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ORAL HEALTH: SURVEILLANCE, RESEARCH AND INFORMATION TECHNOLOGY

GUEST EDITORIAL

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Dentistry shares an interest with public health in using surveillance data to assess the oral health of the population, define dental public health priorities, evaluate public health programs and identify emerging problems and research priorities.[1]

However, dentistry has had a rather limited engagement with public health surveillance. When surveillance was driven by notifications of death and disease, there was little room for collection of information describing specific chronic lifestyle diseases like dental decay or gum disease. With the broadening of public health surveillance to include the ongoing systematic collection, analysis and interpretation of outcome-specific data, and their timely dissemination to those who set policy or implement programs, the door has opened for dentistry to be actively involved.[2]

The longest standing and most extensive surveillance activity in dentistry has been the Child Dental Health Survey, which has been conducted through the school dental services of the states and territories since the mid-1970s. This survey has monitored the burden of dental decay in children and adolescents; identified geographic regions, age cohorts or social groups who should be the priority of oral health promotion; provided data for evaluating the school dental services; and helped to set priorities for research.

The boundary between surveillance and research activity is illustrated by the work assessing the effectiveness of water fluoridation in preventing oral disease in children. Using data collected by the Child Dental Health Survey, crude ecological comparisons can be made

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of indicators of oral health between children living in non-fluoridated Brisbane and children in Adelaide or Canberra where the water is fluoridated. However, while surveillance data may help formulate hypotheses, research data are required to test them. Hypotheses developed from the Child Dental Health Survey about the effectiveness of water fluoridation have been tested by the Child Fluoride Study, a research study conducted in Queensland, South Australia and the Australian Capital Territory.

While the Child Dental Health Survey is an example of surveillance, it was the only notable dental public health surveillance activity for two decades. There is a need in dentistry to both strengthen some of the existing surveillance activities and develop data collections where surveillance is inadequate. The usefulness of existing surveillance activities could be improved by collecting better quality data; for example, surface rather than tooth level observations on decay and the socio-demographic characteristics of populations. Links could also be developed with information describing service provision and with dental health records over time.

Efforts are being made to close some gaps in knowledge of the oral health of adults through surveillance activities, using both population-based interviewer-administered surveys and provider-based data collections, within the public dental services. These developments require both agreed indicators of oral health and access to dental care. Recent initiatives by the Oral Health Branch of the NSW Department of Health to develop indicators for dental caries in NSW are described by Osborn in this issue.

The dramatic increase in the numbers of older Australians, with their associated increased need for oral health services (from preventive to tertiary level) highlights the lack of quality data describing both their oral health status and needs. King discusses this situation and how difficult it makes the planning of appropriate services.

Improvements in the quality of surveillance data in dental public health may follow if those responsible for developing policy and implementing programs demand better quality information to guide their decision-making. Information technology could assist by reducing the burden on data providers and improving access to information. As new information technology is developed, an emphasis is needed on establishing agreed core data elements, timeliness of data provision, accessibility and an encouragement of flexibility in collecting additional data. Dentistry is well placed to move forward in these areas and to improve the response to the population's oral health problems through surveillance activity.

The usefulness of existing data collections for describing public oral health is limited. However, using information from the NSW Central Cancer Registry and other registries, Walker describes the trends in the incidence and mortality of oral cancer in NSW, as well as the public health implications of these data. Much remains to be done to improve the community's oral health. Spencer discusses future directions for oral health research.

To conclude the series in oral health, Barnard describes the oral health workforce in NSW and changes to it over the last 10 years. This is the stock of dental personnel who must drive changes in surveillance, research and information technology, and then apply the information gained to improving oral health.

REFERENCES

1. Thacker SB, Stroup DF. Public health surveillance and health services research. Armenian HK, Shapir S, eds. *Epidemiology and health services*. New York: Oxford University Press, 1998; 61–82.
2. Thacker SB, Berkelman RL. Public Health surveillance in the United States. *Epidemiol Rev* 1988; 10: 164–90.

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ORAL HEALTH SURVEILLANCE IN NSW

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Oral health has been defined as: 'A standard of health of the oral and related tissues which enables an individual to eat, speak and socialise without active disease, discomfort or embarrassment and which contributes to general well being'.[1]

The NSW Oral Health Branch is currently developing indicators that seek to identify factors that contribute to the burden of oral disease in the community.[2] Indicators and outcomes will be used to develop policies and strategies to address areas where the burden of oral disease can be reduced and to optimise the use of resources. This process will involve a collaboration by experts in oral health, and build on work already undertaken in oral health surveillance.

DENTAL CARIES

The first set of core indicators to be developed focus on dental caries. Dental caries is the most costly diet-related disease in Australia, ahead of coronary heart disease, hypertension and diabetes.[3]

Children

The dental caries experience of NSW children as sampled by the 1993 Child Dental Health Survey varied between Area Health Services. The Save Our Kids Smiles (SOKS) program has been operating in NSW since 1996. This program offers free oral health assessments at schools. Parents of children assessed as having oral problems can choose to seek treatment either through private dentists or public child oral health clinics.

Data describing the oral health of children aged 0 to 4 years are not readily available, as these children do not usually access the SOKS program. Hospital separations for the removal or restoration of teeth among children under the age of four years increased during the period 1988–89 to 1991–92, subsequently declined, and rose again slightly in 1994–5.[4]

Oral care is available free to children to the age of 14, or to 18 years if they are attending a high school. From the age of 15 years, the child must be a dependent listed on a Health Care Card or Pensioner Concession Card, or hold such a card in their own right, to access public health care. Any child requiring relief of pain and any further non-urgent treatment after the initial relief of pain may access public oral health clinics around NSW.

Adults

In 1995–96, the adult dental caries status in NSW increased from a mean DMFT (mean number of decayed, missing and filled teeth) of 6.2 for those aged less than 25 years to a mean DMFT of 19.4 for those aged 65 years and over.[5] This implies that, for the NSW population, half of their teeth will be decayed, missing or filled by the age of 65. The potential for health gain from reducing dental caries is probably the best of any oral disease, and there are well documented evidence-based practices for achieving this.[6,7]

Dental Treatment

In 1994, more than 80 per cent of dental treatment was provided by the private sector.[8] Private care is available to all sectors in the community, but the cost and extent of services offered varies from provider to provider. It was noted by the 1997 Senate inquiry into public dental services that the cost of private care inhibits people from seeking or maintaining a good standard of oral health.[9] The disparity between the cost of oral treatment and income level means that those at the lower income levels are more likely to use emergency departments for care. A cycle of emergency care develops, resulting in patients receiving oral treatment that eases the immediate burden of pain, but this does not necessarily address the underlying problems.

In Australia, a fundamental oral care problem is access to services.[10] High percentages of low-income individuals and health care cardholders face direct out-of-pocket costs when using private sector oral health services. Affordability and hardship were also associated with a perceived need for oral treatment and individuals' rating of their own oral health in comparison to other people of a similar age.[11]

CONCLUSION

An oral health surveillance strategy could monitor: outcomes or health gains that oral health can provide; trends in oral disease; benefits through differing types of service provision; clinical disease management; the effect of oral health on a person's well being; and the relationship between an individual's general and oral health status.

However, adequate monitoring of the oral health status of the NSW population will require some fundamental changes in collecting information across all age groups. The last national oral health survey was conducted in 1987.[12] This offers baseline data to benchmark subsequent surveys. The NSW Oral Health Branch's indicator initiative is also an attempt to introduce an evidence-based approach to ensure an optimal standard of oral health delivery.

REFERENCES

1. Fuller SS, Blinkhorn A. *Achieving the targets for oral health.* Manchester: Eden Bianchi Press, 1995.
2. NSW Health. Strategy for population Health Surveillance in NSW. Discussion paper. December 1997.

* Currently with United Medical Protection

3. Australian Institute of Health and Welfare. *Australia's health 1998: The sixth biennial health report of the Australian Institute of Health and Welfare*. Canberra: AIHW, 1998.
4. Public Health Division. *The Health of the People of New South Wales: Report of the Chief Health Officer*. Sydney: NSW Health Department, 1997.
5. Brennan DS, Spencer AJ. *Prospective adult dental programs survey 1995–96*. AIHW DSRU, University of Adelaide, Adelaide, 1996.
6. Lewis DW, Ismail AI. Preventive Dental Care (Chapter 36). Canadian Task Force on the Periodic Health Examination. Ottawa: Canada Communication Group, 1994.
7. US Preventive Services Task Force cited in Canadian Task Force on the Periodic Health Examination. *Canadian guide to clinical preventive health care*. Ottawa: Canada Communication Group, 1994: 408-431.
8. Allister J, Stewart J, Spencer J. *Dental satisfaction survey 1994*. AIHW DSRU, University of Adelaide, 1995.
9. Australia, Parliament. *Inquiry into public dental services: Report from the Senate Community Affairs References Committee*, Canberra, 1998.
10. Spencer J. Key problems, target groups and policy directions. In: *Dental care for adults in Australia*. AIHW DSRU, University of Adelaide, 1993.
11. Spencer J. Affordability and hardship in purchasing dental care. In: *Dental care for adults in Australia*. AIHW DSRU, University of Adelaide, 1993.
12. Barnard PD. *National oral health survey: Australia 1987–88*. Canberra: Commonwealth of Australia, 1993. ISBN O 644 29235 1.

ORAL HEALTH NEEDS OF THE ELDERLY

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This article describes the oral health of elderly Australians using evidence provided by a number of local studies.

INTRODUCTION

It is generally accepted that 65 and over refers to the elderly population. At the turn of the century, only four per cent of Australian residents were aged 65 and over. That figure had risen to 12 per cent by 1979, and it is expected to reach between 24 and 26 per cent by 2051.[1]

There is a trend away from edentulousness (having no natural teeth) in the elderly. In 1979, 60 per cent of elderly Australians were edentulous. By 1989, this figure had dropped to 44 per cent, and it is projected that only about 20 per cent of elderly Australians will be edentulous by 2019. There is also an increase in the number of natural teeth among those who have at least one natural tooth. This aging population with more natural teeth has resulted in growth in the 'pool of teeth' and, therefore, in the 'pool of teeth requiring treatment'.[2]

ORAL HEALTH PROBLEMS OF THE ELDERLY

The predominant oral health problems of the elderly include dental caries, periodontal disease, dry mouth (xerostomia), tooth wear and oral cancer.[3] Recurrent caries around failing restorations, cervical caries (around the neck of the tooth) or root caries are the most common dental caries in the elderly.[3,4] The prevalence of periodontal disease appears to increase with age, which may reflect an accumulation of disease over time rather than enhanced susceptibility. The number of teeth that need to be extracted due to periodontal disease increases with age.[3] Dry mouth is a common complaint of elderly people, a subject discussed in Mark Shifter's article in the March issue of the *Bulletin* (Volume 10, Number 3). The progressive impact of smoking and drinking on the development of soft tissue lesions is more apparent in older adults, and the prevalence of oral cancer increases with age.[3]

IMPACT OF ORAL HEALTH ON THE WELLBEING OF FUNCTIONALLY INDEPENDENT AND INSTITUTIONALISED ELDERLY AUSTRALIANS

The impact of oral health on the wellbeing of elderly people in Australia has been investigated in both the institutionalised elderly and the functionally independent elderly.

In South Australia 1,217 non-institutionalised people aged 60 years and over completed a questionnaire containing 49 questions about the effect of oral conditions on their comfort levels and functional abilities. Conditions such as difficulty chewing, discomfort during eating and avoidance of foods 'fairly often' or 'very often' were reported by more than five per cent of dentate persons

(people with their own teeth) and by 10 per cent of edentulous persons. Five per cent reported that their oral health had significant impact on their interpersonal relationships.[5]

Homan's study of 238 institutionalised geriatric patients at Mount Olivet, Queensland, revealed that oral pain was a problem for 12 per cent of that group.[6] Functional problems including chewing, swallowing and speaking were identified in 49 per cent of the patients. Chewing difficulty can lead to a preference for soft bland foods that may have less nutritional value than vitamin-rich and high-fibre hard fruits and vegetables. Undernutrition in the elderly is a significant problem and has a variety of effects ranging from the development of pressure sores to an increase in the incidence of fractured femurs.[7]

CLINICAL FINDINGS IN AN INSTITUTIONALISED ELDERLY AUSTRALIAN POPULATION

Clinical examination of the Mount Olivet patients and residents found that 41 per cent of patients who had some of their own natural teeth had dental caries. Stomatitis (inflammation of the oral mucosa) was present in eight per cent and oral ulcers in five per cent of denture wearers. The hygiene of dentures was assessed as not satisfactory in 65 per cent of denture wearers. Oral hygiene was assessed to be not satisfactory in 93 per cent of the total Mount Olivet group, and 60 per cent suffered from periodontal disease.[6]

STRATEGIES FOR FUTURE MANAGEMENT

The pattern of elderly Australians seeking dental treatment has been investigated through telephone surveys conducted by the Australian Institute of Health and Welfare, and a dichotomy was found between edentulous and dentate elderly people. Edentulous people were most likely to have visited a dental service five or more years ago, while 61 per cent of the dentate group had visited a dental service within the past 12 months. Another significant finding was that 84 per cent of dentate persons made their last dental visit to a private dental facility. These figures emphasise the need for private practitioners to be well educated in the management of oral health problems of elderly patients.[8]

The 1993 National Health and Medical Research Council published *Oral Health Care for Older Adults*, which recommended the following:

- improving advocacy through deliberate and informed policy development
- developing demonstration programs incorporating innovative oral health promotion and preventive strategies, such as educating caregivers
- establishing appropriate health targets for the elderly and monitoring oral health of older adults
- providing adequate dental education and research in geriatric dentistry.[9]

These recommendations are consistent with other investigations into problems related to the delivery of dental care to elderly patients.[10,11,12]

Some special groups in Australia, such as people under the age of 65 who are homebound or disabled, are likely to face many of the same barriers to oral health which have been identified in geriatric dentistry.[9] These groups should be considered with the elderly for the purpose of assessing their dental care needs using criteria other than chronological age.

REFERENCES

1. Australian Bureau of Statistics. *Year book of Australia*, No. 81, 1999. Canberra: AGPS, 1999. ABS catalogue no. 1301.0.
2. National Health Strategy. *Improving Dental Health in Australia*, Background Paper No. 9. Canberra: AGPS, 1992. ISBN 0 642 17468 7.
3. Gift HC. Issues of ageing and oral health promotion. *Gerodontics* 1988; 4: 194–206.
4. Katz RV, Stanley PH, Neal WC, Muma RD. Prevalence and intraoral distribution of root caries in an adult population. *Caries Res* 1982; 16: 265–271.
5. Slade G, Spencer AJ. Social impact of oral conditions among older adults. *Aust Dent J* 1994; 39(6): 358–64.
6. Homan BT, Lam B, Larsen RG. The oral needs and demands of a geriatric population at Mt Olivet, Brisbane. *Aust Dent J* 1986; 33(5): 424–432.
7. McCormack P. Undernutrition in the elderly population living at home in the community: a review of the literature. *Journal of Advanced Nursing*, 1997; 26: 856–863.
8. Dental Statistics and Research Unit. *A Research Database on Dental Care in Australia*. Adelaide: Australian Institute of Health and Welfare, 1993.
9. NHMRC. *Oral health care for older adults: Report by the Health Care Committee*. Canberra: NHMRC, 1994.
10. Commission on Dental Education and Practice Working Group 10. *Delivery of oral health care to the elderly patient*. FDI Technical Report No. 43. London: Federation Dentaire International, 1986.
11. King PL. A dental health education program for carers of elderly people. MDS thesis, University of Sydney, 1992, in press.
12. Maguire M. Implementing a staff development program. *Geriaction* 1991; 10(2): 8–10.

ORAL CANCER IN NEW SOUTH WALES

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This article describes the incidence and mortality associated with oral cancer in NSW. The risk factors associated with the development of oral cancer, and prevention strategies, are also presented.

INCIDENCE

About two per cent of all new cases of cancer in NSW are oral cancer, of which more than 90 per cent are squamous cell carcinomas (arising from the surface epithelium). In New South Wales in 1995, 582 new cases of oral cancer (lip and oral cavity; International Classification of Diseases-9 140–1, 143–6) were reported, with most occurring on the lower lip and tongue (Table 1).[1]

Oral cancer occurs mainly in middle aged and older people, with 93 per cent of cases reported in people aged 45 years or older.[1] Men have a higher risk of developing oral cancers than women (Table 1). The life-time risk to age 74 for men varies from one in 286 for developing cancer of the tongue to one in 676 for oropharyngeal cancer. For women, the risk ranges from one in 644 for cancer of the mouth to one in 1816 for cancer of the oropharynx.[1]

In NSW, the incidence of mouth and pharyngeal cancers increased by 27 per cent in men and three per cent in women between the periods 1973–77 and 1988–92.[2] Most of the increase occurred in the late 1970s and early 1980s in parallel with similar trends in Europe and the United States.[3]

Oral cancer particularly affects the socially disadvantaged.[4] In urban areas of NSW from 1987 to 1991, age-standardised incidence and mortality rates of cancers of the mouth and pharynx in males were significantly higher in groups of lower socioeconomic status. Incidence in females was also significantly higher in the lower socio-economic groups, while the difference in mortality rates was not significant.[5]

MORTALITY

The risk of dying from oral cancer is low (Table 1). In 1995, 166 people died from oral cancer in NSW, representing 1.5 per cent of all cancer deaths in the state.[1] More than three-quarters of deaths (78 per cent) occurred in people aged 60 years or older.[1]

SURVIVAL

Surviving oral cancer varies significantly depending on the site of the cancer. Today, very few patients die from lip cancer (Table 2), whereas the survival from intra-oral cancer is much lower and only approximately half of the patients with tongue cancer are alive five years after diagnosis (Table 2). The risk of death at five years in those

TABLE 1

INCIDENCE AND MORTALITY OF ORAL CANCER, NSW 1995

Site	ICD-9 code‡	Number of new cases			Age-standardised incidence rate*		Cumulative risk to age 74, one in...	
		Male	Female	Total	Male	Female	Male	Female
Incidence								
Lip	140	167	61	228	5.6	1.6	230	951
Tongue	141	106	33	139	3.4	1.0	286	1200
Mouth	143–5	81	68	149	2.6	1.9	380	644
Oropharynx	146	46	20	66	1.5	0.6	676	1816
Oral cancer	140, 141, 143–5, 146	400	182	582	†	†	†	†
Mortality								
Lip	140	2	2	4	0.1	0.1	24744	–
Tongue	141	47	16	63	1.5	0.4	696	3661
Mouth	143–5	34	25	59	1.2	0.6	1001	2134
Oropharynx	146	31	9	40	1.0	0.2	955	4353
Oral cancer	140, 141, 143–5, 146	114	52	166	†	†	†	†

*Age-standardised using the 1991 Australian population.
†Not published for this collated site.
‡International Classification of Diseases, 9th Revision
Source: Coates and Armstrong, 1998.[1]

TABLE 2

FIVE-YEAR RELATIVE SURVIVAL RATE FOR CANCER OF THE LIP AND TONGUE, NSW, 1980–95

Sex	Lip		Tongue	
	Number of cancers	Five-year relative survival (%)	Number of cancers	Five-year relative survival (%)
Males	2546	96.2	1246	46.9
Females	712	91.4	557	58.1
Total	3258	95.2	1803	50.4

Source: NSW Cancer Registry Cancer Control Information Centre.[6]

with cancer of the tongue that had spread to the lymph nodes in the neck at the time of diagnosis, was more than twice that for patients with localised disease. When distant metastases were identified, the risk of death at five years was more than four times that for localised disease.[6]

In approximately half (46 per cent) of patients with intra-oral cancer, the disease had already spread to the lymph nodes in the neck at the time of presentation.[6,7] There were significant delays in patients presenting for treatment, perhaps due to the absence of symptoms such as pain or dysphagia. There may also be delays in reaching the diagnosis by general medical or dental practitioners. However, the advanced stage of the cancers at presentation contributes to the only moderate survival rate. When patients are referred to specialists, biopsy and appropriate management are usually initiated quickly.

RISK FACTORS

Ultraviolet light

The excess of cancers of the lower lip, particularly in Anglo-Celtic immigrants to this country who work outdoors (for example in agriculture and fishing), is thought to be due to exposure to sunlight. Smoking tobacco can increase this risk.

Tobacco and alcohol

Tobacco smoking and drinking hazardous or harmful amounts of alcohol (in excess of four units [drinks] a day for men and two units a day for women) are major risk factors for oral cancer, particularly in combination.[8]

Potentially malignant epithelial lesions

Mouth cancers may evolve from potentially malignant white or red epithelial mucosal patches (leukoplakias and erythroplakias). There is no information on the prevalence of these lesions in Australia or on their rate of malignant change. Overseas studies have shown malignant transformation to squamous cell carcinoma in four to six per cent of leukoplakias followed in a large series of patients over a mean observation period of up to 9.8 years.[9–11] However, some 15 per cent of leukoplakias with premalignant changes in biopsies (dysplastic lesions) regress spontaneously.[12]

Other conditions also predispose to cancer of the mouth. These include oral lichen planus (a chronic inflammatory eruption of unknown origin);[13] oral discoid lupus erythematosus (a localised inflammatory disorder of skin or oral mucosa, possibly auto-immune in nature);[14] and oral submucous fibrosis (found in people using betel, characterised by deposits of fibrous tissue in oral mucosa).[15]

Betel

The use of betel (areca nut) quid with tobacco is associated with eight to 15 times the relative risk of oral cancer in the Indian subcontinent,[16] and the use of betel quid without tobacco but chewed with lime in Papua New Guinea carries one to four times the relative risk.[17] These substances are on sale in NSW. The extent of their use is unknown, but likely to be low; however, it may be higher in certain ethnic groups.

Other factors

Other factors that may predispose individuals to develop oral cancer include oncogenic types of the human papilloma virus, trauma from the teeth or dentures, syphilis, or dental sepsis.

PROTECTIVE FACTORS

Dietary factors

Including fruit and green-leafed vegetables in the diet, and normal iron status, seem to protect against oral cancer. The value of individual micronutrients such as vitamins A and C has not been confirmed.[18,19]

CONTROL OF ORAL CANCER

Primary prevention

Primary prevention has been estimated to be the most cost-effective method of preventing oral cancer.[20] Up to three-quarters of oral cancers could be prevented by avoiding environmental factors, notably the consumption of tobacco and excess alcohol.[8,21–23] Health education about tobacco has been shown to reduce the incidence of leukoplakia.[24]

Recently, 65 people attending the public dental clinic at Westmead Hospital were surveyed. Ninety-one per cent reported knowing nothing about oral cancer and 38 per cent had one or more of the major risk factors for developing

oral malignancy (for example, tobacco smoking). These findings suggest that oral health professionals need to work in partnership with other health professionals to reduce cigarette smoking and to support primary prevention strategies to promote responsible alcohol intake.

The National Health and Medical Research Council (NH&MRC) advises that primary health care providers should enquire about their patients' use of tobacco and alcohol. They recommend that people who smoke should be advised to quit and that safe levels of alcohol be promoted. Outdoor workers and people engaging in outdoor leisure activities should be advised to protect their lips from ultraviolet damage.[25]

Two studies have recently been conducted of smoking cessation practices used by NSW dentists. The majority of dentists reported that they ascertained their patients' smoking status at least some of the time.[26,27] Dentists said that they told their patients about the oral and general health effects of smoking and advised them to quit or cut down.[26,27]

Secondary prevention

Intervention and excision of leukoplakias and erythroplakias, combined with elimination of risk factors associated with their development, reduces the incidence of oral cancer.[11] Opportunistic screening for oral cancer by oral examination can be carried out during patients' regular visits to their doctor or dentist. All that is needed is a good light and chair (a dental unit is ideal) and a simple systematic examination of all sites in the mouth. Patients with positive findings should be referred to a specialist for a definitive diagnosis, biopsy and further management.

Oral cancer screening

Both the Canadian Task Force on the Periodic Health Examination,[28] and the US Preventive Services Task Force,[29] report that there is insufficient evidence to recommend for or against routine screening of asymptomatic people for oral cancer. Likewise, in Australia, the NH&MRC does not advocate routine oral screening of asymptomatic people, observing that there is no evidence that early detection lowers mortality rates from oral cancer. Both the Canadian and US Task Forces recommend implementing smoking cessation strategies and the US task forces also recommends limiting alcohol consumption.[28,29] The Canadian Task Force also suggested that annual oral examinations should be considered for people over 60 years of age who have risk factors for oral cancer.[28] The American Cancer Society recommends a checkup for oral cancer every three years, and the National Cancer Institute and National Institute of Dental Research in the United States both support efforts for early detection through routine dental examinations.

A large randomised controlled trial of screening being conducted in India has shown promising results after two years.[30] However, the prevalence of oral cancer in India is up to four times higher than in other countries. Consequently, the results may not be generalisable to Australia.

More information describing the prevalence of risk factors in the community is needed. As well, research to demonstrate the effectiveness of primary prevention strategies and the reliability, validity and responsiveness of effective screening or case-finding methods is required. Further laboratory research at the level of gene mutational analysis could assist the fundamental understanding of the process of oral carcinogenesis.

CONCLUSION

Oral cancers are a potentially preventable cause of morbidity and mortality. The major risk factors, tobacco and alcohol consumption, and sunlight for lip cancer, are all also major risk factors for other common diseases. Oral health professionals should engage with other health professionals to identify and implement effective strategies to reduce the prevalence of these risk factors. As well, oral health professionals should be actively involved in effective risk-reducing strategies for their patients and in providing systematic oral examinations, especially for those at greatest risk of developing oral cancer.

REFERENCES

1. Coates M, Armstrong B. *Cancer in New South Wales: Incidence and Mortality 1995*. Sydney: NSW Central Cancer Registry Cancer Control Information Centre, NSW Cancer Council, 1998.
2. McCredie M, Coates MS, Day P, Bell JC. Changes in cancer incidence and mortality in New South Wales. *Med J Aust* 1995; 163: 520–523.
3. MacFarlane G, McCredie M, Coates M. Patterns of oral and pharyngeal cancer: Incidence in New South Wales, Australia. *J Oral Pathol Med* 1994; 23: 241–245.
4. MacFarlane G, Sharp L, Porter S, Franceschi S. Trends in survival from cancer of the oral cavity and pharynx in Scotland: A clue to why the disease is becoming more common. *Br J Cancer* 1996; 73: 805–808.
5. Smith D, Taylor R, Coates M. Socio-economic differentials in urban New South Wales. *Aust NZ J Pub Health* 1996; 20: 129–137.
6. *Survival from Cancer in New South Wales: 1980 to 1995*. Sydney: NSW Central Cancer Registry Cancer Control Information Centre, NSW Cancer Council, 1999.
7. *Epidemiology of cancer in South Australia: Incidence, mortality and survival, 1977 to 1996; Incidence and Mortality, 1996*. Adelaide: South Australian Cancer Registry, 1997.
8. Blot W, McLaughlin JK, Winn DM, et al. Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Res* 1988; 48: 3282–3287.
9. Pindborg J, Daftary DK, Gupta P, et al. Public Health Aspects of Oral Cancer. In: Johnson NW, ed. *Risk Markers for Oral Diseases*. Cambridge University Press; 1991: 338–388.
10. Einhorn J, Wersall J. Incidence of oral carcinoma in patients with leukoplakia of the oral mucosa. *Cancer* 1967: 20: 2189–2193.

11. Banoczy J. Follow-up studies in oral leukoplakia. *J Max-Fac Surg* 1977; 5: 69–75.
12. Scully C. Clinical diagnostic methods for the detection of premalignant and early malignant lesions. *Community Dental Health* 1993: 10 (Suppl. 1): 43–52.
13. Barnard, NA, Scully C, Eveson J Jnr, et al. Oral cancer development in patients with oral lichen planus. *J Oral Pathol Med* 1993; 22: 421–424.
14. Odell EW, Morgan PR. Biopsy pathology of the oral tissues. London, Melbourne: Chapman and Hall Medical, 1998: 53.
15. Murti PR, Bhonsle RB, Pindborg JJ, Gupta PC, Mehta FS. Malignant transformation rate in oral submucous fibrosis over a 17 year period. *Community Dental Health Oral Epidemiol* 1985; 13: 340–341.
16. Daftary D, Murti P, Bhonsle R, Gupta P, Mehta F, Pindborg JJ. Risk factors and risk markers for oral cancer in high incidence areas of the world. In: *Risk markers for oral diseases*, vol 2, *Oral Cancer*. Cambridge University Press, 1991: 29–62.
17. Henderson BE, Aiken GH. *Cancer in Papua New Guinea*. Monograph 53. Bethesda: National Cancer Institute, 1979; 67–72.
18. Steinmetz KA, Potter, JD. Vegetables, fruit and cancer. I: Epidemology. *Cancer Causes Control* 1991; 2: 325–357.
19. La Vecchia C, Franceschi S, Levi F, Lucchini F, Negri E. Diet and human oral carcinoma in Europe. *Eur J Cancer B. Oral Oncol* 1993; 29B: 17–22.
20. Stjernsward J. *Cost benefit in Sri Lanka*. Fact sheet 14. *Oral cancer*. London: Cancer Research Campaign, 1990.
21. Franceschi S, Talamini R, Barra S et al. Smoking and drinking in relation to cancers of the oral cavity, pharynx, larynx and esophagus in Northern Italy. *Cancer Res* 1990; 50: 6502–6507.
22. Schottenfeld D et al. Alcohol as a co-factor in the etiology of cancer. *Cancer* 1979; 43: 1962–1966.
23. Negri E, La Vecchia C, Franceschi G, Tavani A. Attributable risk for oral cancer in Northern Italy. *Cancer Epidemiol Biomarkers Prev* 1993; 2: 189–193.
24. Gupta PC, Mehta FS, Pindborg JJ et al. Intermediary study for primary prevention of oral cancer among 36,000 Indian tobacco users. *Lancet* 1986; i : 1235–1238.
25. NHMRC. *Guidelines for Preventive Interventions in Primary Health Care, Cardiovascular Disease and Cancer*. Canberra: NHMRC, 1996.
26. Rikard-Bell G. *Smoking cessation advice in dentistry*. MPH treatise, University of Sydney 1998.
27. Clover K, Hazell T, Stanbridge V, Sanson-Fisher R. Dentists' attitudes and practice regarding smoking. *Aust Dent J* 1999; 44: 46–50.
28. Canadian Task Force on the Periodic Health Examination. *Canadian Guide to Clinical Preventive Health Care*. Ottawa: Canadian Communication Group, 1994; 838–847.
29. *Guide to Clinical Preventive Services*. Report of the US Preventive Task Force, 2nd edn, Chapter 16. Screening for oral cancer. Baltimore: Williams and Wilkins, 1996.
30. Trivandrum Oral Cancer Screening Study. Summary of results: process and intermediate outcome measures. IARC, Lyon, France. Abstract, p.15. In: *Conference Proceedings of the 6th International Congress on Oral Cancer*. UICC Meeting, New Delhi, 1999. Delhi: Macmillan, 1999.

ORAL HEALTH RESEARCH: CURRENT TRENDS AND FUTURE RESEARCH REQUIREMENTS

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Oral health is not included in Australia's identified health priorities. Perhaps the decline in caries in children and the increased tooth retention in adults have led decision-makers to conclude that the public health issues in dentistry have been largely solved.[1] However, this is not the case.

Oral diseases and disorders are still among the most prevalent causes of morbidity in our community. Past or present dental caries experience and less severe forms of periodontal diseases are ubiquitous among adults. Collectively, oral diseases and disorders propel the gastrointestinal system to the top of 'cost of illness' calculations. While generic measures do not capture the substantial effect of oral diseases on quality of life, specific measures of oral 'quality of life' show a moderate prevalence of negative effects across a range of physical, social and psychological domains. Dental caries and periodontal diseases are largely preventable, and both are amenable to treatment that restores function. In addition to these prevalent oral diseases, less common oral problems contribute to significant public health problems such as injuries and cancer.

This paper describes the oral health research that is required to better understand the nature and distribution of oral diseases, their aetiology, and the efficacy of interventions. The necessary oral health research can best be organised around specific age cohorts in the community.[2,3]

PRE-SCHOOL CHILDREN

The oral health of pre-school children has improved considerably over the last four decades. However, three issues warrant further research:

- the prevalence of early childhood caries
- the plateauing of caries experience in the deciduous dentition

- the balancing of the benefits and risks of fluoride exposure.

As described by Sarah Raphael in the April 1999 issue of this *Bulletin* (Volume 10, Number 4), early childhood caries (sometimes called nursing or bottle caries) represents a significant form of dental neglect in young children. While there is limited evidence of the effectiveness of interventions against early childhood caries, a number of innovative interventions require investigation. These include post-natal education of parents and guardians and including oral health as part of child assessments and advice given to parents and guardians by health professionals. Successful interventions against early childhood caries would most likely assist in reducing dental caries in the deciduous dentition, which plateaued more than a decade ago at around two teeth on average having experienced decay.[4] While such teeth are shed, children may suffer (possibly in silence) unnecessary discomfort or pain due to deciduous caries.

Fluorides are effective in reducing dental decay.[5] However, with fluoride exposures in young children, we need to balance preventing decay with preventing dental fluorosis, a disturbance to tooth formation caused by the presence of fluoride in tissue fluids over a prolonged period during tooth development.[6] While we strive to achieve such a balance in fluoridating water as a public health measure, other exposures to fluoride, such as from toothpaste, have become common. Collectively, such exposures may have enabled higher levels of caries prevention, but they can be accompanied by a higher than desirable prevalence of dental fluorosis. There is a need to monitor the outcome of these new patterns of fluoride exposure in terms of preventing both caries and dental fluorosis.

CHILDREN AND ADOLESCENTS

Australian children and adolescents now have a low level of dental caries in their permanent dentition.[4] The incidence of most caries is concentrated in a minority of children, creating an incentive to pursue a risk identification and management strategies to improve the effectiveness and efficiency of preventive dental care. However, risk prediction models have been disappointing, with the strongest predictors unfortunately being related to past experience of caries.[7,8] Useful population sub-group and individual risk predictors need to be developed and the cost-effectiveness of their use demonstrated. Caries risk identification needs to be paired with risk management strategies. There is a need for the effectiveness of preventive approaches to be critically assessed in sub-groups and individuals identified to be at high risk of caries.

Given the reduction in caries and a community that is increasingly concerned with appearance, it may not be surprising that many parents and children seek advice and orthodontic interventions for irregularities of tooth alignment or malocclusion.[9] While demand for orthodontic interventions funded by individuals is a personal consumer choice, the involvement of third parties, including dental insurance or government, raises allocative efficiency issues.[10] Competition for scarce public funds for such care is intense and defensible methods of assessing the physical, social and psychological impact of malocclusion and the efficacy of interventions in improving the oral quality of life would assist practitioners and managers responsible for resource allocation.

The substantial incidence of dental injury occurring to otherwise healthy and pleasing mouths is also a concern in Australia.[11] Mouthguards provide some protection;[12] however, compliance with wearing mouthguards in sport is low. Competing claims of efficacy between the over-the-counter and professionally supplied and fitted mouthguards also deserves attention because of the differences in cost. Effective, low-cost mouthguards are required, and organised sport needs to develop a policy on their use during training and competition. Further, the substantial percentage of dental injuries that occur in or around the home or at school calls for attention to injury prevention.

ADULTS AND OLDER ADULTS

Most young adults today enjoy improved oral health in comparison to several decades ago. However, some evidence suggests that not all the gains in oral health being made in children and adolescents are carried forward into adulthood. For instance, as part of the surveillance of oral health among adults using public dental services, it was found that 18 to 24 year old Australians had some seven teeth with past or present caries experience.[13] This was considerably higher than the two teeth this cohort would have had with caries experience at the age of 12 years.

Several factors contribute to the less favourable than expected oral health of young adults. Traditional clinical measures of dental caries omit early carious lesions (decay).[14] These lesions are not scored in measures of the number of teeth with caries experience. If such lesions progress among young adults, there is an apparent substantial increase in the burden of disease. The probability of such lesions progressing may be increased by lifestyle changes in adulthood and possibly with alterations in patterns of exposure to fluoride. The presence of carious lesions among young adults is a concern because they tend only to seek care for problems associated with later stages of disease progression, leading to high rates of tooth extraction.[13] Therefore, there is a challenge to understand the history and risk factors associated with caries in young adults and to develop and evaluate programs that might carry improved oral health through this vulnerable stage.

Middle-aged adults in Australia have extensive and widespread experience of dental diseases.[4] Until the late 1980s, there was no indication of any reduction in the total burden of disease, but data from 1995–96 indicate the first small reduction in the number of teeth with past or present caries experience (from 18.0 to 13.5 teeth).[15] While such reductions are welcome, so much disease is still experienced that there is a need to focus preventive efforts among adults.

What has changed among adults is the way their experience of oral disease is managed. Fewer decayed teeth are being extracted and more are being filled.[15] As a consequence, the mean number of filled teeth has either remained unchanged or increased depending on specific ages examined. Thus, there are more filled teeth to maintain. Filled teeth are at risk of recurrence of caries or the breakdown of fillings. Concerns within dentistry over unnecessary treatment have lead to the development of new clinical criteria for replacing fillings, but these need to be adopted more widely.

Just as medicine developed the concept of 'the failure of success',[16,17] dentistry is now challenged by the consequences of increased tooth retention: more teeth, more disease. There is a strong theoretical and some empirical evidence to support an increase in dental needs of middle-aged and older adults.[18] Teeth that would have been extracted in previous generations may spend extra years in ill-health, either because such teeth are saved from extraction but not from disease, or live on to contract further dental diseases or disorders. Given a constant rate of disease, an increased number of teeth will lead to a greater burden of disease.

Two conflicting issues may influence the simple more teeth, more disease relationship. First, rates of disease or disorder may not be constant. For instance, water fluoridation and other fluoride vehicles do alter the rates of caries development in older adults, and improved oral hygiene practices are thought to be associated with improvements in periodontal health over time. Consequently, rates of dental disease or disorders may be declining. Second, our understanding of the rates of disease have been formed among the more healthy oral survivors (those with more of their natural teeth). As an increased number of middle-aged and older adults retain their natural teeth, including those with poor oral health, the underlying rates of disease may increase.

It is important to understanding how the 'failure of success' will influence the burden of dental disease, as well as the need and demand for dental care, because changes in tooth retention are dramatic. In Australians aged 15 years and older the prevalence of edentulism (no teeth) has decreased from 22 to nine per cent from 1979 to 1996.[4,13] In older adults, edentulism has decreased from 66 to 38 per cent in the same period.[4,13] A range of chronic degenerative dental disorders which may have been masked by high tooth loss in the past is now emerging. These include tooth wear (attrition and abrasion), tooth erosion, cuspal factures, pulp death and root fracture. Managing most of these age-related disorders is difficult and much needs to be learnt about their aetiology, prevention and treatment.

OTHER RESEARCH AREAS

In addition to oral health research on the burden of disease in specific age cohorts, there is a need for accompanying research on a number of major themes.

There is a need for improved information on the results of self-care behaviours. Toothbrushing, including the use of toothpaste, has dominated the research literature. However, toothbrushing no longer serves well as an indicator of dental self-care as it is practised as part of personal grooming more than for the prevention of oral disease. To better understand and influence dental self-care, new indicators such as therapeutic mouthrinsing, flossing and dietary modification are required.

The link between professional dental care and oral health also requires investigation. A critical differentiation in the use of professional care is continuity of dental care. This implies both a stability in the source of and periods between receiving professional dental care.[19]

At present, these issues are not frequently explored in social surveys of the use of dental care. A related issue is the measurement of the outcomes of professional dental care. The common clinical indicators in dentistry are irreversible, accumulative measures of past and present disease. These indicators do not reflect the benefit of professional dental care to the individual. A number of socio-dental indicators and oral quality of life indexes have emerged that describe a more understandable benefit from professional dental care.[20] Professional dental care can increase the retention of functional teeth; help maintain sound tooth tissue; and reduce the negative physical, social and psychological impacts of dental diseases and disorders. Progress with measuring these outcomes opens up opportunities for further research on the optimal interval between professional dental visits which minimises cost and/or maximises benefits.

CONCLUSION

While real improvements in reductions in caries experience in children and adolescents and in tooth loss in adults have occurred in the last few decades, both a residual burden of dental disease and emerging further diseases and disorders leave dentistry with a considerable oral health research challenge. Some of the oral research requirements, such as optimising the prevention of dental caries and fluorosis in children under the age of six or

carrying forward the improvements in reduced caries experience in children into adulthood, are specific to age-cohorts. Other issues are more universal: how to respond to the phenomenon of more teeth and of more (and different) diseases and disorders. That response must also include a better understanding of dental self-care and professional dental care and how they contribute to oral wellbeing.

REFERENCES

1. Bailit HL. Changing patterns of oral health and implications for oral health manpower: Responsibility to the public. *Int Dent J* 1988; 38: 56–60.
2. Christianson ML. Lifetime dental health monitoring: An age-related preventive strategy. In: *Epidemiologic and clinical evidence and policy implications*. San Francisco: Health Policy Program, University of California, 1977.
3. Lewis DW (Chairman). Preventive dental services: Practices, guidelines and recommendations. *Report of the Working Group on Preventive Dental Services*. Ottawa: Health and Welfare Canada, 1979.
4. Spencer AJ, Davies M, Slade G, Brennan D. Caries prevalence in Australasia. *Int Dent J* 1994; 44: 415–23.
5. NHMRC. *The effectiveness of water fluoridation*. Canberra: NHMRC, 1991.
6. Spencer AJ, Slade GD, Davies M. Water fluoridation in Australia. *Community Dent Health* 1996; 13 (Suppl. 2) : 27–37.
7. Hausen H. Caries prediction: State of the art. *Community Dent Oral Epidemiol* 1997; 25: 87–96.
8. Stamm JW, Stewart PW, Bohannan HM, Disney JA, Graves RC, Abernathy JR. Risk assessment for oral diseases. *Adv Dent Res* 1991; 5: 4–17.
9. Spencer AJ, Allister JH, Brennan DS. Predictors of fixed orthodontic treatment in 15 year old adolescents in South Australia. *Community Dent Oral Epidemiol* 1995; 23: 350–5.
10. Downer MC. Craniofacial anomalies: Are they a public health problem? *Int Dent J* 1987; 37: 193–6.
11. Stockwell AJ. Incidence of dental trauma in the Western Australian school dental service. *Community Dent Oral Epidemiol* 1988; 16: 294–8.
12. Rodd HD, Chesham DJ. Sports-related oral injury and mouthguard use among Sheffield School children. *Community Dent Health* 1997; 14: 25–30.
13. Brennan DS, Carter KD, Stewart JF, Spencer AJ. *Commonwealth Dental Health Program Evaluation Report 1994–1996*. Adelaide: AIHW Dental Statistics and Research Unit, The University of Adelaide, 1997.
14. Burt BA. How useful are cross-sectional data from surveys of dental caries? *Community Dent Oral Epidemiol* 1997; 25: 36–41.
15. Spencer AJ. Caries activity of age cohorts in the Australian population. *Aust Dent Assoc News Bulletin* 1997; 245: 8, 11–4.
16. Gruenberg EM. The failures of success. *Milbank Mem Fund Quarterly* 1977; 55: 3–34.
17. Verbrugge LM. Longer life but worsening health? Trends in health and mortality of middle-aged and older persons. *Milbank Mem Fund Quarterly* 1984; 62: 475–519.
18. Joshi A, Douglass CW, Feldman H, Mitchell P, Jette A. Consequences of success: Do more teeth translate into more disease and utilization? *J Pub Health Dent* 1996; 56: 190–7.
19. Davidson PL, Cunningham WE, Nakazono TT, Andersen RM. Evaluating the effect of usual source of dental care on access to dental services: Comparisons among diverse populations. *Med Care Res and Review* 1999; 56: 74–93.
20. Slade GD, ed. *Measuring oral health and quality of life*. Chapel Hill: University of North Carolina, Dental Ecology, 1997.

THE SOKS PROGRAM

The Save Our Kids Smiles (SOKS) program, implemented in 1996, is an oral health assessment and promotion program for school-aged children. Oral assessments are offered at school for children in kindergarten and years two, four, six and eight attending Catholic, Government and Independent schools. Oral health promotion is also provided in the classroom.

Data from the 1997 SOKS assessments show that, after adjusting for age, the proportion of children with dental caries (measured by the average number of teeth that are decayed, missing or filled due to caries) was significantly higher in rural Area Health Services and lower in metropolitan Area Health Services when compared with NSW as a whole.[1] Similarly, the proportion of children with untreated decay was higher in rural and lower in metropolitan Area Health Services.[1]

Data from the first three years of the SOKS assessments are currently being analysed and a report will be available later this year. The SOKS program itself is currently being evaluated and results will be available in early 2000.

REFERENCES

1. Epidemiology and Surveillance Branch. 1999/2000–2000/2001 NSW Performance Agreements: AHS Health Status Profiles. NSW Health Department. **www.healthnsw.gov.au/public-health/pubs.html**.

THE DENTAL WORKFORCE IN NEW SOUTH WALES

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Dental services in Australia account for about five per cent of national health expenditures and 0.4 per cent of Gross Domestic Product. The workforce required to deliver these dental services comprises dentists, dental specialists, dental therapists, dental hygienists, dental prosthetists, dental chairside assistants, receptionists and dental technicians.[1] This article describes the size of the workforce in NSW, changes in the number of practitioners over the past 10 years, and sources of training.

DENTISTS

The majority of dentists in NSW have been trained at the University of Sydney through a five-year dental undergraduate course. In the 1970s and 1980s, there were around 90 to 100 graduates per year. In the 1990s, the number of first-year entrants was progressively reduced to about 60 graduates per year. This number of graduates will be maintained when Sydney University becomes the first Australian dental school to introduce a four-year graduate dental course, which will be similar to the graduate medical program.[1,2]

There was a very strong demand for dental services prior to 1970 because of the high prevalence of dental caries. In the 1970s, there were as many dental graduates from overseas countries registered to practise as there were from Australian dental schools. At that time, the supply of dentists in NSW went from an undersupply to an oversupply in relation to demand from the public; consequently, the Regulations of the Dentists Act 1934 (NSW) were changed to restrict the registration of most overseas-trained dentists. At the same time, the prevalence of dental caries was beginning to decrease as a result of water fluoridation and the introduction of fluoride toothpaste.

With less dental caries to be treated, dentists are now able to provide a wider range of more sophisticated and specialised services to more people. However, it is expected that the ratio of dentists to the population will decline further in the future with the lower numbers graduating from the University of Sydney.[1,2]

There were 3,863 dentists registered in NSW in 1998, or 61.5 dentists per 100,000 population (Table 3). Not all dentists registered with the Dental Board of NSW are in active practice as many are either retired, currently not working, or overseas. The number of NSW Branch members of the Australian Dental Association (2,591) is a closer indicator of those who are currently practicing in NSW. However, the best estimates are provided by the Dental Statistics and Research Unit of the Australian Institute of Health and Welfare at the University of Adelaide from their analysis of Australian Dental Practice Survey questionnaires sent out by the Dental Board of NSW. The AIHW publication, *Dental Practitioner Statistics, Australia, 1994*, indicates that 2,733 dentists (45.2 per 100,000 population) were practising in NSW. Of these, 84 per cent were in the private sector and 15 per cent in the public sector. About 10 per cent (264) of dentists were registered by the Dental Board as specialists, with more than half of these being orthodontists.[1–3]

The number of female dentists in practice in NSW has continued to increase. The majority are employed rather than self-employed, but the proportion of those self-employed is increasing rapidly. In 1994, female dentists comprised 24 per cent of all dentists aged 30 to 39 years compared with only four per cent of those over 60 years of age.[3]

There has always been a higher concentration of dentists in Sydney than in other areas of NSW. In 1994, the number of practising dentists per 100,000 population was 54.8 for Sydney and 29.6 for the rest of the state.[4] The Australian Dental Practice Surveys indicate that practitioners outside of Sydney see more patients than their counterparts in Sydney.[4]

DENTAL PROSTHETISTS

Dental prosthetists supply and fit dentures directly to the public and are registered by the Dental Board of NSW. The number of registered prosthetists has increased marginally over the years from 343 in 1987 to 387 in 1998. Dental prosthetists are trained dental technicians who have received additional clinical training through the TAFE college at Redfern (about 10 graduates per year). With limited facilities for training dental prosthetists and the decreasing need and demand for full dentures in NSW, it is expected that their numbers will not increase. As well as private practice, dental prosthetists provide services to government funded denture schemes.[1,2]

DENTAL THERAPISTS

Dental therapists provide a range of preventive and dental treatment procedures and have been the backbone of school dental services provided by the NSW Health Department. Formerly called school dental nurses, then school dental therapists, there were only a few working with the NSW Health Department prior to Commonwealth funding to subsidise training in the 1970s. Commonwealth funds were later withdrawn, but at one time the NSW Health Department had three training schools and the number of therapists employed by the department in school dental services increased rapidly in the 1970s and 1980s. During the 1990s, dental therapists were able to provide care for a larger number of school children due to the reduction in

TABLE 3

DENTAL WORKFORCE IN NEW SOUTH WALES: SUMMARY OF AVAILABLE STATISTICS[1]

Type of personnel	Year	Number registered/listed	Number active	Number per 100,000 population	Number of NSW graduates
Dentists	1978	2617		52.2	94
	1988	3691		64.8	85
	1994		2733	45.5	91
	–Sydney		2048	54.8	
	–Other		685	29.6	
	1998	3863		61.5	51
Dental prosthetists	1979	141			
	1987	343	269		
	1998	387			10
Dental therapists	1978		132		65
	1987		258		32
	1998		200		15
Dental hygienists	1988	42			
	1998	113			
Dental technicians	1987	630	466		23
	1998	621			30

dental caries, and the introduction of an assessment program (SOKS) enabled their services to reach more children. In 1998, 200 therapists were employed by the NSW Department of Health, and 15 were in their final year at the one remaining training school located at Westmead Hospital. The numbers employed are unlikely to increase. Recent proposals, if approved, would give dental therapists the right to practise under the direct supervision and control of dentists in private practice, and to receive additional training that would allow them to treat adults, both in the government and private sectors.[1,2]

DENTAL HYGIENISTS

Dental hygienists work under the direct supervision and prescription of registered dentists to provide a range of oral care services for adults, such as root planing, cleaning and scaling of teeth, and oral health education. They also assist dentists. The absence of a training facility in NSW has limited their numbers. The Dental Board of NSW conducts examinations and lists hygienists who meet the requirements of the Dentists Act 1989 (NSW). There were 42 hygienists in 1988 and this number had increased to 113 by 1998. A number of dental hygienists practising in NSW were trained in South Australia; others received training in the United Kingdom, South Africa and the United States. There is a demand for these staff in both the private and the public sectors.[1,2,5]

DENTAL TECHNICIANS

Dental technicians provide laboratory services and manufacture appliances to the prescription of dentists and dental prosthetists. Many are self-employed, but the majority work for commercial dental laboratories. Their numbers have remained fairly constant; 630 were registered under the Dental Technicians Registration Act 1975 (NSW) in 1987 and 621 in 1998. The number graduating from the course offered at TAFE was 23 in 1987 and 30 in 1998. Although their work has become more specialised in recent years, a large increase in their numbers is not anticipated.[1,2]

DENTAL CHAIRSIDE ASSISTANTS

Many dental chairside assistants are still trained on the job in both the private and government sectors, but full- and part-time courses are now offered at a number of TAFE colleges. About 300 people enrol and about 100 complete these courses each year in NSW. There is also a Dental Assistants Association Certificate, which is completed by 30 to 40 dental chairside assistants in NSW each year. Chairside assistants also often provide receptionist services for private dental practices. TAFE courses are available for dental health education and for radiography. On completion of the radiography course, chairside assistants can take radiographs.[1,2]

THE AUSTRALIAN DENTAL ASSOCIATION

The Australian Dental Association (ADA) carries out regular surveys of dental fees charged by their members in the private practice sector. The results are used by the ADA to negotiate the fixed-fee scale of the Commonwealth Government which is used as the basis for fees charged for work done for Repatriation beneficiaries. They also act as a guide for determining fixed fee scales by state governments. From time to time,

the ADA also carries out dental practice surveys to determine the costs of private dental practices and the productivity of dentists in the private and government sectors. For example, in 1997, self-employed general practitioners averaged about 58 patient appointments per week, which was equivalent to 2,550 patient appointments per year with about 2.1 visits each for the 1,200 different patients seen.[4]

Many groups in the community, such as the elderly, those living in institutions, the rural disadvantaged, socially disadvantaged, the disabled, Aboriginal and Torres Strait Islander people, refugees, and migrants, have special dental needs. To meet these needs, dental services must be expanded and be provided by a more appropriately trained dental health workforce in both the private and government sectors. The NSW Department of Health, universities, and TAFE colleges can provide such training, which should include a focus on population health issues and the needs of special groups.

REFERENCES

1. Barnard PD. *Facts and Figures in Australian Dentistry 1988.* Sydney: Australian Dental Association Inc, 1989.
2. Australian Dental Association (NSW Branch). *Dental manpower statistics as at July 1998.* Sydney: Dental Health Education and Research Committee, 1998.
3. Szuster FSP, Spencer AJ. *Dental practitioner statistics Australia, 1994.* Dental Statistics and Research Series, No. 11, AIHW, University of Adelaide, 1997.
4. Barnard PD, White J, Australian dental practice survey 1997. Third report. *Australian Dental Association News Bulletin* 1999; 266: 13-21.
5. Szuster FSP, Spencer AJ. *Dental hygienist labourforce Australia, 1996.* Dental Statistics and Research Series, No. 12, AIHW, University of Adelaide, 1997.

LETTERS TO THE EDITOR

DEAR EDITOR,

I thank the reviewers for their comments on my article (Volume 10, Number 3), and the NSW Public Health Bulletin for the opportunity to reply to those comments.

In their review of the principal academic references that suggest a link between periodontal disease and preterm birth, Drs Roberts and Algert state '...the Offenbacher article provides only weak evidence, if any, of a causal association between periodontal disease and preterm birth...' and that '...what the study literally shows is a very strong association between PLBW and a variable the authors have created...'

Firstly, this study can only establish an association. Evidence for causation would come from a prospective controlled clinical trial. This would entail periodontal treatment of many women, since preterm delivery is a relatively rare and unpredictable event. However, it is appropriate to establish an association before embarking upon a periodontal intervention study.

The reviewers sought an explanation of the variable used. The yes/no variable that was created involves clinical attachment loss (CAL). The 'yes' category applies to women with CAL of +3mm affecting 60 per cent or more of their dentition. The authors observe, correctly, that mean measures of CAL are often insensitive. They then create a variable that limits the effect of insensitivity. The 'yes' level of CAL is likely to be a true positive observation of severe periodontal disease. A strong association is shown between severe periodontal disease in a particular population and preterm delivery. Investigations to define risk groups and establish causality would be helpful.

In their review of the principal academic references that suggest a link between cardiovascular disease (CVD) and oral health, Professor Tofler and Dr Kull reviewed papers reporting on the link between periodontal disease and CVD in larger populations. I agree with their comments that strong associations exist between periodontal disease and CVD and that further studies are warranted to investigate the effect of treatment interventions.

Barbara Anne Taylor
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DEAR EDITOR,

Professor Tofler and Dr Kull rightly detail, in their comprehensive review of the putative association between periodontal and cardiovascular disease,[1] the potential confounders which compromise the epidemiological evidence demonstrating the link between periodontal disease and CVD, including the risk factors that operate in both diseases, such as age, cigarette smoking and diabetes; and social factors which may be active in both diseases. However, as they pointed out, such confounders were adjusted for and still statistically significant associations were found between the two diseases.[2] As they admitted, in theory, there are 'compelling biological links' between the pro-inflammatory effects of periodontal infection and the resultant CVD. However, randomised clinical trials would be close to impossible to construct, and the objective evidence linking the two diseases is most likely to come from strongly controlled epidemiological studies, as did

the evidence of fat intake and CVD, and intensive studies using appropriate animal models.

It is important that this association linking periodontal disease and CVD is not neglected until more substantive evidence of this association is sought. The association exists, although the biology is not yet understood, or indeed may be of questionable existence.

The association between periodontal disease and CVD is potentially extremely important and requires further exploration. Prospective epidemiologial research needs to be undertaken to determine more clearly the type and strength of the association. Developing collaborative links between oral health and other health professionals would facilitate this research.

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REFERENCES

1. Tofler GH, Kull A. Cupid and the tooth fairy: The link between cardiovascular disease and oral health. *NSW Public Health Bulletin* 1999: 10; 47–48.
2. Beck J, Garcia R, Heiss G, Vokonoas PS, Offenbacher S. Periodontal disease and cardiovascular disease. *J Periodontal* 1996: 67; 1123–1137.

NOTICE OF CHANGES TO THE BULLETIN PRODUCTION SCHEDULE

To streamline the release of the *Bulletin*, so that it is distributed as soon as possible after its title month, this August issue will not contain an Infectious Diseases Report.

Each *Bulletin* has to date presented the previous calendar month's infectious disease notifications, as reported by the Area Health Services. Constraints in collecting this information have affected the timeliness of each issue.

Consequently the *Bulletin* will in future contain an Infectious Diseases Report with notifiable conditions for two month's previous to the title month; for example, the September issue will contain notifiable conditions for July.

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The *Bulletin* aims to provide its readers with population health data and information to motivate effective public health action.

Submission of articles

Articles, news and comments should be 1000 words or less in length and include a summary of the key points to be made in the first paragraph. References should be set out in the Vancouver style, described in the *New England Journal of Medicine*, 1997; 336: 309–315. Send submitted articles on paper and in electronic form, either on disc (Word for Windows is preferred), or by email. The article must be accompanied by a letter signed by all authors. Full instructions for authors are available on request from the editor.

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