

**T**he residents participating in the one-year follow-up data collection for the Adelaide Dental Study of Nursing Homes were very functionally dependent, cognitively impaired, and behaviourally difficult older adults with complex dental problems and treatment needs.

Dental inspections of residents from randomly selected nursing homes revealed:

- a high prevalence of edentulism (63%);
- a high prevalence of coronal and root caries among those residents with natural teeth;
- existing and new residents had similar dental history characteristics, oral hygiene characteristics, demographic characteristics, cognitive status, medical status, functional status, nutritional status, dentate status, oral disease prevalence, normative dental needs and perceived dental needs;
- no significant differences between existing and new residents' tooth status, coronal caries prevalence, or root caries prevalence, with the exceptions that new residents had significantly more teeth present, more filled coronal and root surfaces, and fewer decayed retained roots;
- large accumulations of plaque, calculus and debris on residents' natural teeth and dentures and many challenging oral hygiene care problems;
- high normative dental treatment needs for teeth and dentures, but lower perceived dental needs of residents and their carers;
- residents' coronal and root caries incidence was high and was many times greater than that reported for community-dwelling older adults;
- new residents were being admitted to the nursing homes with a compromised oral health status or developed severe coronal and root caries within several months of their admittance;
- residents' oral diseases, especially coronal and root caries, rapidly progressed during their stay in residential care.

The Adelaide Dental Study of Nursing Homes was instigated by the Australian Dental Association (ADA) (SA Branch) and the AIHW Dental Statistics and Research Unit in 1998. Baseline data were collected during 1998 and one-year data collected during 1999.

## One-year data collection

Clinical dental inspections of 186 residents (111 existing and 75 new) were conducted in the same 7 nursing homes that had been randomly selected at baseline. The aims of the 1-year follow-up study were to:

- compare the characteristics and oral disease prevalence of existing residents with those of residents new to the nursing homes since the baseline dental inspections;
- determine the 1-year incidence of coronal and root caries and tooth loss in existing residents who participated at baseline; and
- identify residents' characteristics that were associated with the 1-year incidence of coronal and root caries and tooth loss.

**Table 1: Participation status of baseline participants (n=224) at 1-year by their baseline characteristics**

	1-year participation		
	Deceased (n=70)	No (n=43)	Yes (n=111)
Female (%)	62.9	61.9	73.2
Number of chronic medical conditions (mean)	5.1	4.9	5.0
Total number of medications (mean)*	8.2	6.5	7.3
Plaque Index score (mean)**	1.9	2.4	1.7
Edentulous rate (%)	72.9	64.3	62.5
MMSE score (mean)***	7.5	5.9	11.4
Consent type (%)			
guardian	67.1	69.0	67.0
self	32.9	31.0	33.0

\* ANOVA sig.  $p < 0.05$  (Scheffe's test: deceased and no categories different)

\*\* ANOVA sig.  $p < 0.05$  (Scheffe's test: yes and no categories different)

\*\*\* ANOVA sig.  $p < 0.05$  (Scheffe's test: yes and deceased/no categories different)

Participation rates at 1-year were high for surviving baseline participants (72%). However, participating residents were significantly less cognitively impaired, and had less plaque accumulated on their teeth than those who did not participate at 1-year (Table 1). Nearly one-third of baseline participants were deceased at 1-year. Participation rates for new participants at 1-year were slightly higher than the participation rate at baseline.

## Characteristics of existing and new nursing home residents

Participants' characteristics were representative of all Adelaide nursing home residents (AIHW, 1998). Existing and new residents of Adelaide nursing homes had similar sociodemographic characteristics, medical status, functional status, and cognitive status, with very few significant differences evident (Table 2).

Resident characteristic	Existing (n=111)	New (n=75)
<b>Sex*</b>		
Male	27.0	42.7
Female	73.0	57.3
<b>Age group*</b>		
≤64 years	2.7	6.7
65–74 years	7.2	10.7
75–84 years	34.2	44.0
85+ years	55.8	38.6
<b>Number of chronic medical conditions</b>		
1–4	29.7	30.7
5–8	55.9	50.7
9+	14.4	18.7
<b>Total number of medications</b>		
1–4	10.8	10.7
5–8	37.8	49.3
9+	51.4	40.0
<b>MMSE score</b>		
≤10 (severe dementia)	51.0	55.2
11–20	25.0	25.4
21–25	14.0	7.5
26–30 (normal)	10.0	11.9
<b>ADL score (number of dependent activities)</b>		
0–2	3.6	0.0
3–4	11.7	23.6
5–6	84.7	77.4
<b>A diagnosed dementia</b>	64.9	69.3
<b>History of stroke</b>	45.0	29.3

\* sig.  $p < 0.05$  chi-square test

The mean age of participating residents was 83.2 years. New dentate residents were significantly younger than existing dentate residents (sig.  $p < 0.05$ ). There was a significantly higher percentage of females residing in the nursing homes (sig.  $p < 0.05$ ). However, there was a higher percentage of males among the new residents. Residents were medically compromised, with approximately 70% having 5+ chronic medical conditions (mean = 5.8 chronic medical conditions), and nearly 90% taking 5+ prescription/over-the-counter medications (mean = 8.6 medications). Dementia, stroke and arthritis were the most prevalent medical conditions. Existing dentate residents had a significantly higher prevalence of osteoporosis and arthritis (sig.  $p < 0.05$ ). Over 65% of residents had a diagnosis of dementia. Mini-Mental State Exam (MMSE) and Global Deterioration Scale (GDS) results indicated that 77% of residents had scores indicative of moderate–severe dementia. The majority of residents were dependent for nearly all Activities of Daily Living (ADLs), and very few could independently perform any Instrumental Activities of Daily Living (IADLs). New residents were admitted a mean of 7.3 months before the 1-year dental inspections. More than half of the existing residents had been admitted more than 5 years prior to the 1-year dental inspections. Approximately three-quarters of both existing and new residents were pension card-holders. Approximately 17% of existing and 10% of new residents were Department of Veterans' Affairs (DVA) card-holders.

There were no significant differences between existing and new residents for their nutritional status, dental history characteristics, or oral hygiene characteristics. The majority of residents could eat softer food types, but not harder foods such as apples or carrots. Approximately 50% of residents ate a soft/vitamised diet. Slightly more residents had lost weight since admission than had gained weight (not significant).

Less than 20% of both existing and new residents reported any dental pain/discomfort or perceived a need for dental treatment. The great majority of residents attended the dentist only when they had a dental problem. New residents had visited the dentist more recently than had existing residents (not significant). New dentate and edentulous residents were both significantly more likely to have had their last dental visit at a dental clinic rather than at a nursing home (sig.  $p < 0.05$ ).

**Table 3: Oral hygiene characteristics of existing and new residents (%)**

Oral hygiene characteristic	Existing (n=111)	New (n=75)
<b>Assistance needed cleaning dentures</b>	(n=94) 96.5	(n=60) 98.2
<b>Frequency of denture cleaning</b>		
Twice daily or more	16.5	7.3
Once daily	83.5	89.1
Less than once daily	0.0	3.6
<b>Assistance needed cleaning teeth</b>	(n=41) 89.7	(n=30) 78.6
<b>Frequency of teeth cleaning</b>		
Twice daily or more	22.5	14.3
Once daily	77.5	82.1
Less than once daily	0.0	3.6
<b>Number of difficulties with oral care</b>	(n=111)	(n=75)
0	45.5	52.0
1-2	17.3	18.7
3+	37.2	29.3
<b>Types of difficulties with oral care</b>		
Resident refuses oral hygiene care	29.7	26.7
Resident does not open their mouth	25.2	21.3
Resident does not understand directions	24.3	20.0
Resident uses abusive/offensive language	14.4	20.0
Resident kicks/hits out	18.9	10.7
Dentures can't be removed or replaced	9.0	6.7
Resident bites toothbrush/carers	9.9	5.3
<b>Uses a mouthrinse (any type)</b>	3.6	0.0

not sig. p>0.05 chi-square test

Information concerning residents' oral hygiene care provision was obtained from nursing home records and discussions with carers and residents (Table 3). There were no significant differences between existing and new residents' oral hygiene characteristics. Nearly all residents' dentures were reported to be cleaned daily or more frequently, with 16.5% of existing and 7.3% of new residents' dentures cleaned twice daily or more frequently. Nearly all required assistance with denture cleaning. Less than 20% of dentate residents had their natural teeth cleaned twice daily or more, with nearly all other residents' teeth cleaned once daily. All but 15% of dentate residents required assistance with cleaning of their teeth. Nursing home carers had difficulties when providing oral care with approximately 50% of residents. More difficulties were noted for dentate residents. The difficulties most frequently reported involved residents refusing oral hygiene care, not opening their mouth, not understanding carers' directions, using abusive and offensive language and kicking/hitting out. The use of cosmetic or therapeutic mouthrinses in these residents was almost non-existent.

## Prevalence of oral diseases in existing and new residents

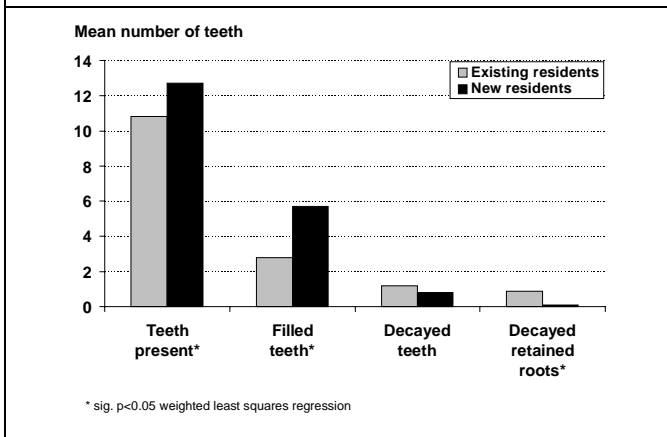
Existing and new residents of Adelaide nursing homes had similar dentate status, oral disease prevalence, normative dental needs, and perceived dental needs.

Nearly two-thirds (63%) of both existing and new residents were edentulous. Edentulous residents had many normative dental problems and treatment needs. There were no significant differences for denture problems between existing and new residents. Among denture wearers, the highest percentages of denture problems occurred in relation to dentate participants' upper dentures (inadequate retention (33.3%) or stability (33.3%)) and edentulous participants' lower dentures (inadequate retention (54%) and stability (39.1%)). Staining on the denture surface was the most frequent material inadequacy found in up to 15% of denture wearers. Dentate participants' upper dentures had the highest number of defects, such as broken teeth or fractured denture material. Residents' perceived need for denture treatment was much lower than the normative need. For example, 60% of residents who required a new full denture and 50% of residents who required a denture reline did not want the treatment. Edentulous residents lost more percentage body weight, could eat fewer foods, and were more likely to be on a soft/vitamised diet, to currently have dental pain/problems, and to have last visited the dentist for a problem (not significant). More dentate (61%) than edentulous (44%) residents had visited the dentist in the previous 12 months (not significant). Up to 25% of residents owned dentures that were not worn. The prevalence of denture-related oral mucosal conditions was low, with 6.6% of residents having denture stomatitis and 5.9% having angular cheilitis.

Dental inspections were completed for 41 existing dentate and 30 new dentate residents. Analyses of the caries data, weighted by nursing home size, revealed that dentate existing residents had a mean of 10.8 teeth remaining, 20.0 missing teeth, and 1.3 retained roots (0.9 decayed and 0.5 sound retained roots). They had a mean of 1.2 decayed teeth, and 2.8 filled teeth (DMFT=24.0) (Figure 1). A mean of 0.4 teeth per existing resident could not be assessed because of excessive plaque/debris accumulation. Dentate new residents had a mean of 12.7 teeth

remaining, 18.9 missing teeth, and 0.3 retained roots (0.1 decayed and 0.2 sound retained roots). They had a mean of 0.8 decayed teeth, and 5.7 filled teeth (DMFT=24.9) (Figure 1). A mean of 0.2 teeth per existing resident could not be assessed because of excessive plaque/debris accumulation. Existing residents had significantly fewer mean number of teeth, fewer filled teeth, and more decayed retained roots (sig.  $p < 0.05$ ; weighted least squares regression) (Figure 1). Both existing and new males had significantly more retained roots than females (sig.  $p < 0.05$ ; weighted least squares regression).

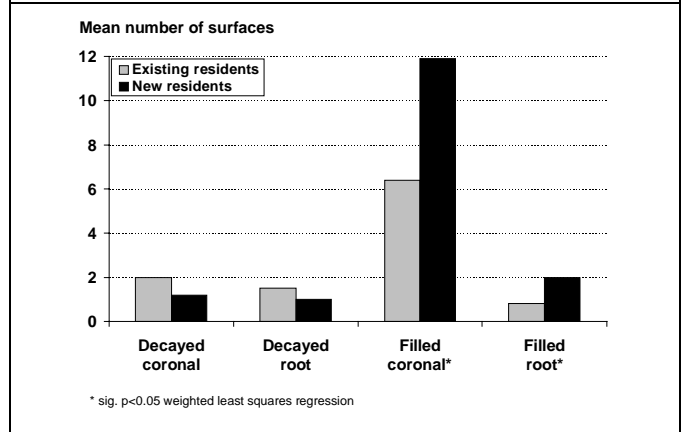
**Figure 1: Tooth status for existing (n=41) and new (n=30) dentate residents**



Coronal and root surface caries prevalence was high (Figure 2). For existing residents, the mean number of decayed coronal surfaces (2.0) was greater than the number of decayed teeth (1.2), indicating that multiple surfaces were affected on some teeth. The mean number of filled coronal surfaces was 6.4, decayed root surfaces was 1.5, and filled root surfaces was 0.8. For surfaces exposed to potential caries, the coronal caries attack rate was 15.9%, and root caries attack rate was 25.1%.

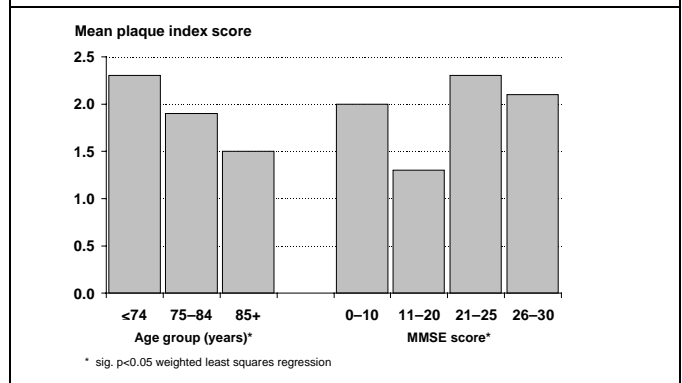
For new residents, the mean number of decayed coronal surfaces (1.2) was greater than the number of decayed teeth (0.8), indicating that multiple surfaces were affected on some teeth. The mean number of filled coronal surfaces was 11.9, decayed root surfaces was 1.0, and filled root surfaces was 2.0. Coronal caries attack rate was 19.8%, and root caries attack rate was 25.4%. New residents had significantly more filled coronal and root surfaces (sig.  $p < 0.05$ ; weighted least squares regression) (Figure 2). Caries prevalence may be underestimated as many surfaces were covered in plaque/debris and could not be scored (mean=1.0 coronal and 9.5 root surfaces/resident).

**Figure 2: Coronal and root surface caries for existing (n=41) and new (n=30) residents**



The majority of residents' teeth showed signs of attrition into enamel or dentine, with no significant differences between existing and new residents. More than one-third of dentate residents had conditions precluding a periodontal inspection, and another one-third had gross plaque accumulations on their teeth. Thus, no periodontal analyses are presented because of the limited number (n=14) of periodontal inspections completed. Mean Plaque Index (PI) score was high for both existing and new residents (1.9 out of 3). There were significant differences in mean PI score for age groups and cognitive status (MMSE score) (sig.  $p < 0.05$ ; weighted least squares regression) (Figure 3). Younger residents had higher PI scores and residents with moderate MMSE dementia scores (11–20) had lower plaque scores. Treatment needs were high for all dentate residents, with no significant differences between existing and new residents. Residents required a mean of 2.9 surfaces to be restored. These were mostly for one-surface or two-surface restorations. Normative need for extractions was 0.6 teeth per resident, and for preventive treatment (at tooth level) was 0.7 teeth per resident. These high normative treatment needs were in contrast to residents' low perceived treatment needs—less than 20% of residents perceived a need for dental treatment.

**Figure 3: Plaque Index scores by age and cognitive status (n=71)**

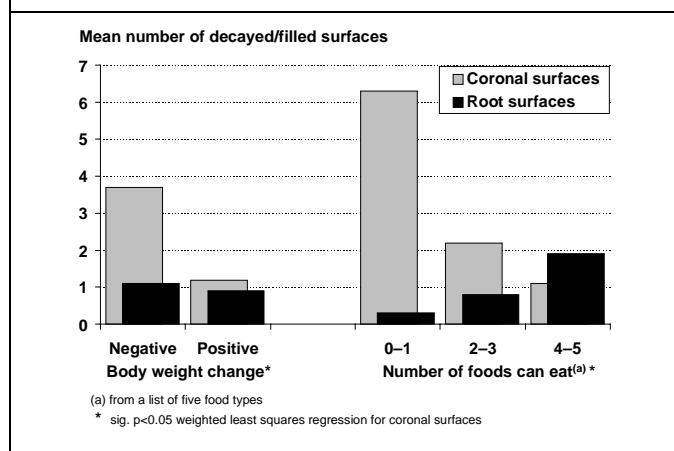


## Incidence of oral diseases in existing residents

Among the 41 existing dentate residents, coronal caries incidence occurred in 64% and root caries incidence occurred in 49%. For coronal caries, the adjusted caries increment (ACI) was 2.5 surfaces. For root caries, the ACI was 1.0 surfaces. Residents with fewer medical conditions had a significantly greater incidence of coronal caries, as did residents taking fewer medications. Those residents who had lost weight and who could eat fewer foods had a significantly greater incidence of coronal caries (sig.  $p < 0.05$ ; weighted least squares regression) (Figure 4). Residents with dementia had a higher coronal caries incidence, but this difference was not significant. No significant differences were found for root caries incidence among residents' characteristics.

The tooth loss incidence rate was low for residents (6–9%) and mean number of teeth lost was 0.1 teeth. However, a change in status of retained roots was evident, with a mean increase of 0.3 retained roots per resident. One-quarter of residents had 1–2 more retained roots at 1-year and only a small percentage (5–9%) had any retained roots removed. Two-thirds of residents had the same number of retained roots at baseline and one-year. During the study period, 38.9% of existing dentate residents had no change in their plaque index (PI) scores, 22.1% had a lower PI score at 1-year and 38.9% had an increase in PI score.

**Figure 4: Coronal caries incidence and nutritional status (n=41)**



## Discussion

Nursing home residents in this study were very functionally dependent, medically compromised, cognitively impaired, and behaviourally difficult older adults who presented many complex dental challenges for their carers and dental professionals. As was reported at baseline, the percentage of edentulous residents (63%) was slightly higher than national estimates for similarly aged older Australians (57%) (Carter, personal communication). This percentage was significantly lower than that reported in previous South Australian nursing home studies of up to 90% (Vowles et al., 1979; Walker, 1984) and parallels the current and projected edentulism estimates from national data (Carter, personal communication). The 1-year study results reinforced the consequences of these declining edentulism rates. The prevalence of oral diseases among dentate residents was higher in this study than in previous studies, with the mean number of teeth increasing from 8.0 in 1984 (Walker, 1984) to 12.7 for new nursing home residents in this study. The current nursing home residents required twice the number of coronal and root restorations than previously reported (Stockwell, 1987; Walker, 1984).

The first of the study aims was to compare: dental history, oral hygiene and demographic characteristics; cognitive, medical, functional, nutritional and dentate status; oral disease prevalence; and normative and perceived dental needs, between existing nursing home residents and residents who were new to the nursing home since the baseline dental inspections. Overall, few of these characteristics were significantly different between existing and new residents. These analyses further reinforced how the increasing levels of dementia in nursing homes are impacting on the oral health of residents. As was evident at baseline, the great majority of residents had moderate to severe cognitive impairment. Dementia and stroke were by far the most prevalent chronic medical conditions reported in residents.

Residents' high prevalence and incidence of oral diseases was highlighted when results were compared with data from The South Australian Dental Longitudinal Study (SADLS) of community-dwelling older adults (Slade & Spencer, 1997; Thomson, personal communication). Both studies used randomly

selected subjects, the same study protocols, and data were weighted to provide population estimates. DMFT scores were similar in both studies (23.2 for SADLS and 24.4 for nursing home residents). However, nursing home residents had many times more decayed teeth, more missing teeth, more retained roots and fewer filled teeth. Similar percentages of SADLS participants and nursing home residents experienced caries incidence. However, nursing home residents had greater annualised caries incidence – 5 times greater coronal caries incidence and 2.5 times greater root caries incidence. Nursing home residents with nutritional problems had a higher coronal caries incidence, highlighting the need for a multidisciplinary approach to the monitoring of residents' eating abilities, type of diet, and weight change. In addition, an improved understanding is needed of the relationship among residents' nutritional status, swallowing problems, medication use, behavioural problems, oral health status, denture problems, and oral hygiene status (especially high levels of plaque accumulation). The high plaque levels over time on dentures and teeth were of concern in these residents as recently a causal link was identified between plaque accumulation and aspiration pneumonia (Loesche & Lopatin, 1998).

From the Adelaide Dental Study of Nursing Homes baseline and one-year data collections, it appeared that new residents were admitted with a compromised oral health status, or developed severe coronal and root caries within several months of their admittance. Coronal and root caries rapidly progressed during residents' stay at the nursing home. With time, the aggressive impact of caries resulted in the loss of tooth crowns and increasing numbers of retained roots. The Adelaide Dental Study of Nursing Homes was one of the first international longitudinal geriatric dental investigations conducted with institutionalised older adults. Results from the baseline questionnaires to dentists and Directors of Nursing, together with the findings from the longitudinal clinical dental inspections, indicated the urgent need for dental professionals to become more knowledgeable and aware of dementia issues. They also highlighted the need for the dental profession to look beyond dentistry for solutions to the problems with behaviour management, severe oral diseases, and oral hygiene care difficulties that are evident in cognitively impaired older adults.

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