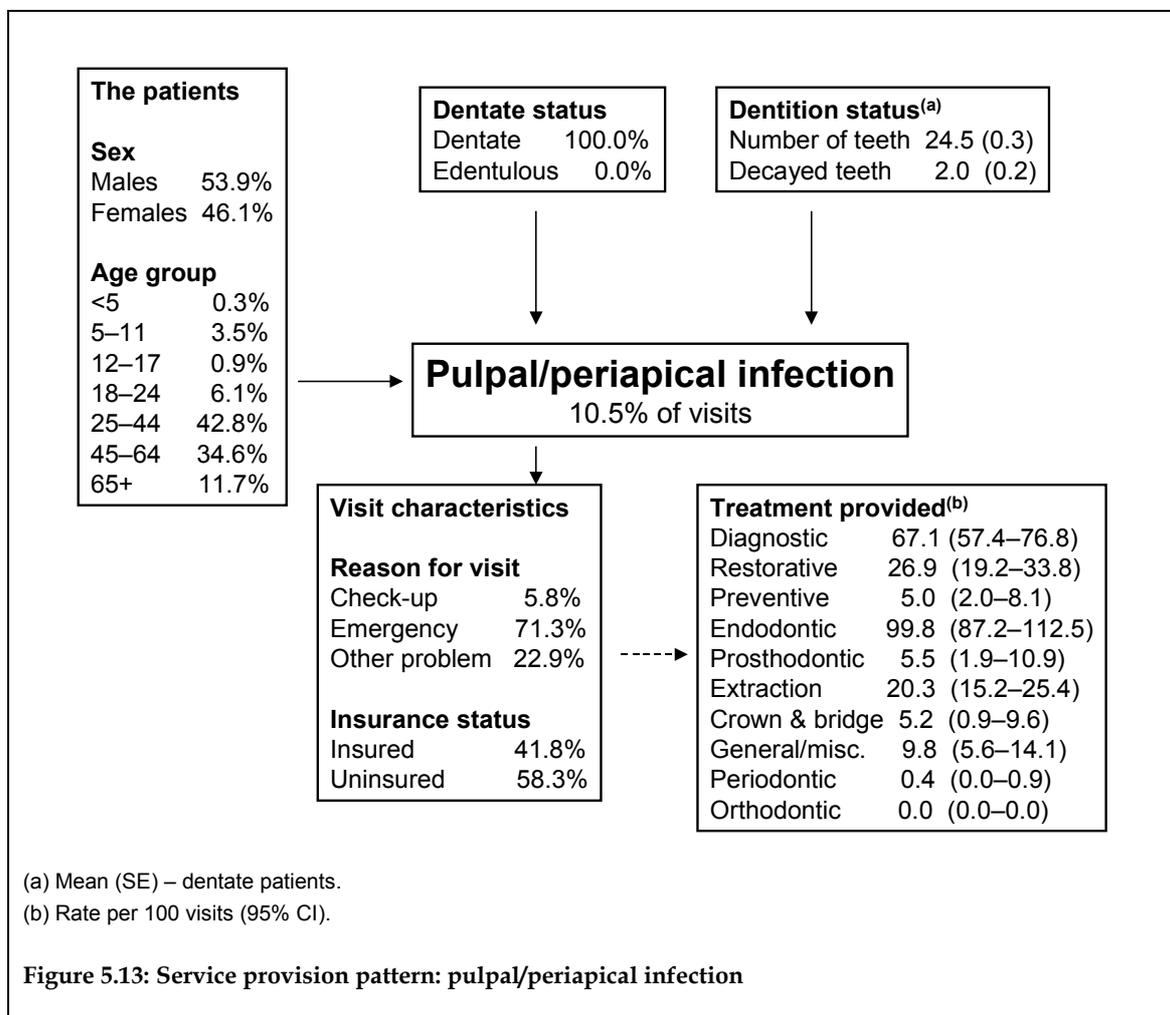
Caries

The pattern of service provision is presented in Figure 5.12 for the main presenting condition of dental caries. Patients with diagnoses of caries as their main presenting condition comprised 25.1% of the visits. Of the patients attending with caries as their main condition, there were similar percentages of males (49.0%) and females (51.0%), and small percentages of children; the highest percentage of patients was the 25–44 years age group (41.8%). Patients with caries must be dentate (100%), and these dentate patients had a mean number of 25.4 teeth, of which 3.0 were decayed. There was a high percentage of patients in all categories of reason for visit, with the highest being check-up (40.7%). Dental insurance was held by 43.9% of patients with caries as their main condition. The treatment provided to caries patients was dominated by restorative services (117.9 services per 100 visits), with diagnostic services (55.9 services per 100 visits) having the second highest rate of service provision among caries patients.



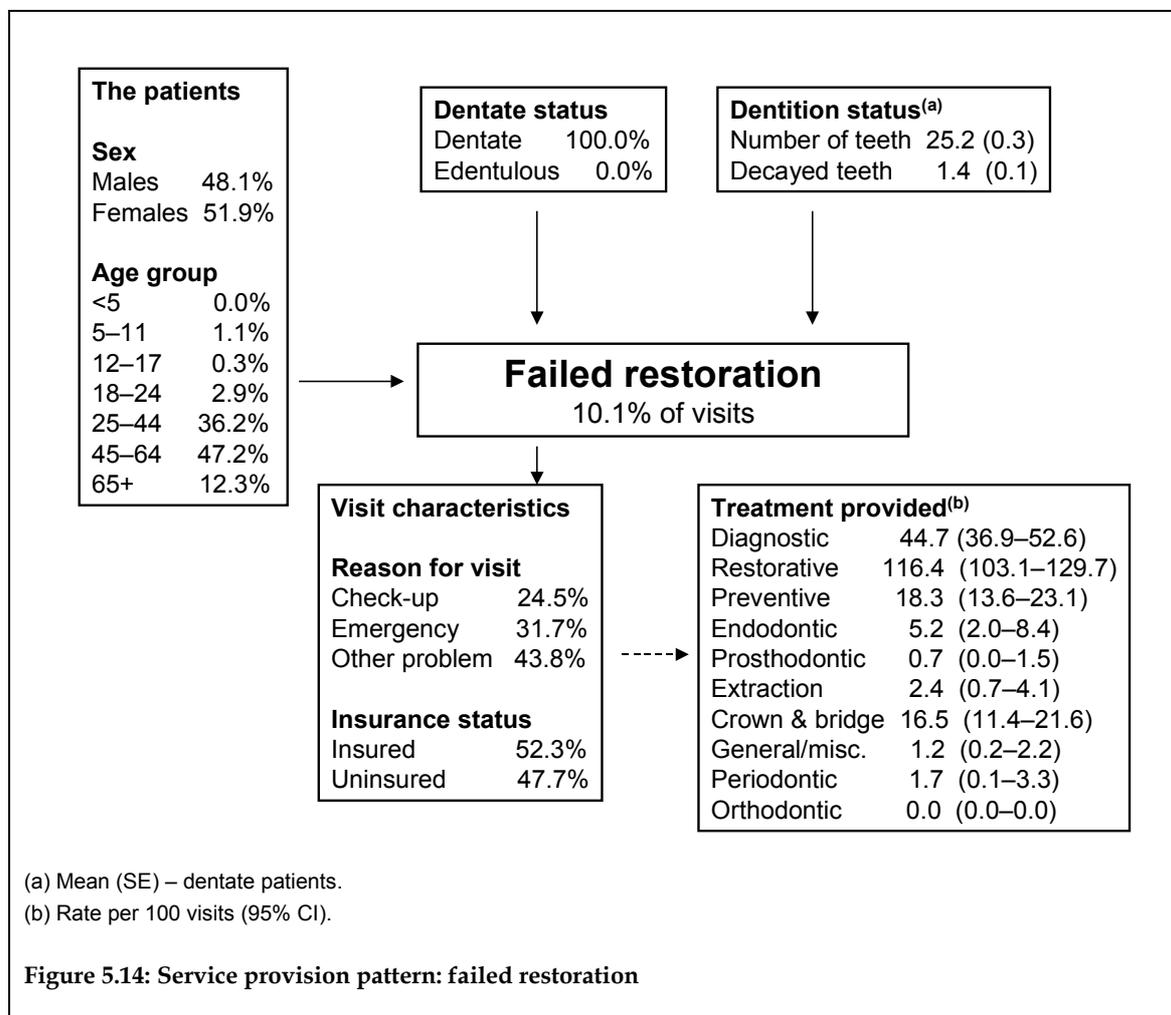
Pulpal/periapical infection

The pattern of service provision is presented in Figure 5.13 for the main presenting condition of pulpal/periapical infection. Patients who presented with pulpal/periapical infection as their main condition comprised 10.5% of visits. There were similar percentages of male (53.9%) and female (46.1%) patients with pulpal/periapical infection. Most patients with pulpal/periapical infection were adults, with the highest percentages in the 25–44 years (42.8%) and 45–64 years (34.6%) age groups. All patients with pulpal/periapical infection must be dentate (100%) and these dentate patients had a mean of 24.5 teeth, of which 2.0 were decayed. The majority of pulpal/periapical patients attended for emergency visits (71.3%) and 41.8% had dental insurance. Treatment provided to patients with pulpal/periapical infection was characterised by high rates of endodontic treatment (99.8 services per 100 visits) and diagnostic services (67.1 services per 100 visits), as well as relatively high extraction rates (20.3 services per 100 visits) compared to most other diagnoses or conditions.



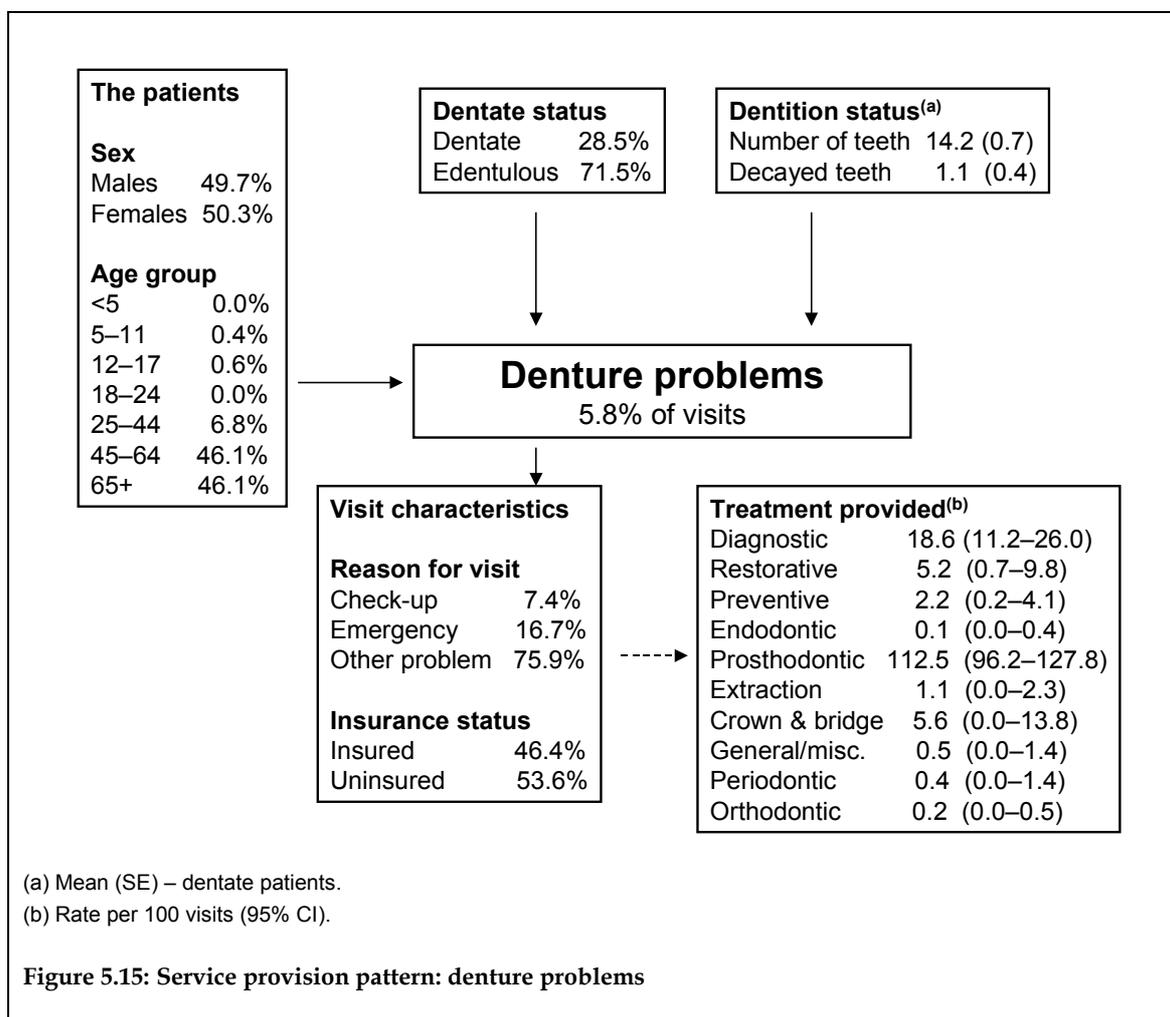
Failed restoration

The pattern of service provision is presented in Figure 5.14 for the main presenting condition of failed restoration. Patients attending with failed restoration as their main condition comprised 10.1% of visits. There were similar percentages of male (48.1%) and female (51.9%) patients with failed restorations, with a high percentage of adult patients, particularly in the 25–44 years (36.2%) and 45–64 years (47.2%) age groups. All patients with failed restorations must be dentate (100%) and these dentate patients had 25.3 teeth on average, with 1.4 decayed teeth. There were high percentages of patients in each category of reason for visit, with the highest in the category of other dental problems (43.8%) which did not involve relief of pain. Approximately half of the patients with failed restorations had dental insurance (52.3%). The treatment of patients with failed restorations was dominated by restorative care (116.4 services per 100 visits), followed by diagnostic items (44.7 services per 100 visits), as well as relatively high rates of crown and bridge treatment (16.5 services per 100 visits) compared to other main diagnoses or conditions.



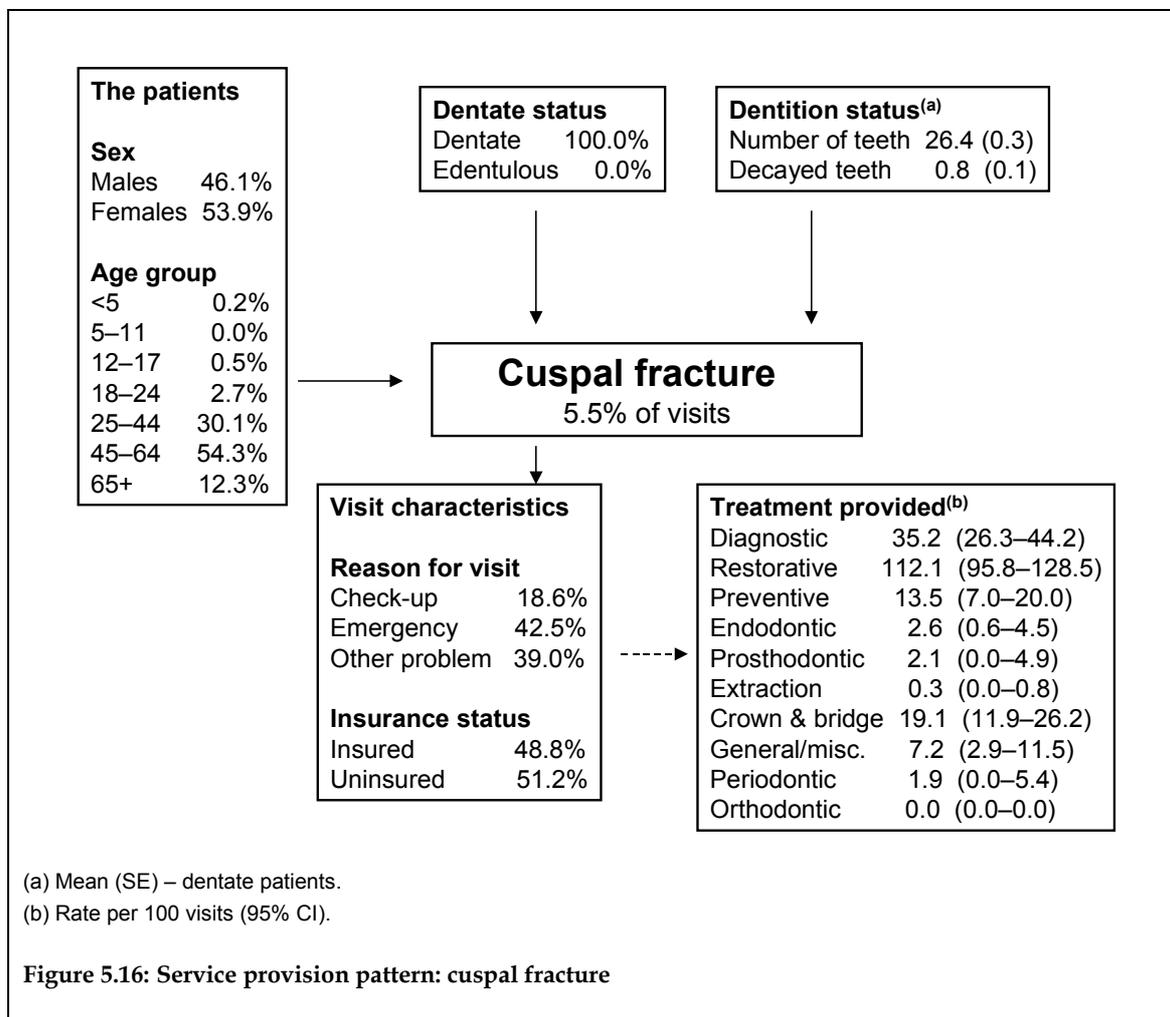
Denture problems

The pattern of service provision is presented in Figure 5.15 for the main presenting condition of denture problems. Denture problems accounted for 5.8% of visits. There were similar percentages of male (49.7%) and female (50.3%) patients with denture problems, with most patients in the 45–64 years (46.1%) and 65+ years (46.1%) age groups. The majority of patients with denture problems were edentulous (71.5%). The average number of teeth among the 28.5% of denture problem patients who were dentate was 14.2, with 1.1 decayed teeth. The majority of patients with denture problems as their main condition attended for the reason of other dental problems (75.9%) not involving relief of pain, and 46.4% of denture problem patients had dental insurance. The treatment provided to patients with denture problems was dominated by prosthodontic care (112.5 services per 100 visits) followed by diagnostic items (18.6 services per 100 visits).



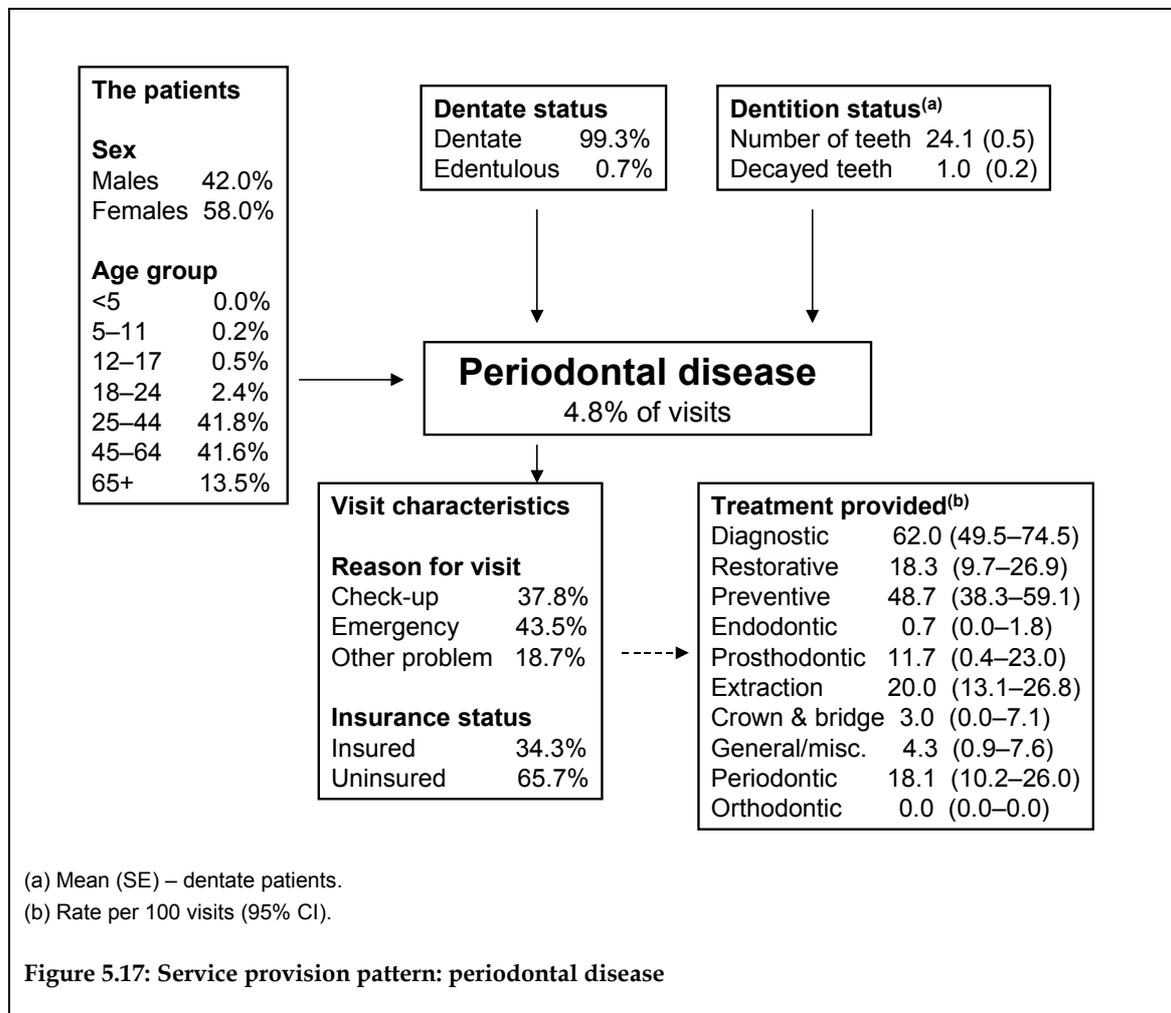
Cuspal fracture

The pattern of service provision is presented in Figure 5.16 for the main presenting condition of cuspal fracture. Patients with cuspal fracture as their main diagnosis or condition comprised 5.5% of visits. There were similar percentages of male (46.1%) and female (53.9%) patients, with the majority aged 45–64 years (54.3%). All patients with cuspal fractures must be dentate (100%) and these dentate patients had on average 26.4 teeth, of which 0.8 were decayed. The main reason for visiting by patients with cuspal fractures were emergency visits (42.5%) involving relief of pain and other dental problems (39.0%) not involving relief of pain. Just under half the patients attending with cuspal fracture as their main condition had dental insurance (48.8%). The treatment provided to patients with cuspal fractures was dominated by restorative care (112.1 services per 100 visits), followed by diagnostic items (35.2 services per 100 visits), as well as relatively high rates of crown and bridge treatment (19.1 services per 100 visits) compared to other main diagnoses or conditions.



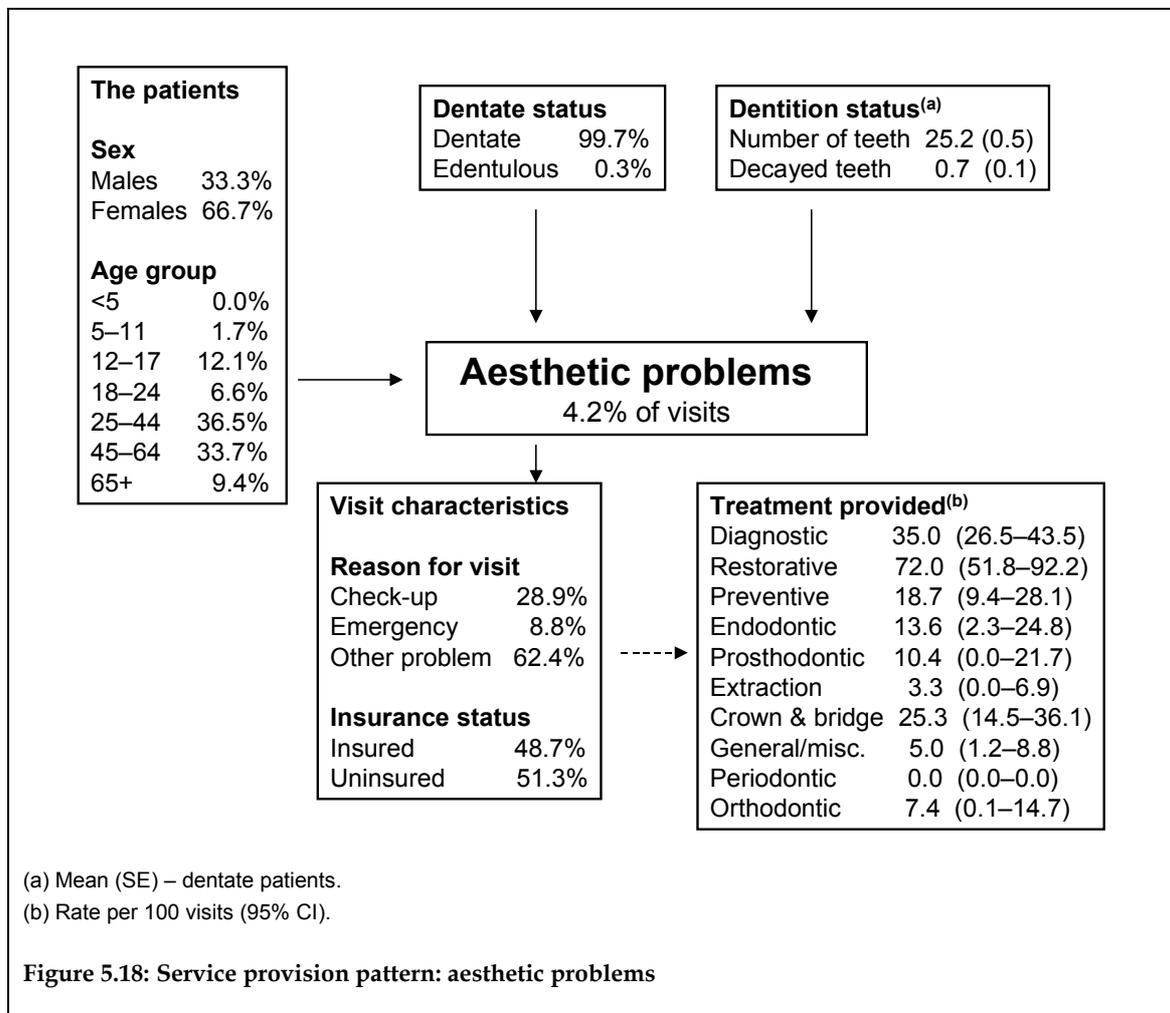
Periodontal disease

The pattern of service provision is presented in Figure 5.17 for the main presenting condition of periodontal disease. Patients presenting with periodontal disease as their main diagnosis comprised 4.8% of visits. There were slightly higher percentages of female patients (58.0%) with periodontal disease than males (42.0%), and high percentages of patients aged 25–44 years (41.8%) and 45–64 years (41.6%). The majority of patients with periodontal disease were dentate (99.3%) and these dentate patients had 24.1 teeth on average, of which 1.0 was decayed. High percentages of patients with periodontal disease attended for the reason of either a check-up (37.8%) or an emergency (43.5%). A relatively low percentage of patients with periodontal disease had dental insurance (34.3%) compared to other main diagnoses or conditions. The treatment provided to patients with periodontal disease as their main presenting condition was characterised by high rates of diagnostic (62.0 services per 100 visits) and preventive services (48.7 services per 100 visits), as well as relatively high rates of extraction (20.0 services per 100 visits) and periodontal treatment (18.1 services per 100 visits) compared to other main diagnoses or conditions.



Aesthetic problems

The pattern of service provision is presented in Figure 5.18 for the main presenting condition of aesthetic problems. Patients with aesthetic problems as their main presenting condition comprised 4.2% of visits. The majority of the patients attending with aesthetic problems were female (66.7%). The highest percentages of patients with aesthetic problems were in the 25–44 years (36.5%) and 45–64 years (33.7%) age groups, with a relatively high percentage of patients in the 12–17 years (12.1%) age group compared to most other main diagnoses or conditions. The majority of patients with aesthetic problems were dentate (99.7%) and these dentate patients had 25.2 teeth on average, with 0.7 decayed teeth. The main reason for visiting among patients with aesthetic problems as their main condition was for other dental problems (62.4%) not involving relief of pain. Just under half the patients attending with aesthetic problems had dental insurance (48.7%). The treatment provided to patients with aesthetic problems was characterised by high rates of restorative (72.0 services per 100 visits) and diagnostic items (35.0 services per 100 visits), as well as high rates of crown and bridge treatment (25.3 services per 100 visits).



6 Discussion

This section discusses the findings on trends in practice activity and patterns of service provision, and reviews some research themes in dentists' practice activity based on work from The Longitudinal Study of Dentists' Practice Activity.

6.1 Collection of service provision data

Recording of patient visits provides replicate measures of services provided by individual practitioners, which are aggregated at the unit of the practitioner for a sample of practitioners. Variance in service provision can be measured within and between practitioners (Colton 1974). Sampling effort can be adjusted to improve the precision of estimates by increasing the number of patient visits by either increasing the number of days sampled per practitioner (i.e. within-subjects component) or increasing the number of practitioners sampled (i.e. between-subjects component). A one-day sampling period can provide sufficient precision as long as the number of practitioners sampled is large enough. Such an approach emphasises the between-subjects component of variance. Other approaches may adopt limited numbers of sentinel practices but collect service data over longer intervals. Such an approach increases the collection of replicate measures within each practitioner, and emphasises the within-subjects component of variance.

There may be a continuum of designs which, depending on the number of practitioners sampled and period of service provision collection, can vary the emphasis on within-subject replication. Practitioners can be considered as clusters in the sample design (Meza et al. 1995). Precision of estimates will vary according to sample size, amount of clustering and item being measured. In general, for the same total sample size, increasing the number of clusters sampled will result in greater precision (Bennett et al. 1991).

Precision of estimates presented in the validation study is limited by being based on a small subsample ($n=30$) compared with previous reports based on larger random samples ($n=300+$) (Spencer & Lewis 1989; Spencer, Szuster & Brennan 1994; Brennan et al. 1998a). However, considering this limitation, the interpretation is that estimates derived from one-day logs provide adequate measures for aggregates of practitioners (e.g. dentist age groups) rather than for individual practitioners, given the operation of other factors such as random sampling, absence of non-response bias and sufficient sample size. The use of a self-selected typical day rather than some other systematic or random start sampling provided estimates similar to those of the remaining days of the survey, indicating that this approach provided representative estimates.

When service data are analysed at the patient level rather than being aggregated to the practitioner level, it may be necessary to adjust for clustering. Using one-day logs from a large representative sample of dentists minimises the effect of clustering, while a greater clustering effect should result when smaller numbers of practitioners are sampled with more patient visits recorded per practitioner.

While there were no statistically significant differences in mean estimates between the typical day and remaining days in the validation study period, this could reflect a

type II error. The effect sizes of the differences between the two samples comprised no effect for the total number of services, and for diagnostic, preventive, endodontic and general/miscellaneous services; weak effects for restorative, extraction, crown and bridge, prosthodontic and periodontic services; and a moderate effect for orthodontic services (Sahai & Khursid 1996). The larger effect sizes for periodontic and orthodontic services reflect the low rate of provision of these more specialised services in private general practice. This lack of precision in the estimates is acceptable for most general surveys, but studies with a particular focus on periodontics or orthodontics might consider an alternative sampling approach in order to target these services.

When estimates and inferences are required for groups of practitioners, one-day logs can be used to provide representative estimates of these aggregates. However, greater replication may be required to make assessments of within-practitioner variation. Data collected in this way may be of use in making estimates and inferences at the individual practitioner or practice level rather than being limited to aggregates of practitioners (e.g. age groups or broad geographic areas). However, it may be more difficult to collect and require adjustment for cluster effects if analysed at the patient rather than practitioner level.

6.2 Trends in practice activity

Changes in population demographics and oral health status associated with increases in the numbers of older dentate adults have been linked to an increased need for adult dental services (Douglass & Furino 1990). With the decline in both edentulism and numbers of missing teeth, the dental needs of adults may increase due to the larger pool of teeth at risk. Use of services therefore may also increase as tooth loss declines (Spencer & Lewis 1988a). The capacity to supply services will depend on how the prevailing population and disease trends interact with factors such as perceived needs and economic conditions, and the levels of effective demand (Furino & Douglass 1990). The capacity to supply services may also be affected by the influence of dentist practice activity on effective supply.

Practice activity measures

The findings from The Longitudinal Study of Dentists' Practice Activity have shown trends in dentist practice activity across a 15-year period, which have a bearing on key issues in dentistry concerned with appropriate levels of supply of services. The observation that reduced patient visits per year was primarily associated with decreased patient visits per hour rather than hours worked per year indicates that supply of dentist services in terms of time devoted to work was maintained across the study period. This was consistent with historical trends in Australia which have reported steady levels of annual time worked by dentists between 1974-75 and 1982-83, but decreases in annual patient visits during the 1960-61 to 1982-83 period (Barnard 1977, 1981, 1985).

The results from The Longitudinal Study of Dentists' Practice Activity have also documented age- and sex-specific patterns of dentist practice activity which will influence projections of supply such as lower mean hours per year among older dentist age groups, and lower hours per year and patient visits per year among female compared with male dentists. Dentist age may be associated with patient age, with

older patients tending to be treated by older dentists (Martens et al. 1987), with the result that older dentists may be less productive than younger ones due to the additional time required for treatment of older patients.

The lower levels of patient visits per hour suggested changes in patient needs or dentist work practices. Possible effects may be related to increased numbers of older patients (Shuman et al. 1994), who may have complex treatment needs which require more services or take longer to complete. Older persons in Australia have shown decreased levels of complete tooth loss, with the percentage of edentulous persons aged 65 years or more declining from 67.7% in 1979 (ABS 1979), to 50.6% in 1987–88 (Slade & Spencer 1998) and 38.9% in 1996 (Brennan, Carter, Stewart & Spencer 1997). These changes in oral health among older persons are reflected in changes in services provided over time, with increased rates of restorative services being provided to patients aged 65 years or more (Spencer, Szuster & Brennan 1994). Overall trends in service-mix between 1983–84 and 1988–89 (Spencer, Szuster & Brennan 1994), and between 1983–84 and 1993–94 (Brennan et al. 1998a) included decreased percentages of patients receiving restorative and prosthodontic services and increases in diagnostic, preventive, endodontic and crown and bridge services. Such changes in service patterns may reflect changes in oral health status translated into need for specific services, which may impact upon productivity. Such changes could have led to longer appointment times. Historical records have indicated that the average length of appointment changed little over the period 1960–61 to 1974–75, but there has been an increase since 1974–75 which was quite marked across the 1977–78 to 1982–83 period (Barnard 1977, 1981, 1985; Spencer & Lewis 1986). Cross-infection control procedures may be another possible source of influence on productivity associated with either increased appointment or changeover times. The operation of such effects on dentist productivity has implications for planning the delivery of dental services.

Service provision measures: aggregate trends

The rate of services provided per visit can be used to compute other measures of service provision using the dentist as the unit of analysis. The number of annual services provided by a dentist can be estimated by multiplying the rate of service provision per visit by the number of patient visits per year supplied by a dentist. The stability of the annual number of services supplied by a dentist reflects a counterbalancing of the observed decline in the number of patient visits per year with the observed increase in the rate of services provided per visit. While, on average, there appears to have been no change in the aggregate provision of services per year by dentists, this masks the shift in the way they are providing services. The trend is to supply fewer visits but to provide more services at each visit. The factors discussed above in relation to the declining supply of visits by dentists per year (e.g. the retention of teeth, a shift towards adults with complex treatment needs, and the operation of infection control procedures) would also apply in relation to the observed trends in service provision measures.

The number of annual services provided by dentists per patients can be estimated by multiplying the rate of services per visit provided by a dentist by estimates of the number of visits made by patients in a year drawn from other sources, for example population surveys. Such population surveys from around the same period as The Longitudinal Study of Dentists' Practice Activity have shown an increase in the number of visits made by patients who attend for dental care. For example, the average

number of visits has increased from 1.9 visits per year in 1979 (ABS 1979) to 2.0 in 1987–88 (Barnard 1993) and 2.4 in 1994 (Carter et al. 1994). When the observed increase in the rate of services per visit is multiplied by the increasing number of visits made by patients over time, the result is an increase in the annual number of services provided by dentists per patient. Explanations for the increased use of dental services over time revolve around the increasing retention of teeth into adulthood and the resulting larger pool of teeth at risk of oral disease (Spencer & Lewis 1988a).

Service provision measures: component trends

Analysis of the main areas of service over time can identify which component services are contributing to changes in aggregate measures. Regardless of whether service provision was measured as a rate per visit, converted to annual services per dentist, or measured as the annual services provided by a dentist per patient, the distribution of services was dominated by restorative, diagnostic and preventive services.

The major trends over time in the rate of services per visit included increases in diagnostic, preventive and endodontic services consistent with both improved oral health and retention of teeth through routine maintenance care and avoidance of extraction through endodontic root canal treatment.

While endodontic services also increased as a component of the annual services provided per dentist, there were no changes over time in annual numbers of either diagnostic or preventive services per dentist. Annual numbers of restorative services per dentist decreased over time. These trends in component services reflect the operation of rates of component services per visit and the annual number of visits supplied by a dentist.

The annual number of endodontic services provided by a dentist per patient increased, as observed for rates per visit and annual services per dentist. The annual number of diagnostic and preventive services per patient increased over the study period, consistent with the trend for rates per visit. The number of annual restorative services per patient also increased over time, in contrast to the rate per visit and number of annual services per dentist. The trends in component services reflect the operation of component services per visit and the average number of visits made by patients attending for dental care.

6.3 Patterns of service provision

This section reviews patterns of service provision observed in the 1998–99 wave of The Longitudinal Study of Dentists' Practice Activity. Previous reports have shown that service patterns are related to the age and sex of the patients (Bailit & Clive 1981; Spencer & Lewis 1989). Visit factors related to service patterns include insurance status and reason for visit. Insurance has been positively related to use and mix of services, and to oral health (Manning et al. 1985; Bailit et al. 1985; Mueller & Monheit 1988). Service patterns have also been associated with reason for visit with a less favourable service-mix in terms of preventive care and tooth retention associated with emergency visits after controlling for insurance status (Brennan et al. 1996a).

Characteristics of patients and visits

The largest percentage of patients was in the 25–44 years age group for both male and female patients. Overall, the majority of patients were dentate (98.3%). The mean number of teeth among dentate patients was 24.8 per patient and the mean number of decayed teeth was 1.7 per patient. These estimates reflect patients attending for care and may differ from population estimates. For example, the number of decayed teeth of 2.0 observed among 25–44-year-old patients was higher than for the general population in 1987–88 (Barnard 1993), where each component age group was lower than 2.0 (i.e. 25–29 years: D=1.8, 30–34 years: D=1.5, 35–44 years: D=1.2); but was lower than that observed for public patients (Brennan, Spencer & Slade 2000) where each component age group was higher than 2.0 (i.e. 25–34 years; D=3.1, 35–44 years: D=2.3). The four highest ranked main diagnoses or conditions of recall/maintenance (25.3%), caries (25.1%), pulp/periapical infection (10.5%) and failed restoration (10.1%) accounted for approximately 70% of the total visits. Main diagnoses have been associated with patterns of service provided but, even after controlling for diagnosis, uninsured patients and those visiting for emergencies had less favourable service patterns (e.g. higher odds of extractions and lower odds of preventive care) compared to patients who had dental insurance or visited for check-ups or other non-emergency dental problems (Brennan, Spencer & Szuster 2000). The highest percentage of visits was for check-ups (41.1%) but there were also a substantial percentage of emergency visits (28.6%) and visits made for other dental problems (30.3%). Nearly half of the visits were made by patients who had dental insurance (47.8%).

Services provided

There appear to be fewer gender-specific associations in dentistry compared to medicine. This probably reflects the lack of gender-specific types of oral health problems in dentistry as compared to medicine, where biological differences operate and some health issues are seen as masculine and some as feminine, providing a source of differentiation (Bensing et al. 1993). There were few differences observed in service rates by sex of patient in the 1998–99 wave of the Longitudinal Study of Dentists' Practice Activity. Other reports of dental service patterns in Australia have detected differences by sex of patient, but statistically significant differences have been few in number and less pronounced in size compared to those observed for age of patient (Brennan et al. 1998a).

Many main areas of service exhibited age-specific variations in service patterns in the 1998–99 wave of the Longitudinal Study of Dentists' Practice Activity. Some of this age-specific variation in services reflects the cumulative effect of dental problems over a lifetime (e.g. tooth loss, failed restorations and cuspal fractures) as well as probable cohort effects as younger cohorts with better oral health progress into older adult age groups over time. Children tended to have higher rates of diagnostic and preventive services but lower rates of extraction, reflecting the improved oral health reported among this age group (Armfield et al. 2000). Adolescents had higher rates of orthodontic services, indicating a preference for treating malocclusion at this stage in development. Adult patients had higher rates of restorative, endodontic and crown and bridge services, indicating both the provision of services aimed at retaining a natural dentition and the effect of increased tooth retention on the pool of teeth at risk of oral diseases. Older adults in particular had higher rates of prosthodontic services, reflecting the cumulative effect of tooth loss in this age cohort.

Dental services provided from other sources should be considered when interpreting the service patterns observed in private general practice. The other main sources of provision of dental services include school dental services, public sector dentists and private specialists. School dental services can be expected to account for a large percentage of the dental services provided to children. For example, a survey of primary school children in metropolitan Adelaide found that 60.9% used the school dental service, 27.5% used a private dentist, 9.0% used both the school dental service and a private dentist, while 2.4% had not attended for dental care in the previous two years (Gaughwin et al. 1996). The public sector provides dental care to eligible adult health cardholders, but there are often long waiting times for non-emergency treatment. The pattern of service provision among public patients has been shown to differ from patients in private general practice, with more emphasis on emergency treatment and consequently higher extraction rates (Brennan, Carter, Stewart & Spencer 1997). The provision of dental care in Australia by specialists is limited by the small percentage of dentists in specialist or restricted practice (10.3%), with nearly half of these being orthodontists (Szuster & Spencer 1997).

Service patterns

Service patterns in private general practice by main diagnoses or conditions showed that there were similar percentages of male and female patients for most dental conditions, with the exception of aesthetic problems, where there were relatively higher percentages of female patients. Adults comprised the highest percentage of patients regardless of diagnosis or condition, with the highest percentages of children and adolescents observed in patients attending for recall/maintenance care and aesthetic problems.

The majority of patients were dentate, with the exception of those attending for denture problems. The average number of teeth among dentate patients was similar for most diagnoses or conditions (in the range of 24 to 26 teeth), with the exception of dentate patients attending for denture problems, who had relatively fewer (14) teeth than other patients. The average number of decayed teeth was highest for patients with diagnoses of caries (3.0 decayed teeth) and pulpal/periapical infection (2.0 decayed teeth) compared to patients with other main diagnoses or conditions (in the range 0.7 to 1.4 decayed teeth).

Reason for visit varied by the main diagnosis or condition, with visits for recall/maintenance care dominated by check-ups (84.9%), pulpal/periapical infection by emergency visits (71.3%), and both cuspal fractures (75.9%) and aesthetic problems (62.4%) by visits made for other dental problems not involving relief of pain. While approximately half of the patients overall had dental insurance, this varied by main diagnosis or condition, with lower percentages of insured patients observed among those with caries (43.9%), pulpal/periapical infection (41.8%) and periodontal disease (34.3%).

Rates of treatment provided varied by main diagnosis or condition. Diagnostic services were provided at high rates for most diagnoses or conditions, with the exception of patients with denture problems, who had the lowest rate (18.6 services per 100 visits). The highest rate of diagnostic services was provided to patients attending for recall/maintenance care (94.0 services per 100 visits), with diagnostic rates among the remaining diagnoses or conditions ranging from 35.0 to 67.1 services per 100 visits.

Restorative services were provided at high rates to patients with main diagnoses or conditions of caries (116.9 services per 100 visits), failed restorations (116.4 services per 100 visits), cuspal fractures (112.1 services per 100 visits) and aesthetic problems (72.0 services per 100 visits). Preventive services were provided at the highest rates to patients with main diagnoses or conditions of recall/maintenance care (87.3 services per 100 visits) and periodontal disease (48.7 services per 100 visits). High rates of endodontic services were provided to patients who had main diagnoses of pulpal/periapical infection (99.9 services per 100 visits). Prosthodontic services were provided at high rates to patients with denture problems (112.0 services per 100 visits). Extractions were provided at the highest rates to patients with main diagnoses or conditions of pulpal/periapical infection (20.3 services per 100 visits) and periodontal disease (20.0 services per 100 visits). Crown and bridge treatment was provided at the highest rates to patients with main diagnoses or conditions of aesthetic problems (25.3 services per 100 visits), cuspal fracture (19.1 services per 100 visits) and failed restorations (16.5 services per 100 visits).

6.4 Research into dentists' practice activity

In addition to the analysis of trends in practice activity and patterns of service provision, a number of research themes in dentists' practice activity have been pursued through The Longitudinal Study of Dentists' Practice Activity. These have included the role of female dentists in the workforce, the translation of service provision measures into work effort, the influence of geographic location on dental practice, and the adoption of practice styles by dentists. The following section provides a series of summary boxes that outline the main findings that have been published from The Longitudinal Study of Dentists' Practice Activity on these research themes.

Male and female dentists

The practice of dentistry by male and female dentists

Increasing numbers of women are entering the once male-dominated dental profession in Australia. Determining what differences exist in the practice of dentistry between male and female dentists has therefore become an important task. Spencer and Lewis (1988b) used data from the 1983–84 wave of The Longitudinal Study of Dentists' Practice Activity to examine differences in practice between male and female dentists.

Discriminant analysis showed that age; practice setting; number of other dentists in the practice; inputs to the practice of dentistry either hired, acquired or contributed; direct demand; and community size were all significant in separating male and female dentists. It was more difficult to separate younger male and female dentists, indicating some convergence between the sexes. However, some differences persisted.

Differences in time devoted to work by male and female dentists

Previous studies have found that female dentists work fewer hours per year than male dentists. Brennan et al. (1992) examined factors which may explain the differences in hours worked per year that exist between male and female dentists in private practice using data from the 1988–89 wave of The Longitudinal Study of Dentists' Practice Activity.

Annual time devoted to dental practice was significantly lower for females, for dentists who were not the sole earner of the family income, and for dentists with young children.

A significant interaction between the factors sex of dentist and child age showed that hours per year in practice decreased only for females with young children. Hours per year were significantly higher among female dentists with no children, or older children. For males, hours worked remained at a higher level.

The amount of time devoted to dentistry requires monitoring in the estimation and projection of capacity to supply dental services.

Service provision by male and female dentists in Australia

The identification of factors that influence service provision in Australia is important to the future practice of dentistry. Few studies have investigated variation in service provision by sex of dentist. Kent et al. (1998) used data from the 1993–94 wave of The Longitudinal Study of Dentists' Practice Activity to examine differences in the service-mix provided by male and female dentists in Australia.

Service provision was assessed by converting service-mix data to relative value units (RVUs), a common scale based on work effort. Work effort was divided into low-, medium- and high-level interventions.

Mean work effort per patient visit was 34.8 RVUs. Work effort devoted to medium-level interventions comprised the largest proportion (17.7 RVUs). Low- and high-level interventions constituted 11.7 and 5.5 RVUs, respectively.

Sex of dentist was a significant factor (ANOVA) explaining variation in work effort devoted to total and high-, but not low- and medium-level, intervention procedures. The models for total and high-level intervention work effort explained 7.6% and 6.1% of the variance in the dependent variable, respectively. A significant interaction was identified between the factors sex of dentist and reason for visit for both total and high-level intervention work effort. The factor practice type interacted with sex of dentist within the total work effort model.

These sex differences in service provision may be attributed to subtle variations in patient characteristics (insurance status) and practice style (e.g. financial motivation). The magnitudes of the sex differences in service provision at the patient level were small. However, the cumulative effect of sex differences in service provision across an individual patient's course of care and at a population level would result in a larger effect for sex differences in practice styles when measured at these levels.

Work effort

Trends in work effort among private general dental practitioners

Trends in the distribution and volume of dental services provide an empirical base upon which hypotheses on future service provision can be tested. Spencer, Brennan & Szuster (1994) used data from the 1983–84 and 1988–89 waves of The Longitudinal Study of Dentists' Practice Activity to examine changes in the distribution and volume of service provided in private general dental practice, and compare these with an existing conceptual model. The data were weighted to provide population estimates for private general dental practitioners in 1983 and 1988.

Service-mix data were converted to relative value units, a common scale based on work effort, and annual estimates of this work effort were calculated. Work effort was divided into low-, medium- and high-level interventions.

Medium-level interventions comprised the greatest volume of work effort, followed closely by low-level interventions, with high-level interventions having the smallest volume. The pattern of work effort was in contrast to the conceptual model of service distribution, with low-level interventions higher and high-level interventions lower than expected.

While there was a significant increase in work effort among high-level interventions, there was no increase in work effort among low-level interventions and no decrease in work effort among medium-level interventions over the 5-year period 1983–88 as expected in the conceptual model of changing service provision.

Geographic location

Dental service provision between capital city and non-capital locations

Variations in service provision between geographical locations may be associated with factors such as imbalances in the availability of health services. Brennan et al. (1998b) used data from the 1993–94 wave of The Longitudinal Study of Dentists' Practice Activity to examine differences in dental service provision between capital city and non-capital locations.

Significantly more services per visit (Mann-Whitney, $P < 0.05$) were provided at capital city locations (mean = 2.16, 95% CI = 2.08–2.24) compared to non-capital locations (mean = 1.84, 95% CI = 1.74–1.94). Controlling for age of patient, insurance status and visit type, capital city locations included significantly higher rates of service per visit ($P < 0.05$) for adult dentate patients (rate ratios, 95% CI) of diagnostic (1.17, 1.09–1.25), preventive (1.20, 1.09–1.32), periodontal (2.71, 1.72–4.26), and crown and bridge (1.25, 1.03–1.53) services, but lower rates of prosthodontic (0.80, 0.67–0.94) services compared to non-capital locations.

These findings indicate that, compared to non-capital locations, capital city patients received care that was orientated more towards prevention and maintenance of teeth rather than replacement by dentures.

Practice style

Dentist service rates and distribution of practice styles over time

Studies of dentist service rates have identified clusters of dentists with particular styles of practice, but these practice styles need to be investigated to determine whether patterns of care become established and remain characteristic among dentists. Brennan et al. (1996b) used data from the 1983–84 and 1988–89 waves of The Longitudinal Study of Dentists' Practice Activity to establish dentist practice styles and to assess the distribution of these styles of practice between 1983 and 1988.

A total of 202 private general practitioners who provided service rate data in both 1983 and 1988 were used in a cluster analysis to group dentists into practice styles. For both 1983 and 1988, three clusters of dentists were obtained, characterised by service rates as 'High Restorative', 'Low Total Rates', and 'High Diagnostic and Preventive'.

However, the distribution of cluster membership changed over time. The percentage of dentists in the 'High Restorative' cluster decreased from 27.9% in 1983 to 16.6% in 1988, the 'Low Total Rates' cluster decreased from 60.7% in 1983 to 49.2% in 1988, while the 'High Diagnostic and Preventive' cluster increased from 11.4% in 1983 to 34.2% in 1988. The distribution of dentists between these practice styles may be related to ageing of dentists, practice maturation, population demographics or need or demand changes; or may involve subtle differences in cluster classification over time.

7 Summary

The Longitudinal Study of Dentists' Practice Activity has collected data at 5-year intervals since 1983, with response rates of 73.4% in 1983–84, 75.5% in 1988–89, 73.9% in 1993–94 and 71.2% in 1998–99.

The study is based on random samples of 10% of male dentists and 40% of female dentists from the dental registers of each State/Territory in Australia, with sample supplementation at each point in time to ensure representative cross-sectional estimates.

7.1 Trends in practice activity

The practice activity measures of hours per year devoted to work, patient visits supplied per hour and patient visits supplied per year; and the service provision measures of services per visit, annual services per dentist and annual services provided by dentists per patient were assessed four times at 5-year intervals over the 15-year study period.

Trends over time in practice activity measures included:

- stable numbers of hours worked per year
- declining numbers of patient visits per hour
- an observed decline in patient visits per year.

Trends over time in aggregate measures of service provision showed:

- an increasing rate of services provided per visit
- a stable number of annual services per dentist
- an increase in the number of annual services supplied by dentists per patient.

The stable number of annual services per dentist reflected the combination of the increasing rate of services provided per visit and the observed decline in patient visits per year. The increased number of annual services supplied by dentists per patient reflected the observed increase in rate of services per visit and a population trend towards increased numbers of visits by persons obtaining dental care.

Trends over time in component measures of service provision showed increases in the:

- rate per visit for diagnostic, preventive and endodontic services
- annual numbers of endodontic services per dentist
- annual numbers of restorative, diagnostic, preventive and endodontic services provided by dentists per patient.

7.2 Patterns of service provision

Patterns of service provision were assessed for the 1998–99 wave of the study in terms of sex- and age-specific estimates of rates of services provided by main areas of service, and patterns of services provided by main diagnoses or conditions.

There were few differences observed in service rates by sex of patient.

Many main areas of service exhibited age-specific variations in service patterns:

- Children had higher rates of diagnostic and preventive services but lower rates of extraction, reflecting improved oral health among this age group.
- Adolescents had higher rates of orthodontic services, indicating a preference for treating malocclusion at this stage in development.
- Adult patients had higher rates of restorative, endodontic and crown and bridge services, indicating both the provision of services aimed at retaining a natural dentition and the effect of increased tooth retention on the pool of teeth at risk of oral diseases.
- Older adults in particular had higher rates of prosthodontic services, reflecting the cumulative effect of tooth loss in this age cohort.

Rates of treatment provided varied by main diagnoses or conditions:

- Diagnostic services were provided at high rates for most diagnoses or conditions, with the highest rate of diagnostic services provided to patients attending for recall/maintenance care (94.0 services per 100 visits).
- Restorative services were provided at high rates to patients with caries (116.9 services per 100 visits), failed restorations (116.4 services per 100 visits) and cuspal fractures (112.1 services per 100 visits).
- Preventive services were provided at the highest rates to patients attending for recall/maintenance care (87.3 services per 100 visits) and periodontal disease (48.7 services per 100 visits).
- High rates of endodontic services were provided to patients with pulpal/periapical infection (99.9 services per 100 visits).
- Prosthodontic services were provided at high rates to patients with denture problems (112.0 services per 100 visits).
- Extractions were provided at the highest rates to patients with pulpal/periapical infection (20.3 services per 100 visits) and periodontal disease (20.0 services per 100 visits).
- Crown and bridge treatment was provided at the highest rates to patients with aesthetic problems (25.3 services per 100 visits), cuspal fractures (19.1 services per 100 visits) and failed restorations (16.5 services per 100 visits).

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Appendix A: Publications from the Longitudinal Study of Dentists' Practice Activity

Newsletters

AIH Dental Statistics and Research Unit 1990. *Newsletter*. Vol. I (1), May 1990.

AIH Dental Statistics and Research Unit 1991. *Newsletter*. Vol. II (1), May 1991.

AIH Dental Statistics and Research Unit 1992. *Newsletter*. Vol. III (1), February 1992.

AIHW Dental Statistics and Research Unit 1994. *Newsletter*. Vol. V (1), May 1994.

AIHW Dental Statistics and Research Unit 1995. *Newsletter*. Vol. VI (1), July 1995.

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Reports

Spencer AJ & Lewis JM 1986. *Workforce participation and productivity of dentists in Australia*. Melbourne: University of Melbourne.

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AIHW Dental Statistics and Research Unit 1998. *The Longitudinal Study of Dentists' Practice Activity*. In: Australia's oral health and dental services. Adelaide: AIHW Dental Statistics and Research Unit, The University of Adelaide pp 80-91.

Scientific journals

1983–84 wave

Spencer AJ & Lewis JM 1988. The practice of dentistry by male and female dentists. *Community Dentistry and Oral Epidemiology* 16: 202–7.

Spencer AJ & Lewis JM 1989. Service-mix in general dental practice in Australia. *Australian Dental Journal* 34: 69–74.

Spencer AJ & Lewis JM 1989. The provision of periodontal services in general dental practice in Australia. *Community Dental Health* 6: 337–47.

1988–89 wave

Brennan DS, Spencer AJ & Szuster FSP 1992. Differences in time devoted to work by male and female dentists. *British Dental Journal* 172: 348–9.

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1993–94 wave

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Brennan DS, Spencer AJ & Szuster FSP 2001. Provision of extractions by main diagnoses. *International Dental Journal* 51: 1–6.

1998–99 wave

Brennan DS, Spencer AJ, Kriven S & Szuster FSP 2001. The effect of mailing strategies and use of incentives on response rates to mailed surveys. *Australasian Journal of Market Research* 9: 1–10.

Brennan DS & Spencer AJ 2002. Practice activity trends among Australian private general dental practitioners: 1983–84 to 1998–99. *International Dental Journal* 52: 61–6.

Appendix B:

Glossary of dental terms

This is based on an *Australian Glossary of Dental Terms* produced by the Australian Dental Association 1992. The outline provided below describes dental service items.

Diagnostic services

Examinations (initial, periodic & emergency oral exams; consultations; written reports; referrals)

Radiographical examination and interpretation (intraoral radiographs; skull radiographs)

Other diagnostic services (bacteriological examination; antibiotic sensitivity test; biopsy; casts)

Preventive services

Dental prophylaxis (removal of plaque; removal of calculus; recontouring of existing restorations)

Topical fluoride (application of fluoride solution or gel; instruction on self-application)

Other preventive services (dietary advice; oral hygiene instruction; fissure sealing; mouthguards)

Periodontics

Treatment of gums (treatment of acute infection; root planing; surgical removal of soft tissue)

Oral surgery

Extractions (removal of permanent or deciduous tooth, tooth fragment)

Surgical extractions (removal of erupted, unerupted tooth; incision; removal of bone; fragments)

Surgery for prostheses (preparation for removable prosthesis)

Treatment for maxillo-facial injuries (repair of skin; wiring of teeth)

Endodontics

Pulp treatments (pulp capping; pulpotomy; extirpation or debridement of root canal)

Periradicular surgery (periapical curettage; apicectomy)

Other endodontic services (bleaching; removal of root filling)

Restorative services

Amalgams (filling of 1, 2, 3+ surfaces)

Glass ionomer, silicate and composite resins (filling of 1, 2, 3+ surfaces)

Gold foil (filling of cavity with small increments of gold foil)

Inlays/onlays (construction & insertion of inlay or onlay)

Other restorative services (recementing of inlay; temporary filling, crown, bridge)

Crown and bridge

Crowns (resin; porcelain; gold jacket; amalgam core for crown; cast post)

Bridges (enamel bonded—metal frame, cast metal & porcelain, cast metal & resin)

Repairs and other services (recementing crown, bridge; removal of crown; repair of crown)

Prosthodontics

New dentures and denture components (upper & lower, partial dentures; tooth replacement)

Denture maintenance (adjustment; relining; remodelling; rebasing)

Denture repairs (reattaching tooth; replacing clasp; repairing base)

Implant prostheses (implants to stabilise & retain prostheses)

Orthodontics

Removable appliances (passive, active; one, two arches)

Fixed appliances (partial, full arch banding; space maintainer)

Extra-oral appliances (harness appliances)

Attachments (restoration with wire hook)

General services

Emergencies (palliative emergency treatment; sedative dressing)

Drug therapy (drug administration—intravenous, intramuscular, oral; drug prescription)

Professional visits (home; hospital)

Anaesthesia and sedation (local; sedation—intravenous, inhalation; general—inhalation)

Occlusal therapy (occlusal adjustment; mounting of diagnostic casts; splinting)

Miscellaneous

Other services (splinting; post-operative care)

AIHW Dental Statistics and Research Series

1. *The Child Dental Health Survey, Australia 1989*
2. *The Child Dental Health Survey, Australia 1990*
3. *Inventory of Dental Public Health Data Collections in Australia, 1980–1990*
4. *The Child Dental Health Survey, Australia 1991*
5. *The Child Dental Health Survey, Australia 1992*
6. *Dental Practitioner Statistics, Australia 1992*
7. *The Child Dental Health Survey, Australia 1993*
8. *Dental Practitioner Statistics, Australia 1993*
9. *The Child Dental Health Survey, Australia 1994*
10. *The Child Dental Health Survey, Australia 1995*
11. *Dental Practitioner Statistics, Australia 1994*
12. *Dental Hygienist Labourforce, Australia 1996*
13. *Dental Therapist Labourforce, Australia 1996*
14. *Population estimates, standard errors and hypothesis tests from the 1987/88 National Oral Health Survey of Australia*
15. *Adult Access to Dental Care – Migrants*
16. *Adult Access to Dental Care – Indigenous Australians*
17. *Adult Access to Dental Care – Rural and Remote Dwellers*
18. *Australia's Oral Health and Dental Services*
19. *Aging and Dental Health*
20. *The Child Dental Health Survey, Australia 1996*
21. *The Child Dental Health Survey, Australia 1997*
22. *The Adelaide Dental Study of Nursing Homes 1998*
23. *The Adelaide Dental Study of Nursing Homes One-year Follow-up 1999*
24. *The Child Dental Health Survey, Australia 1998*
25. *Public perceptions of dentistry: stimulus or barrier to better oral health*
26. *Dentists' Practice Activity in Australia: 1983–84 to 1998–99*

Information on the above reports can be obtained from:

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