# The Association between State Funding and Utilization of Dental Services: A Case for A Universal Dental Scheme


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# The Association between State Funding and Utilization of Dental Services: A Case for A Universal Dental Scheme

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## ABSTRACT

The aim of this study is to investigate the association between State funding towards dental services and the frequency of dental visits among concession card holders. Based on nationally representative data collected from the Australian National Health Survey, probit regression showed that individuals residing in the State of Tasmania were less likely to visit the dentist relative to residents from the State of Victoria, but no other Australian State showed a consistently significant relation. Variation in the funding of dental services provided by Australian States amplifies inequity among concession card holders and provides support for a universal dental scheme.

## INTRODUCTION

Oral health is an integral component of general health (Brennan and Singh 2011; Gift and Atchison 1995; Petersen 2003; Spencer and Ellershaw 2011). Indeed, the success of general health care interventions can be compromised by a failure to deal with oral health issues (Australian Health Ministers' Advisory Council Sterring Committee for National Planning for Oral Health 2001; Rutkauskas 2000). In Australia the total number of Potentially Preventable Hospitalisations[i] (PPHs) related to dental conditions was 2.8 separations per 1,000 population in 2009–10 (S. Chrisopoulos et al. 2011). Poor dental health influences diet which in turn impacts on health outcomes. An infected mouth delays and excludes patients from surgery. Missing teeth reduce the probability of getting a job or rental accommodation. And yet most dental disease is preventable.

By adopting preventative measures such as the introduction of water fluoridation across most States and Territories and the inclusion of fluoride in tooth-paste, Australia has been rather successful in improving oral health at the population health level (Wright and List 2012). The Australian Commonwealth government, however, has been less successful in reducing inequalities in access to dental services (Harford and Spencer 2004; Wright and List 2012). The transference of the Commonwealth Government's School Dental Program and later the Commonwealth Dental Health Program in late 1996 to the state and territory governments meant that no individual State or Territory had sufficient resources to reduce inequality in access to dental services through the promotion of universal access (Wright and List 2012). Across the States, considerable differences now exist in publicly funded dental health expenditure per capita (AIHW 2006, 2011), giving rise to variations in the availability and utilization of dental services (Vecchio 2008) (Australian Research Centre for Population Oral Health 2003).

Ironically, although the Commonwealth plays a national leadership role in providing general health services, the same does not apply to oral health (Harford and Spencer 2004). Despite Australia's universal health coverage, most dental care in Australia is provided through the private sector (ARCPOH et al. 2010). State/territory public dental programs for adults limit eligibility to those who have a health care card or pensioner health care card. In Australia, a concession card is issued to social security pensioners and other eligible individuals who receive government assistance. Concession cardholders have access to Australian Government health concessions such as cheaper health care services and less expensive medicines, and also receive help with the cost of living. Various State / territory and local governments and some private providers may offer additional health, household, transport, education and recreation concessions to concession card holders (Australian Government Department of Social Services 2014).

The Commonwealth makes an indirect contribution to these services through the dental component of the 30% rebate on private health insurance. (Harford and Spencer 2004). The consequence of the Commonwealth's subsidization of oral health towards private health insurance for middle and high income earners has been the diversion of resources away from preventive strategies and clinical services for disadvantaged Australians. Public funding for dental care favours the financially and orally better off at the expense of disadvantaged and orally unhealthy Australians (Harford and Spencer 2004). This has led to an inequitable and inefficient health care system (Harford and Spencer 2004).

[i] hospital separations where the principal diagnosis of the hospitalisation is thought to be avoidable if timely and adequate non-hospital care had been provided S. Chrisopoulos, K. Beckwith, and Je. Harford, 'Oral Health and Dental Care in Australia: Key Facts and Figures 2011. Cat. No. Den 214 ', (Canberra: AIHW, 2011).

Given the social, economic and health implications of poor dental health, it is surprising that very little discussion exists in the public arena regarding the disparities in dental health services and the role of State government funding. This study examines the utilization patterns of dental services among Australian adults taking into consideration the association between State funding and frequency of dental visits among concession card holders.

## The Current Literature

The decision to seek dental care is based on an individual's assessment of factors such as money, time, pain, and inconvenience of travel (Stewart and Ellershaw 2012). Factors that affect individual health care-seeking behavior include predisposing factors (socio-demographic, education, attitudes and beliefs towards health) (Hellenic Dental Association 2005; Koletsi-Kounari et al. 2011; Zavras et al. 2004), enabling factors (income, health insurance etc) and illness level (AIHW 2012; Anderson and Newman 1973; Hopkins et al. 2013; Spencer and Ellershaw 2011). Traditionally, research in economics has focused on the association between dental services and economic factors (Conrad et al. 1987; Grembowski D 1987; Grytten and Holst 2002; Jamieson and Thomson 2006; Nguyen L 2005; Tianviwat S 2007). Bendall and Asubonteng's (Bendall and Asubonteng 1995) review of several US studies revealed that family income impacted positively on the demand for dental care. Outside the United States, the findings relating to income and dental care are similar (for example, (Grytten and Holst 2002; Jamieson and Thomson 2006; Nguyen L 2005; Tianviwat S 2007)). That is, individuals with higher incomes tend to utilise dental services more frequently (Hellenic Dental Association 2005; Zavras et al. 2004). Indeed, improving dental visiting behavior among low socioeconomic status groups appears to have the greatest effect on improving oral health and reducing impacts from poor oral health (Crocombe et al. 2012).

In recent years, researchers have included health-related lifestyle behaviors such as smoking habits, regularity of food consumption, diet, physical activity and obesity as links to the frequency of dental visits (Koletsi-Kounari et al. 2011; Kosteniuk and D'Arcy 2006; Sheiham and Watt 2000; Wu 2007). Petersen and Holst (Petersen and Holst 1995) added societal, environmental (living and working conditions), structural (structure and function of dental health service system) and psychological factors as potential influences on dental service utilization. Stephenson et al found socioeconomic status and fluoridation status to be the strongest predictors of caries in the deciduous dentition (Stephenson et al. 2010). Many have shown the benefits of the addition of fluoride to public water supplies ((NHMRC). 2007; Griffin et al. 2007; Mahoney et al. 2008; McDonagh et al. 2000; Parisotto et al. 2010; Slade et al. 2013).

Australian research reflects the findings reported in other countries. Patterns of dental visits among Australians are related to age, annual household income, health insurance and government benefit cardholder status (Hopkins et al. 2013; Ringland et al. 2004; Slade et al. 2007; Stewart and Ellershaw 2012). Concession cardholders report higher rates of visiting for a problem and a greater likelihood of receiving an extraction or a filling than non-cardholders (Stewart and Ellershaw 2012). Being female increases the likelihood of accessing dental services while leaving school at less than 15 years of age, financial insecurity, non-homeowner and inability to travel alone decreases this likelihood (Ringland et al. 2004). Slade et al. (Slade et al. 2007) found that favourable patterns of dental attendance were more likely among dentate individuals, the insured, those residing in capital cities and individuals with higher levels of schooling. Those less likely to exhibit favourable patterns of dental care were indigenous Australians and those eligible for public dental care. Similar studies found that lack of dental insurance was a strong predictor of infrequent dental attendance (Hopkins et al. 2013; Roberts-Thomson and Slade 2008). Armfield (J. Armfield 2012) concluded that the main reason for dental avoidance was cost, followed by lack of time. In rural and remote areas, Australians tend to visit a dental professional less frequently than individuals residing in urban areas (Adams et al. 2004; Armfield et al. 2006; Vecchio 2008).

About 60% of Australians visit a dentist for a check-up; the remaining 40% go only when they have symptoms (Australian Research Centre for Population Oral Health 2003). Certain diseases or concomitant diseases and the use of drugs may contribute to poorer dental health (Pajukoski et al. 1999; Sandberg et al. 2000). Cardiovascular diseases, diabetes, cancer and chronic obstructive pulmonary diseases share common risk factors with oral diseases (Petersen 2003). Overall, people with a chronic condition are around twice as likely as those without to report toothache or discomfort, dissatisfaction with their (oro-facial) appearance, or to report avoidance of some foods due to oral problems, often or very often in the previous 12 months. Experience of toothache was highest among those with heart disease, and arthritis/osteoporosis. In contrast, cancer was the only chronic condition group to report less toothache than people without a chronic condition (AIHW 2012). Among those with a chronic condition, those that experienced a stroke had the highest likelihood of experiencing negative impacts of oral conditions (AIHW 2012). Nevertheless, several Australian studies indicate little difference in the proportion of dental visiting patterns between people with chronic conditions and people without (AIHW 2012; Spencer and Ellershaw 2011).

While much of the research relating to dental services focuses on the demand side, supply side

determinants of service utilisation also need to be considered. When seeking access to publicly funded dental care, factors such as providers' accessibility, queuing procedures or a dentist's participation in publicly subsidised dental care determine whether, and how quickly, individuals are able to access public dental care (Stewart and Ellershaw 2012). External factors such as lack of public clinics, isolation or perceived inadequacy of the available provider may restrict access to publicly funded dental care (Stewart and Ellershaw 2012). The negative association between cardholders and healthy dental visits (Slade et al. 2007; Stewart and Ellershaw 2012) and between remoteness and dental visits ((Adams et al. 2004; Armfield et al. 2006; Vecchio 2008) reflect to some extent the difficulties in access to public dental care. The supply side component in patterns of dental visits, particularly in relation to public funding, has received far less attention by researchers.

### Objective

This study examines the utilization patterns of dental visits among Australian concession card holders. A major consideration is the impact of individuals residing in a particular Australian State to determine a link between State funding and frequency of dental visits among low income and disadvantaged individuals who receive a government concession card.

Given the variation in State public funding towards dental health, the first hypothesis is: *Lower State government dental expenditure reduces the frequency of dental visits by concession card holders residing in that State.*

## METHOD

### Study Population

The cross-sectional analysis is based on the 2005 National Health Survey (NHS). Analysis based on more recent data was not possible. The Australian Bureau of Statistics did not collect information on dental visits in the subsequent ABS surveys. The survey (Australian Bureau of Statistics 2005) conducted throughout Australia in the months of August 2004 to July 2005, covered individuals in both urban and rural areas in all States and territories. Trained interviewers from the Australian Bureau of Statistics (ABS) collected the household component of the data survey from a sample of 19,501 private dwellings (Australian Bureau of Statistics 2006a). Within each selected household a random subsample of usual residents were selected for inclusion in the survey.

The inclusion criteria for this study were that individuals be aged 20 and over and receive a concession card. This resulted in the unweighted sample size of 6,542. The ABS supplied the weightings (person weights) in the NHS CURF (National Health Survey, Confidential Unit Record File) dataset providing an estimated population of 4,749,930.

### The Model

Initially a binary probit model is used to estimate the relationship between frequency of dental visits and State Expenditure. By incorporating other relevant factors identified in the literature - socio-demographic, economic and geographic - we are able to derive a relationship between frequency of dental visits and each of these factors.

The frequency of dental visits is determined in the following equation.

$$DentalVisit_i = \beta_0 + \beta_1 Socio\text{-}demographic + \beta_2 Health + \beta_3 Remote + \beta_4 State + \beta_5 Expenditure + \beta_6 Health\ Condition + \varepsilon_i$$

Although there are difficulties in defining an appropriate frequency of dental check-ups (Kay 1999; Patel 2010) there is strong evidence that a yearly dental examination is beneficial to the patient's health (Kay 1999). Six-monthly dental check-ups have traditionally been advocated by general dental practitioners in many developed countries, including Australia (Beirne et al. 2005; Patel 2010). Guidelines by NICE (National institute for Clinical Excellence) recommend interval dental check-ups should be determined on the basis of patient needs (National Institute for Clinical Excellence 2004). For adults NICE suggest the interval should be between 3 and 24 months. Routine dental attendance is associated with better oral health (Crocombe et al. 2012; Thomson et al. 2010). Individuals who have made a dental visit within the previous 12 months are likely to benefit from regular dental care (Stewart and Ellershaw 2012). Thomson et al (Thomson et al. 2010) identify routine attenders as those who (a) usually visit for a check-up and (b) make a dental visit during the previous 12 months (Thomson et al. 2010). Conversely, those who haven't visited within the last five years can be regarded as effectively being out of the dental system (Spencer & Harford 2007) (Stewart and Ellershaw 2012). In our analysis, we define *DentalVisit*: 1 if frequent visit, the most recent dental visit less than 1 year; 0 if infrequent visit, the recent dental visit more than or equal to 1 year. Ideally, we would like to measure symptomatic visits, rather than regular dental visits. However, due to data limitations, we use *DentalVisit* as an imperfect proxy for symptomatic visits, and our noisy measure should bias against any significant results. Regardless of the purpose or type of visit reported, our main concern is the identification of differences in the visiting patterns of concession card holders residing within each State. The actual direction of the *DentalVisit* coefficient is of less interest.

The standard socio-demographic variables such as country of birth, education, age, marital status and gender are included in the model. The categorical *Health* variable represents self-reported health status. A large body of literature identifies self-reported health as highly correlated with medically determined health status (see Cai 2007). A link also exists between health status and oral health..

The *Remote* variable captured information about the distance to a dental professional and the dentist:population ratio. This variable, to some extent, capture unobserved factors relating to that area such as disease prevalence, access to other health services and differences in fluoridated water supplies[ii]. The categorical variable, *State,* is a proxy for the supply of publicly provided dental services. *Expenditure* is a continuous variable representing the amount of public dental expenditure in each state. Information was sourced from the Health Expenditure Australia report (Australian Institute of Health and Welfare 2006). Later an additional model is run that replaces *Expenditure* with *Expenditure per concession card holder*. The vector of *Health Conditions* includes cancer, diabetes, heart and circulatory conditions, arthritis/osteoporosis, and asthma. The conditions chosen for analysis are based on their prevalence as chronic conditions in the Australian health care system and the association of these conditions with dental health (AIHW 2012) [iii, iv, v, vi].

We expect a negative coefficient for those States ($\beta_4$) with low government expenditure would reflect the lower supply of publicly funded dental services.

## THE RESULTS

Table 1 report the summary statistics for the sample by comparing individuals reporting infrequent visits with those reporting frequent dental visits, where frequent dental visits refer to those with the most recent dental visit(s) less than 1 year ago. Our discussion is based primarily on the univariate t-test for difference in means. Consistent with our expectation, Table 1 shows that females, those with a higher educational attainment, and younger age groups are more likely to visit a dentist. In contrast, married individuals, those residing in remote areas are less likely to make frequent dental visits.

Table 2 reports the probit regression results for frequent versus infrequent dental visits. , Six versions of the model were run to check the robustness of the estimated coefficients under investigation. Referring to model (1), presented in Table 2, *Expenditure* indicates that as public expenditures on dental health services increase, dental visits tend to increase. Being female, tertiary educated and in poorer health increase the likelihood of dental visits. Living in a remote area of Australia has the opposite impact. As concession card holders age they tend to visit the dentist less often.

Referring to model (2) that includes the *State* variable, we find that relative to Victorian residents those residing in Tasmania are less likely to make frequent dental visits. All other estimated coefficients for State report no significant results. Interestingly, the coefficient for Expenditure is only significant in model (1). But, when the state dummies are included, the Expenditure coefficient becomes insignificant. This indicates the positive relation between Expenditure and the frequency of dental visits is likely driven by Tasmania. The replacement of the *Expenditure* variable with *Expenditure per Concession Card holder* show similar results, see models (5) and (6). However, now the State of South Australia is significant and positively associated with frequent dental visits.

Similar to other Australian studies (AIHW 2012; Spencer and Ellershaw 2011), across the health conditions we find no statistically significant association between frequency of dental visits and specific health condition (refer models (3) and (6) in Table 2).

### Limitations of the Study

In this study dental visits were self-reported. We were unable to verify each participant's dental utilisation independently, and whether the visits were for a regular check-up or for symptomatic reasons. Since individuals with bed-ridden chronic conditions were less likely to make dental visits, our measures of dental visit propensity need to be treated with caution. The study assumed that the benefits (or not) of routine dental care were similar irrespective of the dentist visited. The validity of these assumptions is beyond the scope of the current analysis.

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ii By 1977 all Australian capital cities, with the exception of Brisbane, had fluoridated water. Today all residents of the ACT have fluoride in their tap water, along with 91 per cent of Tasmanian residents, 90 per cent in New South Wales, 86 per cent in Western Australia, 77 per cent in Victoria and 70 per cent in the Northern Territory. Before 2008, less than 5 per cent of Queenslanders had access to fluoridated water (Queensland Government 2008). In 2012, the Queensland Government revoked compulsory fluoridation, handing the decision to councils.

iii http://www.nidcr.nih.gov/OralHealth/Topics/CancerTreatment/OralComplicationsCancerOral.htm

iv http://www.colgate.com.au/app/Colgate/AU/OC/Information/OralHealthBasics/MedCondOralHealth/DiabetesandDisorders/DiabetesandOralHealthProblems.cvsp

v http://www.securiandental.com/cm_files/pdf/S_HST_Osteo_112904.pdf

vi http://ezinearticles.com/?Dental-Care-and-Asthma&id=4565660

**Table 1**. Variable definitions and weighted summary statistics

| Variable | Definition | Infrequent visits N=4,135 | | Frequent visits N=2,407 | | Difference |
|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | T test |
| Dependent Variable | | | | | | |
| Dental Visit | 1 (Frequent visit): most recent visit was less than 1 year<br>0 (Infrequent visit): most recent visit was 1 year or greater | | | | | |
| Socio-demographic characteristics | | | | | | |
| FEMALE | 0 if male; 1 female. | 0.61 | 0.49 | 0.65 | 0.48 | -2.12 |
| AGE | Categorical variable: age of the respondents in 20 year class intervals from 20 years of age<br>AGE2030s - Reference<br>AGE4050s<br>AGE6070s<br>AGEG80 | 0.21<br>0.45<br>0.13<br>0.20 | 0.41<br>0.50<br>0.33<br>0.40 | 0.24<br>0.46<br>0.09<br>0.15 | 0.42<br>0.50<br>0.29<br>0.36 | -1.35<br>-1.32<br>4.55<br>3.70 |
| COB | 1 if English speaking background; 0 otherwise | 0.85 | 0.36 | 0.83 | 0.37 | 0.95 |
| MARRIED | 1 if married; 0 otherwise | 0.28 | 0.45 | 0.23 | 0.42 | 3.14 |
| TERTY | 1 if Post or Bachelor Graduate; 0 otherwise. | 0.11 | 0.32 | 0.20 | 0.40 | -8.61 |
| DIPCERT | 1 if Diploma/Certificate; 0 otherwise. | 0.21 | 0.41 | 0.24 | 0.43 | -0.31 |
| GRADE12 | 1 if completed up to grade 12 ; 0 otherwise. | 0.67 | 0.47 | 0.56 | 0.50 | 6.83 |
| Health | | | | | | |
| HLTH | General self-reported health status. Categorical variable<br>Excell (Excellent)<br>Vgood (Very good)<br>Good<br>Fair/ poor - Reference | 0.30<br>0.23<br>0.21<br>0.21 | 0.46<br>0.42<br>0.41<br>0.41 | 0.31<br>0.19<br>0.21<br>0.24 | 0.46<br>0.39<br>0.41<br>0.42 | 1.10<br>3.82<br>-0.24<br>-1.35 |
| Geographic characteristics | | | | | | |
| REMOTE (Urbanicity) | Outer regional and remote | 0.56 | 0.50 | 0.54 | 0.50 | 1.23 |
| STATE | New South Wales (NSW) | 0.15 | 0.36 | 0.17 | 0.37 | -1.53 |
| | Queensland (QLD) | 0.16 | 0.37 | 0.15 | 0.36 | 2.57 |
| | Victoria (VIC) - Reference | 0.18 | 0.38 | 0.20 | 0.40 | -1.86 |
| | South Australia (SA) | 0.10 | 0.31 | 0.12 | 0.33 | -1.51 |
| | Western Australia (WA) | 0.15 | 0.36 | 0.10 | 0.30 | 3.16 |
| | Tasmania (TAS) | 0.00 | 0.06 | 0.00 | 0.05 | 1.01 |
| | Northern Territory (NT) | 0.04 | 0.21 | 0.06 | 0.24 | -1.01 |
| | Australia Capital Territory (ACT) | 0.15 | 0.36 | 0.17 | 0.37 | -1.53 |
| Medical Condition | | | | | | |
| CANCER | 1 if current cancer; 0 otherwise | 0.10 | 0.30 | 0.09 | 0.29 | 1.86 |
| DIABTS | 1 if current diabetes; 0 otherwise | 0.02 | 0.12 | 0.01 | 0.09 | 2.44 |
| HEART | 1 if current heart and circulatory condition; 0 otherwise | 0.43 | 0.50 | 0.43 | 0.50 | -0.16 |
| ARTH/OSTE | 1 if current arthritis or osteoporosis; 0 otherwise | 0.13 | 0.33 | 0.13 | 0.33 | 1.34 |
| ASTHMA | 1 if current asthma; 0 otherwise | 0.20 | 0.40 | 0.19 | 0.40 | 0.05 |

Source: Derived from the NHS, 2005

**Table 2**. Probit regression results on dental visits against state dental expenditure, N=6542

| Independent variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Coeff (SD) | Coeff (SD) | Coeff (SD) | Coeff (SD) | Coeff (SD) | Coeff (SD) |
| FEMALE | 0.088** | 0.086* | 0.083* | 0.087** | 0.086* | 0.083* |
| | (0.044) | (0.044) | (0.045) | (0.044) | (0.044) | (0.045) |
| COB | -0.051 | -0.049 | -0.058 | -0.040 | -0.049 | -0.058 |
| | (0.056) | (0.057) | (0.057) | (0.056) | (0.057) | (0.057) |
| TERTY | 0.309*** | 0.310*** | 0.309*** | 0.306*** | 0.310*** | 0.309*** |
| | (0.060) | (0.060) | (0.060) | (0.060) | (0.060) | (0.060) |
| DIPCERT | 0.072 | 0.066 | 0.066 | 0.074 | 0.066 | 0.066 |
| | (0.051) | (0.051) | (0.051) | (0.051) | (0.051) | (0.051) |
| MARRIED | -0.063 | -0.062 | -0.061 | -0.062 | -0.062 | -0.061 |
| | (0.043) | (0.043) | (0.043) | (0.043) | (0.043) | (0.043) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Excellent | -0.046 | -0.043 | -0.043 | -0.045 | -0.043 | -0.043 |
| | (0.059) | (0.059) | (0.060) | (0.059) | (0.059) | (0.060) |
| Very good | -0.111** | -0.111** | -0.113** | -0.110* | -0.111** | -0.113** |
| | (0.056) | (0.056) | (0.056) | (0.056) | (0.056) | (0.056) |
| Good | -0.144** | -0.144** | -0.145** | -0.140** | -0.144** | -0.145** |
| | (0.062) | (0.062) | (0.062) | (0.062) | (0.062) | (0.062) |
| AGE2030s | 0.251*** | 0.259*** | 0.283*** | 0.254*** | 0.259*** | 0.283*** |
| | (0.079) | (0.080) | (0.083) | (0.079) | (0.080) | (0.083) |
| AGE4050s | 0.265*** | 0.271*** | 0.282*** | 0.266*** | 0.271*** | 0.282*** |
| | (0.078) | (0.078) | (0.079) | (0.078) | (0.078) | (0.079) |
| AGE6070s | 0.180** | 0.182** | 0.188*** | 0.181** | 0.182** | 0.188*** |
| | (0.071) | (0.071) | (0.071) | (0.071) | (0.071) | (0.071) |
| REMOTE | -0.138** | -0.117** | -0.117** | -0.127** | -0.117** | -0.117** |
| | (0.055) | (0.056) | (0.056) | (0.055) | (0.056) | (0.056) |
| NSW | | 0.089 | 0.092 | | 0.175* | 0.175* |
| | | (0.057) | (0.057) | | (0.090) | (0.090) |
| QLD | | -0.180 | -0.170 | | 0.074 | 0.074 |
| | | (0.265) | (0.265) | | (0.080) | (0.080) |
| SA | | -0.136 | -0.122 | | 0.167*** | 0.169*** |
| | | (0.247) | (0.248) | | (0.057) | (0.057) |
| WA | | -0.010 | -0.003 | | 0.065 | 0.069 |
| | | (0.109) | (0.110) | | (0.072) | (0.072) |
| TAS | | -0.212*** | -0.210*** | | -0.136* | -0.137* |
| | | (0.076) | (0.076) | | (0.074) | (0.074) |
| NT | | -0.761 | -0.734 | | -0.250 | -0.243 |
| | | (0.622) | (0.623) | | (0.347) | (0.348) |
| CANCER | | | 0.145 | | | 0.145 |
| | | | (0.097) | | | (0.097) |
| DIABET | | | -0.058 | | | -0.058 |
| | | | (0.069) | | | (0.069) |
| HEART | | | -0.206 | | | -0.206 |
| | | | (0.193) | | | (0.193) |
| ARTH/OSTE | | | 0.044 | | | 0.044 |
| | | | (0.045) | | | (0.045) |
| ASTHMA | | | -0.047 | | | -0.047 |
| | | | (0.063) | | | (0.063) |
| EXPENDITURE | 0.009** | 0.028 | 0.027 | | | |
| | (0.004) | (0.023) | (0.023) | | | |
| EXP PER CONCCARD | | | | 0.001 | 0.002 | 0.002 |
| | | | | (0.001) | (0.002) | (0.002) |
| INTERCEPT | -0.731*** | -1.185** | -1.171** | -0.589** | -0.841** | -0.841** |

Source: Derived from the NHS, 2005

*Notes:* Probit regressions on Dental visit (Dentalvisit) are estimated against medical conditions (COND), where Dentalvisit equals to unity if the most recent dental visit was less than 1 year and 0 otherwise. Estimated coefficients (Standard errors) are reported in the table.

***, **, * denote 1%, 5%, and 10% significance, respectively.

**Table 3**. State dental expenditure and dental expenditure per concession card holder in 2005/2006

| State | Dental Expenditure ($M) | Per capita expenditure ($) | Expenditure per concession card holder ($) |
|---|---|---|---|
| NSW | 120 | 17.6 | 74.59 |
| VIC | 126.3 | 24.87 | 100.69 |
| QLD | 132.4 | 32.81 | 139.43 |
| WA | 56.11 | 27.47 | 125.54 |
| SA | 47.2 | 30.41 | 109.13 |
| TAS | 14.5 | 29.67 | 96.74 |
| ACT | 7.585 | 23.12 | 149.89 |
| NT | 7.792 | 37.84 | 171.5 |

Source: (Australian Dental Association 2006)

## DISCUSSION

The aim of this study was to investigate the association between State funding towards dental services and the frequency of dental visits among concession card holders. The study's strength lies in its use of a nationally representative data set. The inclusion of individuals aged 20 and over provided an estimated population of 4,749,930 available for analysis.

In terms of the general socio-demographic characteristics this study supports the findings of previous studies. Of particular interest was the association of frequency of dental visits among concession card holders residing in a particular State. The analysis revealed that relative to Victorians, concession card holders residing in Tasmania were less likely to visit a dentist. This was not observed in other States. The lack of adequate public funding in the State of Tasmania is the likely explanation. In 2005, Tasmania reported relatively low public expenditure on dental health.

We conclude, however, that it is simplistic to assume that increased public State expenditure leads to an increase in dental visits. New South Wales reported the lowest expenditure per concession card holder of all the Australian States (refer Table 3), but showed a positive association with dental visits. In contrast, Tasmania, ranked as second lowest in expenditure per concession card holder, is associated with a decrease in dental visits. Thus, an increase in dental visits is likely to be achieved when State public funding aligns with public need and State attributes. States such as New South Wales may require less public funding due to specific attributes of that State such as more access to dental specialists, or higher dentist to population ratio[vii] (S. Chrisopoulos and Nguyen 2012). Future research will endeavour to investigate the influence of State attributes on dental visit patterns.

The importance of State characteristics was particularly noticeable in the Tasmania effect of our analysis. The Legislative council inquiry of 2011 into The Department of Health and Human Services cost reduction strategies (Australian Dental Association Tasmanian Branch 2011) highlighted the poor dental health of Tasmanians. Tasmania has the worst adult oral health of any State or Territory in Australia (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, and a generally lower socioeconomic status (Australian Bureau of Statistics 2006b). Unsurprisingly, this State also has a higher proportion of people eligible for public dental care than mainland Australia (Slade et al. 2007). In 2005, the practising rate of dentists ranged from 31.2 dentist per 100,000 population in Tasmania to 75.4 in the Australian Capital Territory (Australian Institute of Health and Welfare Dental Statistics and Research Unit 2005). Between 2003 and 2005, Tasmania was the only jurisdiction to observe a decrease in these rates (5.5%) (Australian Institute of Health and Welfare Dental Statistics and Research Unit 2005). In regards to the dental health of children across Australia, the AIHW reported that in 2005 Tasmania had the highest proportion of children aged 12 years with a history of decay (53.4%), while Western Australia had the lowest proportion (39.6%) (Australian Institute of Health and Welfare 2011).

In Australia, government intervention in health care is based on two core principles - efficiency and equity. In the dental health sector these principles appear to be lacking. The underfunding of public dental health services in Tasmania is associated with a decreased likelihood of visiting a dentist. Greater emphasis in public policy towards preventative general dental care by extending eligibility for public dental services would assist in reducing inequalities. The advantages of the economies of scale

[vii] For example, in 2006 practicing dentists per 100,000 population was 47.8 in Victoria and 35.1 in Tasmania. S. Chrisopoulos and T. Nguyen, 'Trends in the Australian Dental Labour Force, 2000 to 2009: Dental Labour Force Collection, 2009', *Dental statistics and research series no. 61. Cat. no. DEN 218.* (Canberra: AIHW, 2012).

associated with a nationally funded oral health care program will improve efficiencies. The uniformity of such a scheme across all Australian States and Territories will improve equity.

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