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ABOUT THE AUTHORS

A/Prof Len Crocombe. Ms Diana Godwin, and A/Prof Erica Bell are researchers at the Tasmania University Department of Rural Health (UDRH). The UDRH is a research-focused academic unit that achieves its mission by valuing close, sustained, and responsive relationships with the communities it serves and engages with. It is uniquely positioned within an island state and has developed strong strategic alliances with local government, community organisations and the Tasmanian Government Department of Health and Human Services, to promote an evidence-based rural health agenda.

A/Prof Len Crocombe and Ms Diana Godwin have spent the majority of their working lives in clinical dentistry and are past employees of Oral Health Services Tasmania. They have seen the effect on people of the ravages of dental diseases and this has instilled in them a passion to do something about it. A/Prof Erica Bell has worked extensively with disadvantaged groups with unequal health outcomes, developing health policy and services for these groups.

A/Prof Len Crocombe is also employed by the Australian Research Centre for Population Oral Health at the School of Dentistry of the University of Adelaide and by the School of Dentistry at the University of Western Australia. He is the dental consultant for AITEC who are responsible for the administration and delivering the curriculum of the Voluntary Dental Graduate Year Program.

A/Prof Len Crocombe and A/Prof Bell are both Chief Investigators and Ms Diana Godwin is a postgraduate research student with the Research Centre of Excellence in Primary Oral Health Care (CRE). The CRE is a collaboration between the Australian Research Centre for Population Oral Health and the School of Dentistry at the University of Adelaide; the University Department of Rural Health and the Menzies Research Institute Tasmania at the University of Tasmania, the School of Dentistry at The University of Western Australia and the Centre for Health Economics at Monash University and the South Australian Dental Service.

The CRE is part of the Australian Government funded Primary Health Care Research Evaluation and Development (PHCRED) Strategy to improve Australia's capacity to produce high quality primary health care research.to establish an expanded pool of primary health care researchers, more research relevant to practice and policy, and in collaboration with other relevant organisations, well informed primary health care practice and policy.

A/Prof Crocombe is also a Federal Councillor of the Australian Dental Association (ADA) and is Chairman of its Dental Workforce Education Committee. The ADA has as its aim the encouragement of the health of the public and the promotion of the art and science of dentistry. There are Branches of the Association in all States and Territories. Membership is voluntary and over 90% of dentists in Australia are members.

The views expressed in this submission are not necessarily those of the Tasmanian University Department of Rural Health, the Research Centre of Excellence in Primary Oral Health Care, or the Australian Dental Association.

Thank you for the opportunity to submit to the Legislative Council Joint Select Committee Inquiry into Preventive Health Care. Should you wish to discuss any of the matters raised in this response, please contact A/Prof Crocombe.

ORAL HEALTH IN TASMANIA

In Australia's National Oral Health Plan (National Advisory Committee on Oral Health, 2004), a definition of oral health was given that linked the concept of oral health to wellbeing and the quality of life:

"Oral health includes having healthy teeth and gums, but it also means that people's lives are not affected by a range of other conditions including diseases of the oral mucosa, cancers of the mouth and throat, malocclusion, birth defects (e.g. cleft palate), temporo-mandibular joint problems, or trauma to the jaw or middle of the face."

Oral Health is fundamental to overall health, wellbeing and quality of life. A healthy mouth enables people to eat, speak and socialise without pain, discomfort or embarrassment. The impact of oral disease on people's everyday lives is subtle and pervasive, influencing eating, sleep, work and social roles (National Advisory Committee on Oral Health, 2004). The prevalence and recurrences of these impacts constitutes a silent epidemic. Dental caries is the second most costly diet-related disease in Australia, with an economic impact comparable with that of heart disease and diabetes (AHMAC 2001). Expenditure on dentistry in Australia was \$7.7 billion in 2009-10 or 7.5% of total health funding (AIHW, 2012).

Tasmania has arguably the worst adult oral health of any State or Territory in Australia. Tasmanians are more likely to have an inadequate dentition, (fewer than 21 teeth) than their mainland counterparts (Roberts-Thomson and Do, 2007). Tasmania does not have a dental school, and compared to mainland Australia has a relatively low number of dentists. It is more decentralized, has an older population, lower socioeconomic status (ABS, 2006), and a higher proportion of people eligible for public dental care than mainland Australia (Slade et al., 2007). People from rural areas live in a different physical environment, are more likely to poorer, older, and less educated (ABS, 2006), have poorer oral health (Crocombe et al. 2010) and suffer from poorer access to dental care than their metropolitan counterparts (AIHW, 2008).

THE NEED FOR EVIDENCE-BASED ORAL DISEASE PREVENTION STRATEGIES TO IMROVE THE ORAL HEALTH OF TASMANIANS

The crucial characteristics of the medical and dental systems we have today stemmed from the seventeenth-century view of health. Rene Descartes (1596-1650), a French philosopher and mathematician, described the body using the machine metaphor (Hewa and Hetherington, 1995):

"... I assume the body is nothing else than a statue or machine ... indeed, the nerves of the machine I am describing to you may very well be compared to the pipes of the machinery of fountains, its muscles and its tendons to various other engines and devices which serve to move them ... its heart is its spring"

There were three consequences of thinking of the body as being like a machine, and these consequences describe the biomedical approach to health.

The first was a physical reductionism that permeated the biomedical system (Hahn and Kleiman, 1983) where the body was split into parts that were analysed and treated separately leading to an era of specialisation with oral health being seen as a separate identity to health in general.

The second was that diseases were seen as "deviations from the norm of measurable biological (somatic) variables" (Engel, 1977; Mishler, 1981) with most disorders being understood in terms of simple cause-effect relationships.

The third was people relied on medical interventions as the source of health. Health was delivered to people by health professionals and the hospital became the essential base and focus for medical services. Medical and dental treatment grew more complex, costs spiraled, yet there were few cures for the increasing burden of chronic diseases (Pine, 1997).

The language of oral health policy documents in OECD countries is dominated by workforce and practitioner development concepts (Bell and Crocombe, 2012). The policy document authors assert three causal explanations for unequal oral health based on socio economic causality, service model causality, and workforce causality. Bell and Crocombe (2012) found that there was an absence of oral health policy documents, those that were available were dated, and that they had limitations in explaining poor oral health causes and providing solutions.

Improving access to dental care is an option, albeit an expensive one, and with the recent large increase in dental practitioner training places, and the increase in the number of dentists coming from overseas, finding dental practitioners willing to practice in Tasmania will become easier and easier. In the five years between 2006 and 2011 the number of dentists registered in Australia increased by 13.2%, while the total number of dental practitioners increased by 15.4% (AHPRA, 2012).

For those that can afford it, excellent dental care is available in Australia (AIHW, 2012). 2009). However, **many people do not have adequate access to dental care**, including frail and older people (Chalmers et al. 2002), rural residents (Crocombe et al. 2010), Indigenous Australians (Slack-Smith et al. 2011), people with physical and intellectual disabilities (Pradhan et al. 2009), and people of low socio-economic status (Sanders et al. 2004). In Australia, people eligible for public dental care are more likely than the rest of the population to have teeth missing due to pathology. They are also almost 1.5 times as likely to have untreated dental decay and they have, on average, four more teeth affected by caries than ineligible people (Spencer and Harford, 2007). Similar comparisons are found in Tasmania (AIHW, 2008). "This paints a picture of the public system (in Australia) as providing sporadic and problem-orientated care to a small percentage of the eligible population" (Spencer, 2004).

A reason some people do not receive adequate dental care is that the costs of such care are mainly covered privately by the individual. Less than 19% of dental costs are covered either by State or Commonwealth Governments (AIHW, 2012). Dentistry is largely supplied by the private sector (Balasubramanian and Teusner, 2011).

Some argue that a "Denticare" would be beyond the financial capabilities of the Australian Government. Senator Walsh in his book *Confessions of a Failed Finance Minister* advised that:

"dental treatment has the potential to be a bottomless fiscal pit which no Commonwealth Government should go near" (Walsh, 2005).

The cost of providing such a scheme has been estimated to be in the order of anywhere between \$7 and \$11 billion per annum (NHHRC, 2008).

The architect of Medicare, Professor John Deeble, recognised that dentistry was not suitable for universal schemes. He has said:

"The main problem with Medicare covering the [dental] industry is its basic uninsurability ... insurance works for best for things that are episodic and unpredictable. Dental illness is slow: it is not episodic and it is not unpredictable, because you know you have it for guite a long time ..."

A concern with a universal publicly-funded dental scheme is that we could end up with those who are currently receiving dental care receiving more elaborate services, while those who are not able to access dental care, will remain poorly serviced. Some argue (ADA, 2010) that, as 65% to 70% of the population can readily access dental care without Government assistance, if the remaining 30% to 35% of the population, who believe they are unable to afford dental care (Sanders, 2007), were to receive appropriate and proper access, this would achieve universal availability of dental care regardless of people's ability to pay.

Improving access to dental care is the main thrust of Commonwealth Government policy to improve oral health outcomes. In the 2011/12 Budget, the Government announced the Voluntary Dental Graduate Year Program (VDGYP) to support 50 newly graduated dentists and provide them with a structured program for enhanced practice experience and professional development opportunities, whilst increasing dental workforce service delivery capacity, particularly in the public sector. The oral health spending in the 2012-13 Budget was \$515.3 million, over four years. This included \$10.5 million for oral health promotion and to develop a National Oral Health Promotion Plan, \$35.7 million for an expansion of the VDGYP, \$45.2 million for a Graduate Year Program for Oral Health Therapists, \$77.7 million for a Rural and Remote Infrastructure and Relocation Grants for Dentists, and \$450,000 to a non-government organisation to coordinate pro-bono work by dentists (Australian Government Budget 2012-13). More recently (August 29, 2012), the Minister announced a \$4.1 billion dental package with \$2.7 billion over 6 years for dental care to 3.4 million children in families eligible for Family Tax Benefit A capped at \$1,000 per child over a two year period, \$1.3 billion for low income adults, including pensioners, concession card holders and those with special needs.

The Tasmanian Government approach to poor oral health has been largely two-fold, based on the use of water fluoridation and investing in public dental health care. Beaconsfield was the first town to fluoridate in Australia, while in 1964, Hobart and Canberra were the first capital cities in Australia to fluoridate their water supplies (ARCPOH 2012). Compared to the other Australian States and Territories, in 2008/09 Tasmania spent the most at \$46.33 per capita on delivering dental care (ADANSW, 2010). This is more than double the amount spent in New South Wales. Tasmania was the first state in Australia to introduce New Zealand dental nurses, now called dental therapists, to treat school children, though it was the last state to introduce dental hygienists who specialize in preventive oral health.

Even though Tasmania spends the most on oral health care, according the Tasmanian Auditor General (2002):

"waiting times for general care were at unacceptably high levels..."

Prior to the recent Tasmanian Government cost reduction strategy, the dental care provided by the Tasmanian public sector was severely restricted by the available funding. Only 26% of eligible adults were actively attempting to access general dental care. Of those, only one third were successful:

"Dental resources are insufficient to provide general dental care and there was some evidence that in the Southern region the service is struggling to meet the demand for emergency care" (Tasmanian Auditor General, 2002)

For those who do continued to attempt to access public dental care in Tasmania, the waiting time for public dental care was quite long. The Tasmanian Auditor General (2002) noted that:

"waiting times for general care are at unacceptably high levels with no reasonable chance of an adult obtaining general care in Tasmania's public oral health system."

Since the current Tasmanian Government's cost reductions strategies, and the recent cessation of the Commonwealth funded Chronic Disease Dental Scheme, the situation can only have gotten worse.

The expansion of public dental services to supply dental care to all Tasmanians such as a "Denticare" would be way beyond the financial capabilities of the Tasmanian Government. With 2.26% of the Australian population (ABS, 2012), the NHHRC figures (2008) indicate that the cost for a "Denticare" for Tasmania would equate to between \$158 and \$249 million. Tasmania cannot afford to supply the dental care needed to maintain a high level of oral health for its relatively high proportion of health care card holders. The amount needed would be between \$63 and \$100 million, no whether the dental services are supplied in the private or public sector, or by dentists or other dental practitioners. This compares to the current budget for Oral Health Services Tasmania of \$26.8 million to supply dental care to both school children and eligible adults (Parliament of Tasmania 2012)

This means that, unless the State Government is willing to quadruple its investment in delivering dental health care, an evidence-based preventive health care strategy is needed to prevent dental disease occurring in those currently with good oral health outcomes and in future generations of Australians.

WHAT THE EVIDENCE SAYS WORKS IN ORAL DISEASE PREVENTION

Oral health outcomes have improved over the generations (Crocombe and Slade 2007). For those who lived through World Wars I and II, dentistry frequently involved extracting teeth and making dentures. For the next generation, dentistry involved restoring teeth leading to "the repeat restoration cycle" (Elderton, 1990) of filling and then later refilling the same teeth as restorations collapsed or more tooth decay occurred. The latest generations have not suffered from poor oral health to the extent of previous generations (Slade et al. 2007, Crocombe et al. 2010).

Investigating why oral health outcomes have improved will give us insights into how we can ensure continuing improvements of oral health into the future. We will first investigate dental surgery preventive health care measures and then preventive health care measures that can be undertaken by individuals and within the community.

Dental Surgery Preventive Oral Health Measures

Research has shown that frequently visiting a dentist has not reduced dental caries (tooth decay) experience (Sheiham 1977, Evans et al. 1993). The debate on appropriate dental visiting behaviour began back in 1977 when Sheiham found that though the most frequent dental attenders had the advantage over the less frequent attenders of having a higher number of functioning teeth, they also had the disadvantage of higher levels of dental disease experience. Later, regular attenders were found to have to be less likely to suffer acute symptoms and require emergency treatment (Sheham et al. 1985, Todd and Lader 1991, Murray 1996). Dental care may not prevent much dental disease, but that doesn't mean it is a waste of time. Regular dental visiting has allowed people receive dental care while the disease was at an early stage so that it could be treated before it caused problems. Improving access to dental care may improve oral health outcomes but that is not the whole solution (Crocombe et al. 2013). In comparison to adults with favourable visiting patterns, adults with unfavourable visiting patterns are half as likely to receive preventive treatment and four times more likely to receive extractions (Ellershaw & Spencer, 2011). Both moderate to severe periodontal (gum) disease is also more likely in adults with unfavourable patterns compared to adults with favourable patterns (Spencer & Harford, 2008).

Private dental practice has changed to reflect not just the greater retention of teeth, but also the increased use of services by adults. The pattern of practice has shifted towards

fewer visits to the dentist per year, but more services provided per visit, so that there have been a stable annual number of services supplied per dentist (Brennan and Spencer, 2000). The mix of services per year by dentists has shifted from simple restorative, denture and extraction services to diagnostic, preventive, more complex restorative and root filling services. **The use of minimal intervention dentistry that involves more conservative tooth cavity preparation, and the comprehensive management of oral diseases, has the potential to prevent dental disease, reduce "the repeat restoration cycle" and improve oral health outcomes (Tyas et al. 2000).**

However, the research suggests, that historically, in-surgery preventive health measures have not prevented dental disease. Rather, regular dental treatment has meant that the disease is tackled in its earlier stages resulting in better oral health outcomes.

Pitts and colleagues (2011) suggest that the slow change to how dental caries is managed:

can be attributed in large measure to factors such as clinical and professional conservatism, economic incentives that reward surgical treatment more highly than preventive caries control, and the consistent failure of communication between the dental sub-groups, with poor communication by the research community and limited attempts at systematic implementation of research findings by clinicians working in health systems that promote the *status quo*.

Another and more plausible reason is simply that dental practitioners have not seen the evidence that preventive measures are cost effective. For example, Kallestal et al. (2003) in a systematic review found that the scarcity of well-conducted studies, as well as contradictory evidence in the reviewed articles, made it difficult to judge the health-economic effect of the studied caries-prevention measures which included fissure sealants, fluoride rinsing, fluoride tablets and lozenges, fluoride varnish, preventive programs and chlorhexidine.

This does not mean that we shouldn't continue the trend towards using more in-surgery preventive health measures. However, we need to ensure that the measures used are evidence-based. So, let's look at what the evidence indicates going through currently discussed potential preventive measures.

The research evidence is of insufficient quality to reach any conclusions regarding the beneficial and adverse effects of routine scaling and polishing for periodontal health (Bierne et al. 2008).

There is clear evidence of a caries-inhibiting effect of fluoride gel (Marinho et al. 2009a). Additional forms of topical fluoride (mouthrinses, gels, or varnishes), whether used in the surgery or at home, can reduce tooth decay in children and adolescents more than fluoride toothpaste alone, but the extra benefit is not great (Marinho et al. 2009b). A review (Marinho et al, 2009c) suggested a substantial caries-inhibiting effect of fluoride varnish in both the permanent and the deciduous dentitions based largely on trials with no treatment controls. Given the relatively poor quality of most of the included studies and the wide confidence intervals around the estimates of effect, there remains a need for further trials. The Australian guidelines (ARCPOH, 2006) recommend that professionally applied fluoride varnish should be used for people who have elevated risk of developing caries. It also recommends that high concentration fluoride gels and foams may be used for people aged 10 years or more who are at an elevated risk of developing caries in situations where other fluorides vehicles may be unavailable or impractical.

There is some evidence that one-to-one dietary interventions in the dental setting can change behaviour, although the evidence is greater for interventions aiming to change fruit/vegetable and alcohol consumption than for those aiming to change dietary sugar consumption (Harris et al. 2012).

Pit and fissure sealing of teeth is a recommended procedure to prevent caries of the occlusal surfaces of permanent molars. There was some evidence on the superiority of pit and fissure sealants over fluoride varnish application in the prevention of occlusal decays. However, current scarce data limit recommendations on whether to apply pit and fissure sealants or fluoride varnishes on occlusal surfaces (Hiri et al. 2010). According to Ahovuo-Saloranta and colleagues (2009), the effectiveness of sealants is obvious at high caries risk, but information on the benefits of sealing specific to different caries risks is lacking.

In Britain, a review (Nasser and Neild, 2011) concluded that behavioural intervention for smoking cessation involving oral health professionals was an effective method of reducing tobacco use in smokers and users of smokeless tobacco and preventing uptake in non-smokers. There was not enough evidence available to assess whether these interventions are cost-effective and the effectiveness of one intervention (or component of the intervention) over another was not clear.

The research results indicate that, other than in people with high dental caries risk, the evidence for successful use of dental surgery preventive oral health care is lacking. Further research needs to be undertaken as a matter of urgency.

Preventive Oral Health Measures that can be undertaken by Individuals

The causes of poor oral health we frequently hear about include poor hygiene, poor diet, social determinants, smoking, and low fluoride exposure.

It is questionable if the regularly stated causes of poor oral health hold true. For example, whether oral hygiene is effective in reducing dental disease is questionable, some suggest the effect of toothbrushing has more to do with regular applications of low dose fluoride from the toothpaste than the brushing per se (Davies et al. 2003). The current guidelines on the use of fluorides in Australia (ARCPOH, 2006), which are to be updated in 2013, is that for people aged six years or more, the teeth should be cleaned twice a day or more frequently with a standard fluoride toothpaste containing 1 mg/g fluoride, but that they should spit out, not swallow and not rinse.

The supervised regular use of fluoride mouthrinse at two main strengths and rinsing frequencies is associated with a clear reduction in caries increment in children with a high caries risk (Marinho et al. 2009d). The Australian guidelines (ARCPOH, 2011) recommend that fluoride mouthrinse may be used by people aged six years or more who have an elevated risk of developing caries.

The evidence suggests that the use of antimicrobial rinses provides an extra benefit in reducing dental plaque and gingivitis (gum inflammation) reduction when used in tandem with mechanical oral hygiene methods (Charles et al. 2004; Sharma et al. 2004; Mankodi et al. 2005). Whether reducing dental plaque and gingivitis reduction will lead onto reduced periodontal disease is open to question. We now know that few people exhibit advanced periodontal destruction, and though gingivitis precedes periodontitis, relatively few sites with gingivitis later develop periodontitis (Burt, 1993).

Dental flossing has not been linked to better oral health in systematic reviews (Hujoel et al. 2006, Sambunjak et al. 2011). Berchier et al. (2008) used a meta-analysis for plaque index and gingival index scores and concluded that routine instruction to use floss as an adjunct to toothbrushing to prevent periodontal disease was not supported by scientific

evidence. They suggested that the dental profession should determine, on an individual basis, whether high-quality flossing is an achievable goal. Crocombe et al. (2012) found that self interdental cleaning was not associated with dental plaque levels, dental calculus, gingivitis and periodontal disease. The Australian guidelines (ARCPOH, 2011) were silent on the use of dental floss and interdental cleaning.

The effect of poor diet on tooth decay has reduced over the last 50 years due to increased fluoride exposure (Rugg-Gunn, 1993; Burt & Pai, 2001). However, controlling the consumption of sugar remains a justifiable part of caries prevention, if not always the most important aspect (Li, 2011). It also does not mean sugar consumption should not be limited from a general health point of view. The World Health Organisation (2002) in a report on Diet, Nutrition and the Prevention of Chronic Diseases has recommended that "national health authorities and decision-makers should formulate country-specific goals for reduction in the amount of free sugars, aiming towards the recommended maximum of no more than 10% of energy intake and targets for "the frequency of foods and/or drinks containing free sugars should be limited to a maximum of four times per day." The Australian guidelines (ARCPOH, 2011) recommend people follow the Australian dietary guidelines (NHMRC, 2003), with for oral health, a focus on drinking plenty of tap water, limiting sugary foods and drinks; and choosing healthy snacks, e.g. fruits and vegetables.

A critical review of the literature (Riberio and Riberio, 2004) concluded there was no strong and consistent evidence between breastfeeding and caries. Similarly, in a randomised control trial, Kramer et al (2007) found no evidence of the beneficial or harmful effects of prolonged and exclusive breastfeeding on dental caries at early school age. On the other hand, studies have found that bottle-fed children drinking bottles had higher levels the level of early childhood caries as those that were breastfed (Du et al. 2000; Livny et al. 2007). Hence, promotion of breast feeding should reduce the prevalence of early childhood caries.

Changing a person's social determinants is very difficult. You can't pick your parents. The reasons why socioeconomic factors are associated with oral health are still open to debate. Sanders and colleagues (2006) found that the community health view that poor oral health was explained by personal neglect, where personal neglect was defined as lack of dental visiting or dental self-care or both, was not true. More recently, evidence has arisen about genetic risks for dental caries (Shaffer et al. 2012). These are important findings because it suggests that **having poor oral health is not necessarily the fault of the person with the condition**.

The other preventive suggestions have been chewing sugar-free gum to stimulate salivary flow and the use of mouthquards to prevent dental injuries. ARCPOH (2011) noted that recent reviews have consistently supported the use of xylitol and sorbitol in chewing gum for the prevention of caries as part of an oral hygiene routine (Deshpande and Jadad, 2008, Ly et al. 2008) and that one randomized controlled trial found that addition of casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) to sugarfree gum increased the preventive effect (Morgan et al. 2008) and went on to recommend that chewing sugar free gum can reduce dental decay. However, a more recent study found that daily application of 10% w/v CPP-ACP paste on school days for one year, when added to regular toothbrushing with a fluoride toothpaste, had no significant added effect in preventing caries in the primary dentition of pre-school children (Sitthisettapong et al. 2012). ARCPOH (2011) also noted that several studies show that use of a mouthquard when playing sport effectively reduces the incidence of dental and / or facial injuries (Labella et al. 2002; Knapik et al. 2007; Finch et al. 2005, Marshall et al. 2005, Quarrie et al. 2005) and recommended that mouthquards should be worn for all sports where there is a reasonable risk of a mouth injury.

Evidence-based preventive oral health measures that can be undertaken by individuals include toothbrushing with fluoride toothpaste, chewing sugar-free gum, if playing a sport with a reasonable risk of injury to wear a mouthguard and if a mother with an infant, breastfeeding. If people have a high dental caries risk, they could consider using a fluoride mouthrinse.

Preventive Oral Health Measures that can be undertaken by the Community

It has been proven that smoking is linked with periodontal (qum) health (Do et al. 2008) and fluoride exposure with tooth decay (ARCPOH, 2006). International bodies such as the US-based Centers for Disease Control and Prevention (CDC), the World Health Organisation and the US Surgeon General actively promote water fluoridation. The CDC placed water fluoridation in the top ten public health achievements of the 20th Century. The current guidelines (ARCPOH, 2006) recommend that water fluoridation should be expended to as many people as possible. It would not be an exaggeration to state that the one big thing that has improved oral health in the latter half of the twentieth century has been the use of water fluoridation and of fluoridated toothpastes. Unfortunately, we have not found any more "silver bullets" to improve community oral health. The simplest and most cost effective way of improving oral health in Tasmania is to ensure all its water supplies of communities down to 500 people are fluoridated (Campain et al. 2010). The larger the community, the more cost-effective water fluoridation becomes (Wright et al. 2001). The difficulty in Tasmania is that with its decentralisation (ABS 2012), there will be more smaller communities requiring fluoridation.

Other than fluoride exposure, the stated causes for poor oral health are the same as for poor health in general. This raises the question of whether these issues could be tackled as part of health promotion overall, not as a separate oral health promotion campaign. To promote oral health promotion as a separate message to general health promotion may only complicate the messages going to the public.

Perhaps not surprisingly as the mouth is part of the body, more and more links are being found between oral and general health. Examples include periodontal (gum) disease with low vitamin D serum levels (Grant & Boucher, 2010, Hujeol 2012), coronary heart risk (Hujoel et al. 2000) rheumatoid arthritis (Mercado et al. 2000), diabetes mellitus (Khader et al. 2006), premature births (Davenport et al. 1998) and respiratory infections (Scannapieco, 1999). In most cases, the evidence shows correlations without causality.

Further, pushing oral health messages may not work. One well known systematic review by Kay & Locker (1995) concluded that oral health education resulted in a small positive, but temporary effect on plaque accumulation and no discernible effect on caries increment. We do know that health promotion campaigns work in the area of early childhood caries (Hamilton et al. 2001, Plutzer and Spencer, 2007) and should be encouraged.

Despite advocacy over a long period for the common risk factor approach to the management of caries, the integration of oral health promotion into health promotion strategies, and emphasis on the importance of oral health to systemic well-being (Petersen 2008), there remains a disappointing focus on separate, dedicated, dental health education. It is not surprising that this approach has had limited impact (Pitts et al. 2011).

This suggests that the time of excluding the mouth from health planning, including in health promotion, should cease and that further research into the oral health/general health links should be encouraged.

System and wider social influences on unequal oral health outcomes

Currently oral health lacks a persuasive theory and evidence-base for understanding the socio-economic dimensions of unequal oral health. However, it is known that socio economic factors are the primary determinants of unequal health outcomes. That is, good health and poor health are linked to the economic and social shapers of people's lives (Commission on the Social Determinants of Health, 2008; Rainham, 2007). In this paper, the 'social determinants of health' are defined as the set of risk factors operating in broader social, not individual biological levels, to shape disease risks and outcomes. The work of Marmot and Acheson and others in the UK has demonstrated how: 'In countries at all levels of income, health and illness follow a social gradient: the lower the socioeconomic position, the worse the health '(Marmot et al., 2008; Acheson, 1998).

Bell (2010) has described the work of Acheson, Britain's leading public sector policy researcher in this area in the following manner, with reference to a watershed 1998 UK health policy report—the *Independent Inquiry into Inequalities in Health* (Acheson, 1998):

The aim of this report was to undertake a government review summarising the evidence of inequalities of health and life expectancy in Britain and identify evidence-based policy for reducing health inequalities. That aim was shaped by the strategic policy-making needs of the new Blair government at a particular historical moment. Britain had experienced eighteen years of Conservative rule which had brought prosperity at the price of growing inequality and social division. This created powerful impetus for new directions in public policy towards greater equality (Martin Laffin, 1997) — a 'policy window' not present twenty years before when a similar report (Black et al., 1980) was presented to the British government.

The focus in the Acheson report on health inequalities linked to complex structural inequalities in British society meant that it had to draw on a wide range of evidence beyond classical experimental designs. Concluding that 'controlled intervention studies are rare' the report explains that:

Indeed, the more a potential intervention relates to the wider determinants of inequalities in health (i.e. 'upstream' policies), the less the possibility of using the methodology of a controlled trial to evaluate it. We have, therefore, evaluated many different types of evidence in forming our judgement (Acheson, 1998).

Thus, the inquiry had to proceed in a context where there was little hard empirical evidence of 'what works'. Much of the available evidence did not offer proposals focusing on relevant changes to legislation and policy (Macintyre et al., 2001). The community among which Acheson sought consensus was primarily the community of experts across multiple disciplines who could help synthesise evidence about the diverse structural determinants of health inequality. The inquiry received a wide range of submissions from the community, including and commissioned papers from experts on seventeen topics such as income, housing and transport. The policy argument that the report presented drew on arguments to do with equity and social efficiency based on a socioeconomic model of the causes of health inequalities. These were used to support recommendations for change to a wide range of areas, from education to housing to transport, that went far beyond recommendations to do with healthy behaviours. The Acheson report had arguable success—the holistic outcomes of its inter-governmental recommendations were difficult to measure. Yet there can be no doubt it

helped put health inequalities at the centre of the British government's efforts to produce a healthier nation (Blane, 1999).

Oral health research has yet to properly investigate and theorise how such socioeconomic determinants of health could be working to shape oral health outcomes in ways that go beyond simple explanations of employment and income status. This is a big part of the challenge of addressing the socio economic determinants of unequal oral health. In researching the social determinants of oral health, oral health research will need to move beyond its current clinical paradigms to develop more policy-relevant solutions. **Policy-relevant research is needed to better examine how economic status interacts with cultural factors in areas such as self-management of oral health.** For example, poverty and poor health literacy are known to limit the capacity of people to manage their health in critical areas such as their health service utilisation. Such social determinants of oral health may be at work in, for example, rural and Aboriginal communities (Beard et al. 2009; Bell 2011; Costello et al. 2009; Dixon and Welch 2000; Marmot et al. 2008; National Preventative Health Taskforce 2008; Wilkinson and Marmot 2003)

CONCLUSIONS

Tasmanians have arguably the worst adult oral health and Tasmania has the most people eligible for public dental care in Australia. Tasmania cannot afford to supply the dental care needed to maintain a high level of oral health for its relatively high proportion of health care card holders. An evidence-based preventive health care strategy is needed to prevent dental disease occurring in those currently with good oral health outcomes and in future generations of Australians.

Historically, regularly visiting a dentist has not reduced dental caries experience. However, it has allowed people receive dental care while the disease was at an early stage so that it could be treated before it caused problems. Other than in people with high dental caries risk, the evidence for successful use of dental surgery preventive oral health care is lacking. The use of minimal intervention dentistry that involves more conservative tooth cavity preparation and the comprehensive management of oral diseases has the potential to prevent dental disease, reduce "the repeat restoration cycle" and improve oral health outcomes. Further research needs to be undertaken as a matter of urgency.

Having poor oral health is not necessarily the fault of the person with the condition and further research is needed into the system and wider social influences on unequal oral health outcomes. Evidence-based preventive oral health measures that can be undertaken by individuals include toothbrushing with fluoride toothpaste, chewing sugar-free gum, if playing a sport with a reasonable risk of injury to wear a mouthguard and if a mother with an infant, breastfeeding. If people have a high dental caries risk, they could consider using a fluoride mouthrinse.

The simplest and most cost effective way of improving oral health in Tasmania is to ensure all its water supplies of communities down to 500 people are fluoridated. The time of excluding the mouth from health planning, including in health promotion, should cease and that further research into the oral health/general health links should be encouraged. We are happy to present verbal evidence to the Joint Select Committee. Please contact us if you have any questions.

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