IMPACT OF DENTAL SERVICES ON QUALITY OF LIFE

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Submitted 29 April 2010

Chapter 1: Introduction

The thesis examines how dental services influence general and oral health related quality of life (HRQoL) in a sample of people from the Australian state of Tasmania. The contention is that the volume, complexity and cost of dental care alter HRQoL, and that patient factors further determine whether dental services yield the greatest benefit.

This chapter provides a background concerning health and oral health, and the effect of dental care on patients' quality of life. The rationale for studying the problem is explained, and the aims, hypotheses and thesis structure are outlined.

1 Background

1.1 Health

Descartes described the human body like a machine with different parts that could be treated individually. This view of the body is called Cartesian reductionism. In particular, the 17th century ideal of the Cartesian dualism, in which there is a separation of mind and body, was a fundamental assumption of biomedicine (Hewa and Hetherington, 1995).

Health was seen by Descartes, and later by clinicians and researchers, as the absence of disease or infirmity. Researchers used measures of survival, clinical endpoints, and disease- and treatment-specific symptoms and problems as inverse measures of health (Ware, 1995).

However, clinical indicators do not measure the impact of the disease process on function or the person's well being. Researchers grappled with the commonly observed phenomenon that two patients with the same clinical manifestations of disease often had dramatically different responses when asked about their functional capacity and well being (Guyatt et al. 1993). Also there were pressures to provide evidence that escalating expenditure on health care was improving the health of the population; a relationship which could not be demonstrated using insensitive health statistics such as mortality and clinical markers of morbidity (Elison, 1974).

Health-related quality of life (HRQoL) became increasingly important as researchers realised that traditional disease measures are of little interest to the patient and that some form of what Dijkers called ‘real life’ outcome measure was required in the current health climate (Dijkers 1999).

1.2 Oral health

Like medicine, dentistry used clinical indicators of disease as an inverse measure of oral health. When looking at what clinical indicators of oral disease did and didn’t represent, it became apparent that they were designed and administered by oral epidemiologists and clinicians, and none took into account any dimension of function (Cohen and Jago, 1976; Nikias et al. 1977).

In 1976, Cohen and Jago (1976) called for socio-dental indicators of oral health and noted that very little research had been done relating available indices of oral health to social indicators such as personal lifestyle, or cultural and ecological factors. Those consequences that are focussed on the individual are called social impacts, while consequences that flow from individuals to society are called societal impacts. Socio-dental indicators measure both the social and societal impacts of a disease.

Subsequent studies showed that the impact of oral disease is large when measured by societal indicators such as restricted activity, bed disability and days of work lost (Reisine, 1984; Sternbach, 1986; Spencer and Lewis, 1988; Gift and Redford, 1992). However, using societal indicators, while useful for indicating trends in the uptake of health care services, give little information on an individual level (Allen, 2003). Furthermore, a patient’s assessment of their HRQoL is often markedly different to the opinion of health care professionals (Slevin et al. 1998).

The way to gain a perspective on the impact of oral disease at the individual level and from the patients’ perspective is by general and oral HRQoL measures. Researchers asserted that HRQoL measures should become more important when determining health priorities (Slade and Spencer, 1994).

1.3 Dental care and quality of life

A cross sectional study utilising the Office for National Statistics and Omnibus Survey of a sample of 1,865 adults in Great Britain showed that dental attendance is positively associated with the perception of an enhanced quality of life (McGrath and Bedi, 2001). Given that people spend hard earned money and undergo inconvenience for dental care, such as time away from their place of employment, it is tempting to infer that dental treatment does something that, in the patients' perception, improves their quality of life.

Until recently, most research that investigates the relationship between dental care and HRQoL has been cross-sectional rather than longitudinal. Missing teeth, untreated decay, periodontal attachment loss, third molar symptoms and barriers to dental care were found to be associated with increasing levels of adverse impact on well-being (Slade and Spencer, 1994; Locker and Slade, 1994; Slade et al, 1996; Steele et al. 2004, Slade et al. 2004). The author (Crocombe et. al, 2007) has investigated the influence of general dental treatments and visit factors on quality of life as measured by the 14 item Oral Health Impact Profile (OHIP-14) utilising data from the cross-sectional Australian National Survey of Adult Oral Health (Slade et al. 2007). The OHIP was developed first as a 49 item scaled index of the social impacts of oral disorders (Slade and Spencer, 1994). It was later shortened to a shorter 14 item version (Slade, 1997a). I found that any association on HRQoL of dental treatment received was explained by the usual reason for visit. However, cross-sectional studies do not show a temporal sequence, hence limiting the capacity to make cause and effect inferences.

More recently, longitudinal studies have looked at individual dental interventions, such as dental implants, wisdom tooth removal, dentures, orthodontics, orthognathic surgery, or tooth loss, and found that the intervention improved oral HRQoL (Awad et al. 2000; Allen et al. 2001; Att and Stappert, 2003; Strassburger et al. 2004; McGrath et al. 2003; John et al. 2004; Heydecke et al. 2004; de Oliveira and Sheiham, 2004;

Cunningham et al. 1996; Hatch et al. 1998; Bennett and Phillips, 1999; Locker and Jokovic, 1997; Steele et al. 2004; Dao et al. 1994, Schliephake et al. 1996).

Five longitudinal studies have investigated the association between routine dental care and HRQoL but these have been limited to older adults (Fiske et al. 1990; Peterson and Nortov, 1995; Locker, 2001; Gagliardi et al. 2008), and/or to subjects with an oral disadvantage (Fiske et al. 1990; Fisher et al. 2005; Gagliardi et al. 2008). A recent systematic review (Naito et al. 2006) of five observational and two intervention studies that used validated generic HRQoL instruments, noted that oral health status could affect HRQoL; however, the authors concluded that further evidence is needed to support this interpretation.

There is a need for research investigating the association between dental care and HRQoL that is prospective in order to demonstrate temporal sequence, that is based on a population sample for representativeness, and that relates to a wide range of dental clinical treatment options to be generalisable.

2 Rationale for studying the problem

Dental problems are one of the most common health problems in Australia (Spencer and Lewis, 1988; Crowley et al. 1992; AIHW, 2004). Dental caries is Australia's most prevalent health problem, edentulism the third most prevalent and periodontal disease the fifth most prevalent (AIHW, 2001). The amount of funds spent on dentistry is substantial. Expenditure on dental services in Australia amounted to some $5.1 billion in 2005/06, representing 5.8% of total health expenditure (AIHW, 2006).

As demand for health care grows, decisions about resource allocation and priorities for healthcare will fall under increasing scrutiny (Lopez, 2003). Decisions about allocating health care resources involves trade-off calculations among alternative policies, with determination being made about whether one approach leads to a greater improvement in quality of life than would another. Similarly, for people accessing dental care in the private sector, decisions about treatment options, or even having dental treatment at all, involves trade-off calculations with determination being made about whether one approach leads to a greater improvement in quality of life than would another.

Knowing which dental services improve HRQoL would assist dental clinicians, administrators and patients in their allocation of limited valuable resources in a more effective manner so as to improve an individual's and the population's HRQoL. It would also be useful when advocating for public funds for specific aspects of oral health care. Politicians might get a better sense of the need for providing oral health care to underserved populations if they realised that dental clinical indicators translate into impaired quality of life (Inglehart and Bagramian, 2002). For example, an adult with deep periodontal pockets may be malnourished because of the inability to eat certain kinds of food, and may not be able to sleep through the night or concentrate at work because of the associated pain.

Some (Furino and Douglass, 1990) believe that the market for dental services can be modelled conceptually as an interaction between supply and demand. If the patient goes ahead with treatment then the perceived expected benefits would outweigh the expected costs. Under such a model, it is logical to predict that those patients who pay more for dental treatment would expect higher benefits, such as an improved HRQoL, and this would outweigh the higher costs. Further, one would expect that more complex, high volume or high cost dental treatments would be more expensive than less complex, low volume or low cost treatments. It is similar for patients who have access to ‘free’ or subsidised dental care via public dental services because the more complex or the greater the volume of dental care, the greater the investment in time and discomfort. Hence, it is logical to assume that patients would expect that dental treatment of a higher volume, complexity or cost will improve their HRQoL by a greater amount than dental treatment of a lesser volume, complexity or cost, and under the assumption that patients have an indication of which dental treatments will improve their HRQoL more than others, will invest more in money, time and discomfort in those treatments.

This project will improve our knowledge on which interventions improve oral health thereby facilitating effective treatment planning and resource allocation, and will encourage future investigation into why certain dental services do improve HRQoL and why some do not.

3 Aims

The aims are to determine if the volume, complexity and cost of general dental care provided to a population of dentate adults and baseline oral HRQoL is associated with changes in their HRQoL, and/or modify the impact of dental care on changes in HRQoL.

Pre-treatment factors hypothesized to modify the impact of dental care on change in HRQoL are: people’s pre-treatment levels of HRQoL, patient factors such as sociodemographics, and dental treatment need.

4. Hypotheses

The aims and hypotheses follow logically from the conceptual diagram for this study (see Figure 1).

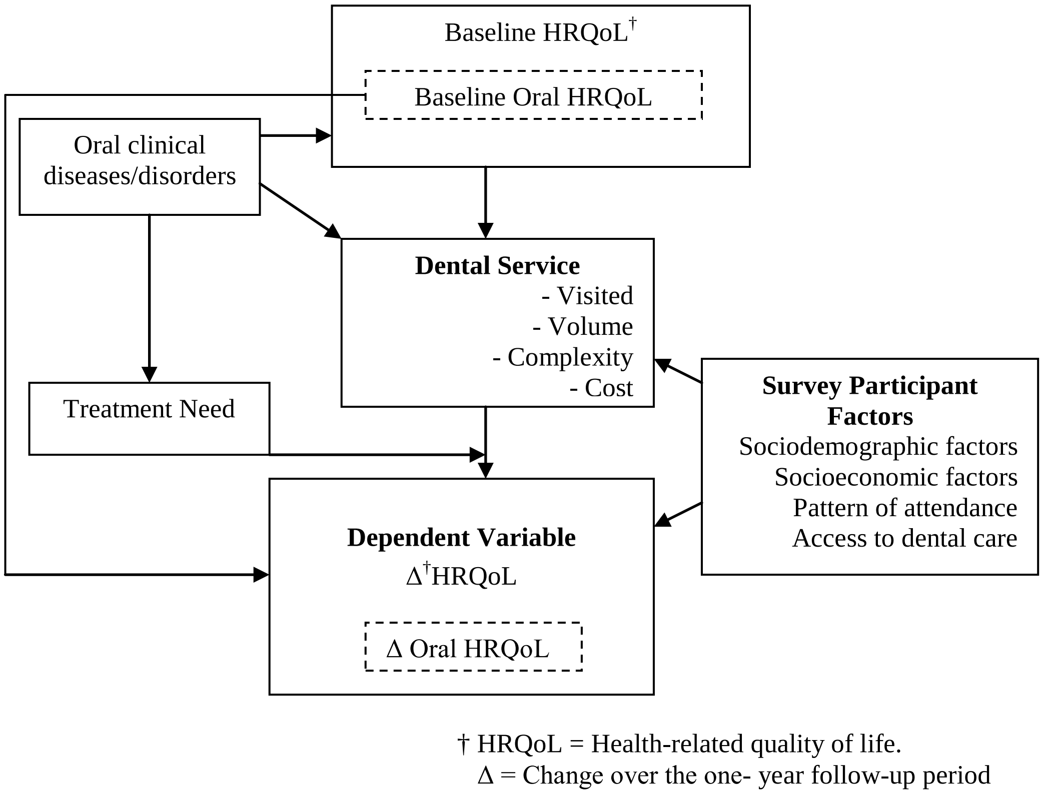


Figure 1. Conceptual diagram for analysis of the influence of dental care on change in HRQoL

Hypotheses to be tested are:

- Among people with poor oral health related quality of life, provision of any dental intervention will improve their HRQoL.
- Among people with treatment needs, provision of complex dental interventions will improve their HRQoL.
- Among people with treatment needs, provision of a high volume of dental interventions will improve their HRQoL.
- Among people with treatment needs, provision of high cost dental interventions will improve their HRQoL

5. Structure of the thesis

The thesis begins with a Literature Review (Chapter 2) in which the development of the conceptual model for this study is explained. Methods (Chapter 3) are described under headings of study design, sampling, data collection procedures and data management, weighting, statistical analysis, and power and sample size. Details of participation, including an analysis of representativeness of the study sample are presented in the Results section along with the main findings (Chapter 4). The findings are interpreted in the Discussion (Chapter 5). A set of overall conclusions is presented in Chapter 6.

Chapter 2: Literature Review

1. Introduction

The literature review looks at the changing perceptions of health and oral health. It will develop a conceptual model for this study that evolves from existing conceptual models of oral health and concludes with the study aims and hypotheses. In this thesis treatment need, oral clinical disease/disorders, sociodemographic factors, socioeconomic factors, pattern of dental attendance, access to dental care, and dental care itself were investigated, but other factors such as fluoride variable, genetic predisposition, oral health behaviours, stress and personal control of life were not considered.

2. Concepts of health

This section will give an overview of the changing perceptions of health by discussing the development of the biomedical and biopsychosocial models of health, and the rising importance of the concept of health related quality of life (HRQoL).

The phases in the history of public health, as described by Pine (1997), give an insight of how the perception of health has evolved since the middle of the nineteenth-century.

2.1 Middle–late 1800s to 1930

The first phase of public health was from the middle to the late 1800s when social change was characterised by urbanisation and industrialisation. Although this social change improved production levels, it also led to suboptimal living conditions for workers, which in turn stimulated epidemiological studies that demonstrated causal relationships between compromised health status and conditions such as malnutrition and poor hygiene. The linking of the outbreak of cholera to the Broad Street pump and the removal of the pump handle by John Snow in 1854 was the first recorded, and most famous, use of epidemiology. The epidemiological studies played a large role in justifying the sanitary reforms that were the hallmarks of public health achievement during this period.

The second phase of public health between 1880 and 1930 was characterised by advances in bacteriology and immunology. Increasingly, the prevention of disease was applied to populations as well as individuals.

2.2 Biomedical model

The crucial characteristics of the third phase 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.

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. Researchers used measures of survival, clinical endpoints, disease- and treatment-specific symptoms (Ware, 1995), which did not reflect the capacity of individuals to perform desired roles and activities (Mechanic, 1995). Social and psychological issues that may impact a patient were neglected or ignored (Freund and McGuire, 1991).

The third was people relied on medical interventions as the source of health. Health was delivered to people by health professionals (US Department of Health and Human Services, 2000a) and the hospital became the essential base and focus for medical services. Medical treatment grew more complex, health care costs spiralled, yet there were few cures for the increasing burden of chronic diseases (Pine, 1997).

Criticisms of the biomedical approach to health care arose.
Mechanic (1995) noted:

> "the irony is that while so much of the challenge in health care is social – to enhance the capacity of individuals to perform desired roles and activities – the thrust of the health enterprise was substantially technologic and reductionist, treating complex sociomedical problems as if they were amenable to simple technical fixes."

It was noted that the biomedical approach alone did not solve all health problems (Dubos 1979, 1990). McKeown (1979) found that it was not the expensive medical interventions that played the major role in improving health and cited three factors that were responsible for the major reductions in disease: the environment, economics, and behaviour.

Pressures built to provide evidence that the escalating expenditure on health care was improving the health of the population, and this could not be demonstrated using insensitive health statistics such as mortality and clinical markers of morbidity (Elison, 1974). A different approach was needed.

2.3 Biopsychosocial model

The fourth phase in public health was first described by Engel in 1977 who developed the biopsychosocial model of health, which instead of a total reliance on biological factors followed a wider perspective by incorporating biological, social and psychological domains; a concept of disease that turned the tide of thinking from professionals being the sole deciders on the supply of necessary health services. The emphasis was on well-being and quality of life.

2.3.1 Quality of life

An ambitious definition of health was that proposed by the World Health Organization in 1948:

> "state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity" (WHO, 1948).

While this definition is more vague and utopian than practical, it does include quality of life within the broader definition of health (Eklund and Burt, 2002).

A later definition of health by the World Health Organization continued with the theme of including quality of life:

> "A resource for living, for which its ingredients needed to include opportunities for individuals to identify and realise aspirations, satisfy needs, and to change or cope with the environment" (WHO, 1986).

Although quality of life has been included into definitions of health, there is little agreement on the definition of the quality of life itself (Brown and Gordon, 1999; Dijkers, 1999) and there are many definitions of quality of life (Abeles et al. 1994). It is seen as a dynamic construct (Allison et al. 1997) and multifactorial (Locker, 1988; Gilbert et al. 1998) and "being concerned with the degree to which a person enjoys the important possibilities of life" (Raphael et al. 1994).

Definitions of quality of life have included:

> "A person's sense of well being that stems from satisfaction or dissatisfaction with the areas of life that are important to him/her" (Becker et al. 1993).

> “An individual’s perception of their position in life, in the context of culture and the value systems in which they live, and in relation to their goals, expectations, standards and concerns” (WHOQOL Group, 1995).
> “A personal sense of physical and mental health and the ability to react to factors in the physical and social environment” (Gift et al. 1996)).

A common feature of all the definitions is that they only have meaning at a personal level (Locker, 1997). Quality of life is represented by those indicators that reflect “getting on about the business of living” (Yellen, 1996). Locker summarises this point with a simple definition in the form of a question:

> “How good is your life for you?” (Locker, 1997).

Over time the term quality of life developed into a much broader concept than health itself, as it also contains factors such as living standards, income, housing, job satisfaction and environmental quality (Ware, 1987; Laplege and Hunt, 1997). A particularly cutting criticism of the concept of quality of life came from (Andrews and Withey, 1976) when they stated that:

> “The measurement of quality of life could involve the measurement of just about anything of interest to anybody.”

2.3.2 Health-related quality of life

Under the biomedical model, the focus was on etiological agents, pathological processes and biological, physiological, and clinical outcomes. On the other hand, the quality of life model focused on dimensions of functioning and overall well-being.

A perception of health was required that was not as broad as quality of life but which was broader than the biomedical definition of lack of disease. Ware defined health status as the health component of quality of life; hence the term “health-related quality of life” came into vogue (Murdaugh, 1996).

2.3.2.1 What is health-related quality of life?

Allen (2003) noted that:

> "there appears to be an association between health and quality of life, which is not clearly defined, and the term health related quality of life is used to describe this association."

Although there is a lack of a universally accepted definition, there is agreement that health related quality of life should include those areas of concern to individual patients (Brown and Gordon, 1999; Jenkinson et al. 1999).

Evidence suggests that health related quality of life has several dimensions (Patrick and Erickson 1993). It is a multifaceted concept, attempting to simultaneously assess how long and how well people live. It has five broad domains: opportunity/resilience, health perception, functional states, impairment/diseases, and duration of life (Patrick and Erickson 1993, Gift and Atchison 1995). It is interesting that this list includes traditional clinical measures that were specifically rejected by the sociomedical indicator movement that sought to redress an over-reliance on traditional medical measures (Elison, 1974; Slade, 2002).

Berger (1989) described the dimensions of health status as being the same as those for HRQoL. In this thesis, health status and HRQoL are used interchangeably as they have been by many authors (Guyatt et al. 1993; Murdaugh, 1996; Guyatt et al. 2007).

2.3.2.2 Models of health-related quality of life

The World Health Organization developed a theoretical model for considering the consequences of chronic and degenerative disease called the International Classification of Impairment, Disability and Handicap (ICIDH - WHO 1980 - see Figure 2). The ICIDH opened the door to include factors outside the traditional classification boundaries of disease, illness, and functional limitations that had previously framed the concept of disability (Gray and Hendershot, 2000).

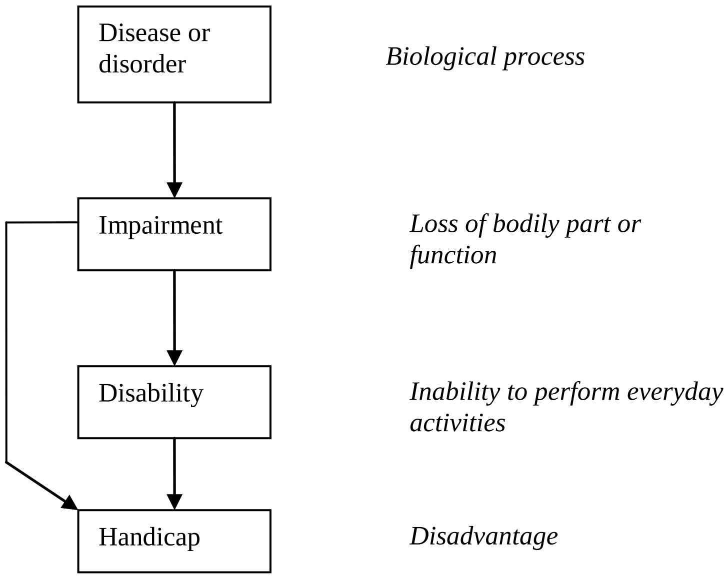


Figure 2: International Classification of Impairment, Disability and Handicap (WHO, 1980)

Impairment was defined as the loss or abnormality of psychological, physiological or anatomical structure or function. Disability was any restriction or lack of ability to perform an activity in a manner or within a range considered normal for a human being. Handicap was a disadvantage for a given individual, resulting from impairment or a disability that limits or prevents the fulfilment of a role that is normal for that individual.

It has been suggested that HRQoL is an umbrella concept that embodies measures of impairment, disability and handicap (Long et al. 1993).

A simple linear model which has been described as particularly helpful (Guyatt et al. 2007) was developed by Wilson and Cleary (1995), in which they integrated the biomedical and quality of life models of health (Figure 3). They proposed a taxonomy or classification scheme for different measures of health outcome and divided these outcomes into five levels: biological and physiological factors, symptoms, functioning, general health perceptions, and overall quality of life.

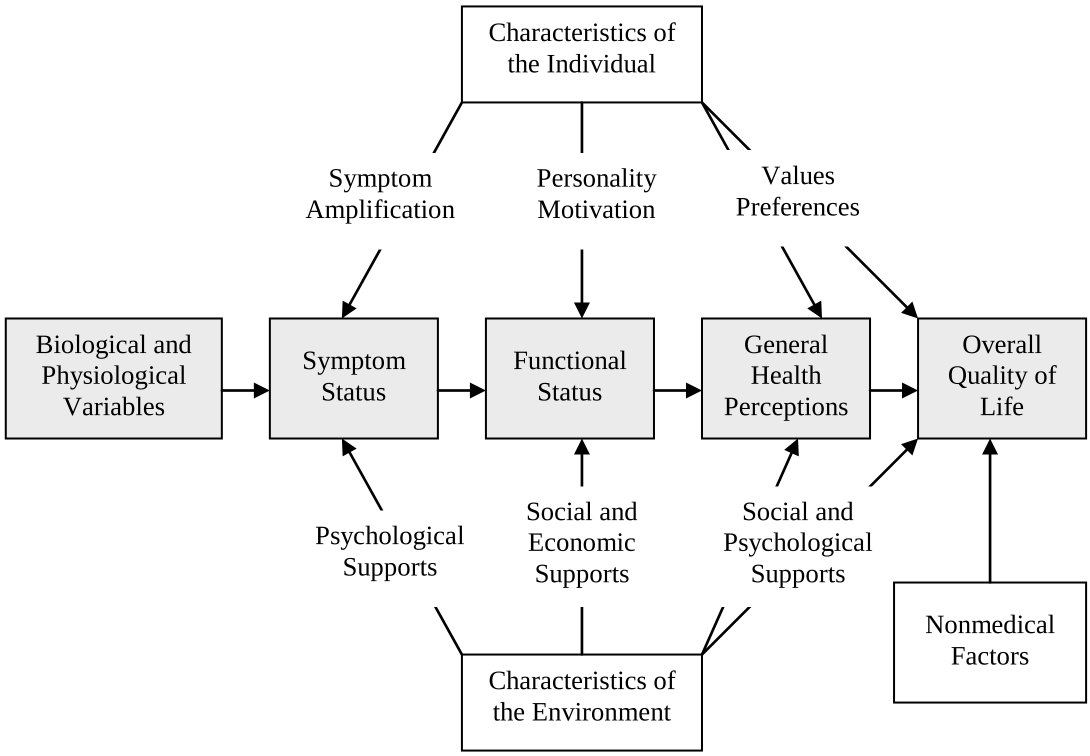


Figure 3: Relationships among measures of patient outcome in a health related conceptual model (Wilson and Cleary, 1995).

As one moves from left to right in the model, one moves outward from the cell to the individual to the interaction of the individual as a member of society (Wilson and Cleary, 1995).

Locker (1997) created a model based on the Wilson and Cleary model that depicted disease, health and quality of life as separate but interrelated concepts. Locker contended that quality of life is determined by both characteristics of the person as well as non-medical factors (Slade, 2002). Under Locker's model (see Figure 4) HRQoL is shown as the area overlapped by all three circles of health, disease and quality of life.

NOTE:
This figure is included on page 22 of the print copy of the thesis held in the University of Adelaide Library.

Figure 4: Relationship Between health, disease and quality of life (Locker, 1997b)

In 1997, the World Health Organization published the Beta-2 version of the International Classification of Impairments, Disabilities, and Handicaps (ICIDH-2), in which the definitions disability, impairments and handicap were revised. Like the Cleary and Wilson model, it was based on the integration of biomedical and quality of life models of health. The new factors in the ICIDH-2 included a dimension for participation in social activities and a listing of environmental factors that were considered important for understanding the complexity of disability (Gray and Hendershot, 2000).

Among the concerns expressed by some who used the ICIDH, including people with chronic health conditions, were the negative portrayal of the consequences of disease in terms of "disability" and "handicap." People were also concerned about the linear (and unidirectional) connections among the elements of the ICIDH model (Rosenbaum and Stewart, 2004).

A criticism by disability scholars of both ICIDH and ICIDH-2 was that the classifications presume an organization of society that saw people labelled as disabled as being able to do little or nothing of value. Pfeiffer (2000) called this presumption:

> "a wrong headed view which is found in the functional definition of disability in the original ICIDH and which continues in the ICIDH-2."

A new model of human functioning and disability (Figure 5) was developed to reflect the *interactive* relationship between health conditions and contextual factors. The first key change was a shift in language from negative terms such as “impairment,” “disability,” and “handicap” to the neutral terms “body function and structure,” “activity,” and “participation,” respectively. A second change was that the designation “disability” was now an umbrella term representing the dynamic interaction between person and environment.

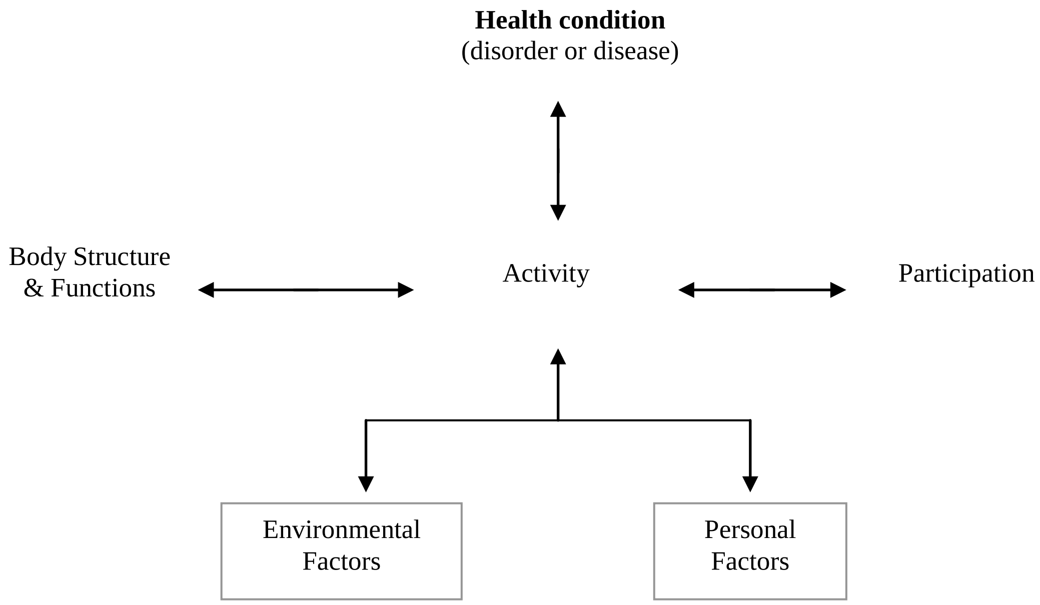


Figure 5: The ICF model.

A modification was made when the implied linear connection between “impairment,” “disability,” and “handicap” was changed with the inclusion of a series of bidirectional arrows that link these (and other) elements of health, functioning, and disability (Rosenbaum and Stewart, 2004).

So as yet, there is no universally accepted conceptual model to explain HRQoL (Cunningham and Hunt, 2001). In spite of this, the major application of HRQoL has been as an endpoint in measuring the effectiveness of medical treatments, provider interventions, and techniques (Murdaugh, 1996). For this study the impact of dental interventions on HRQoL will be measured by the impact of dental interventions on the social impact of oral disorders.

2.4 Measuring general health-related quality of life

HRQoL measures can be used in many ways in health care such as identifying patients needing particular attention, to screen for psychosocial problems, to monitor patients' progress, particularly in relation to the management of chronic illness; or to determine choice of treatment (Fitzpatrick et al. 1992). Such instruments can assess subjective aspects of health problems not addressed by conventional epidemiological measures (Hunt et al. 1985).

HRQoL measures have been used in regular hospital medical audits For example, a project at the Freeman Hospital, Newcastle, in Britain set up a routine system to collect outcome measures including quality of life assessments in a way that was acceptable to both clinicians and managers (Bardsley and Coles, 1992).

There are a range of instruments that have been developed to measure HRQoL and these may be divided into generic and disease specific measures (Camilleri-Brennan and Steele, 1999).

The narrower focus of disease specific measures means that they are more sensitive to small changes in health (Cunningham and Hunt, 2001). A number of disease specific measures for conditions are as diverse as inflammatory bowel disease (Guyatt et al. 1989), rhinoconjunctivitis (Juniper and Guyatt, 1991), epilepsy (Baker et al. 1993), chronic airflow limitation (Guyatt et al. 1991) and chronic liver disease (Younossi et al. 1999).

Generic instruments are used for comparisons between different diseases and across populations. Quite a few have been developed including the Sickness Impact Profile (Bergner et al. 1981), scales analysed from the RAND health insurance study (Ware et al. 1987), the Nottingham Health Profile (Hunt and McEwen, 1980), the Quality of Life Index (Spitzer et al. 1981), the COOP Charts (Nelson et al. 1987), the EuroQol Index (Ellwood, 1988), the General Health Questionnaire (Goldberg and Williams, 1988), Quality of Life Well Being Index (Patrick and Bergner 1990), the Duke Health Profile (Patrick and Bergner, 1990), the MOS Functioning and Well Being Profile

(Stewart and Ware, 1992), and the MOS 36 Item Short Form Health Survey SF 36 (Ware and Sherbourne, 1992).

Two of the most widely used instruments are the SF-36 and the EuroQol (Cunningham and Hunt, 2001). The SF-36 was developed as part of the Medical Outcomes Study that was aimed to enhance the methods used for the monitoring of patient outcomes in practice and research settings (Ware and Sherbourne, 1992; McHorney et al. 1993). It is a practical measure due to its short length and it has undergone extensive psychometric testing in many countries (Cunningham and Hunt, 2001).

The EuroQol was developed by an international team who call themselves the EuroQol Group, as a standardised generic instrument for evaluating and describing HRQoL (Brooks, 1996). It was developed in different disease groups, different settings and countries (Kind, 1996). The EuroQol is widely used and is reported to have construct validity and convergent validity, but is highly skewed and reported to have poor sensitivity (Bowling, 2001). The instrument is cognitively simple, designed for self-completion and has been used extensively at The Australian Research Centre for Population Oral Health (ARCPOH).

3. Concepts of oral health

This discussion shows how, just as in general health, representations of oral health have moved from tooth mortality to tooth morbidity to oral function to wellbeing and from single dimension concepts and measures to multidimensional ones (Locker, 1998; Coulter et al. 1994), and concludes with a discussion of the conceptual models of oral health.

3.1 Dental clinical indicators

Despite the fact that oral health was first considered in terms of quality of life during World War II when the presence of six opposing teeth was used as an indicator of oral functioning and well-being and used to assess suitability for service (Hatch et al. 1998), the biomedical model of health continues to be important in dentistry.

Under the biomedical model, oral health, like general health, was defined as the equivalent to being disease free. Dental clinical indicators detected the level of dental disease with measurements like periodontal pocket depths, and the decayed, missing and filled teeth and tooth surface indices (DMFT and DMFS) that were believed to indicate a person's dental caries experience. Clinical indicators reflect the endpoint of the disease and do not indicate the impact of the disease process on function or the person's well-being. They also focus on the mouth rather than the person.

When looking at what clinical dental indicators did and didn't contain, it became apparent that they were morbidity measures, designed and administered by oral epidemiologists, and none took into account any dimension of function which could be attributed to samples of the general population (Cohen and Jago, 1976; Nikias, 1977; Cohen, 1997).

Dental clinical indicators are important in clinical practice and may in some situations be used to provide an indication of treatment need (Cunningham and Hunt, 2001). The problem arises when these indices are used as measures of oral health (Sheiham et al. 1981). Looking individually at a number of specific indicators of oral diseases, such as dental caries, periodontal diseases, or soft tissue conditions, has not provided a global measure of oral health that reflects the overall picture the clinician observes, or what the individual defines or perceives as health of the oral cavity (Gift et al. 1997).

A debate began three decades ago and continues to this day, on what should be the time interval between check-ups. The debate began in 1977 when Sheiham found that although the most frequent dental attendees had the advantage over the less frequent attendees of having a higher number of functioning teeth, they also had the disadvantage of higher levels of dental disease experience. Later, regular attendees were found to have been less likely to suffer acute symptoms and require emergency treatment (Sheiham et al. 1985; Todd and Lader, 1991; Murray, 1996). The debate continues to this day with a recently published Cochrane Report (Beirne et al. 2005) finding that there is insufficient evidence to support or refute the practice of encouraging patients to attend for dental check-ups at 6-monthly intervals. It included only one study in the review and that study provided limited data for dental caries outcomes and economic cost outcomes – HRQoL was not measured.

3.2 Socio-dental indicators

In 1976, Cohen and Jago called for socio-dental indicators of oral health. They noted that very little research had been done relating available indices of oral health to social indicators such as personal lifestyle, or cultural and ecological factors.

The importance of socio-dental indicators and the limitation of dental clinical indicators were shown by the fact that major oral health policy decisions have been made, not on presentations to decision makers about periodontal pocket depths or the number of surfaces with dental caries, but by articulating the impact of poor dental health on the individual or at population level (Cohen, 1997).

In the USA, using a battery of previously validated scales to determine the impact of several common, but serious dental conditions on quality of life, it was found that the affect of dental disease was large when measured by societal indicators such as restricted activity, bed disability and days of work lost (Reisine, 1985; Nuprin Pain Report, 1985; Gift, 1992). In Australia, using the 1983 Australian Health Survey, Spencer and Lewis (1988) found that 646,000 days were lost from school, 1.1 million days were lost from work, and there were 3.2 million days of reduced activity due to oral health problems.

Surveys utilising socio-dental indicators typically yielded rates of impact that were negligible for individuals, but substantial when expressed in terms of the population's burden of illness in a given year (Slade, 2002; Allen, 2003). However, societal dental indicators were not sufficiently sensitive to describe individuals' experiences of social impact (Reisine, 1985).

3.3 Oral health-related quality of life

Like general HRQoL, oral HRQoL incorporates different domains, such as survival, illness, oral health perceptions, opportunity, as well as interactions between the aforementioned domains (Gift and Atchison, 1995).

Oral HRQoL as been defined as:

> "the cyclical and self-renewing interaction between the relevance and impact of oral health in everyday life" (Gregory et al. 2005).

Another definition of oral HRQoL comes from the U.S, Surgeon General's Report on Oral Health as:

> "a multidimensional construct that reflects (among other things) people's comfort, eating, sleeping, social interaction, self-esteem and satisfaction with respect to oral health" (Locker, 1997).

The concept of oral HRQoL, in a similar fashion to that of general HRQoL, suffers from a lack of an agreed definition although it similarly has a consensus that it should include those areas of concern to individual patients.

3.4 What is oral health?

Yewe-Dyer (1993) defined oral health in a way that moved beyond that of lack of oral disease as measured by dental clinical indicators:

> "Oral health is a state of the mouth and associated structures where disease is contained, future disease is inhibited, the occlusion is sufficient to masticate food and the teeth are of a socially acceptable appearance."

Dolan (1993) suggested oral health is:

> "a comfortable and functional dentition which allows individuals to continue in their desired role."

The Department of Health in Great Britain (1994) used:

> "Oral health is a standard of health of the oral and related tissues which enables an individual to eat, speak and socialize without active disease, discomfort or embarrassment and which contributes to general well-being."

Although these definitions make reference to functional and social concerns, and attempt to cross the divide between biomedical and psychosocial concepts of oral health, they remain largely with the former (Locker, 1997).

They also separate oral health from general health (Reisine and Locker, 1995). Gift and Atchison (1995) stressed the need to conceptualise oral health as an integral part of overall health and to consider the contribution of oral health to overall HRQoL. A major theme of Australia's first National Oral Health Plan 2004-2013 is that oral health is an integral part of general health (NACOH, 2004).

The US Surgeon General's Report (US, Department of Human and Health Services, 2000) included both the psychosocial aspects of oral health and the inclusion of oral health as part of general health:

> "It follows that oral health must also include well-being. Just as we now understand that nature and nurture are inextricably linked, and mind and body are both expressions of our human biology, so, too, we must

> recognize that oral health and general health are inseparable. We ignore signs and symptoms of oral disease and dysfunction to our detriment.
> … oral health is integral to general health. You cannot be healthy without oral health. Oral health and general health should not be interpreted as separate entities. Oral health is a critical component of health and must be included in the provision of health care and the design of community programs" (US Department of Human and Heath Services, 2000b).

Locker contended that it was fairly ludicrous to attach the concept of health to any individual part of the body, that the distinction between general health and oral health was unwarranted, and that the distinction "arose through historical accident." He wondered what would be the response to a questionnaire that asked: How would you rate the health of your leg? He concluded that: "when talking about oral health, our focus is not on the oral cavity but on the individual and the way in which oral disease, disorders and conditions, whether confined to the oral cavity or linked to other medical conditions, threaten health, well-being and the quality of life. In this regard, oral diseases and disorders are no different from diseases and disorders affecting other locations in the body" (Locker, 1997).

In Australia's National Oral Health Plan (NACOH, 2004), a definition of oral health was given that linked the concept of oral health to well-being 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."

A recent study, Kieffer (2008) attempted to assess the association between oral health, general health, and quality of life by distributing the OHIP-49, the RAND-36 which is a variant of the SF-36, and single items on each of self-rated oral and general health to 118 psychology freshmen at the University of Amsterdam. In contrast to the comments above, the findings suggested that oral health, general health and quality of life were mostly unrelated in this seemingly healthy population. They proposed that if no apparent disease is present, oral and general health must be regarded as separate constructs.

3.5 Conceptual models of oral health

Oral health conceptual models were developed in parallel to general health models. For example, Chen (1995) used Anderson's Behavioural Model as a guide to develop a conceptual framework for oral health inequality (see Figure 6).

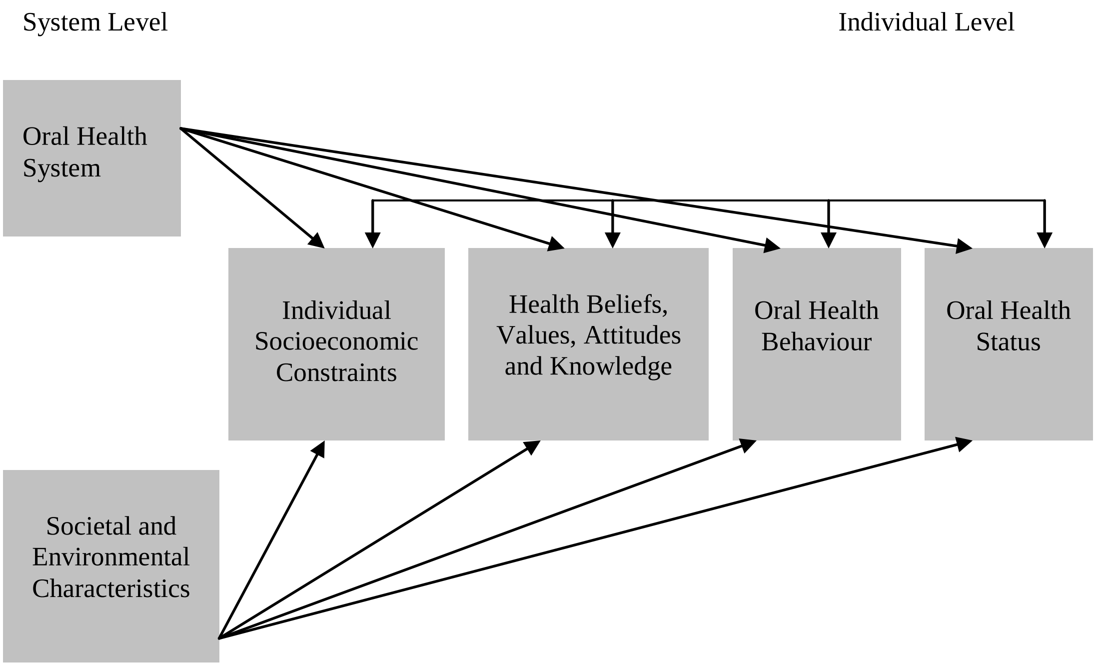


Figure 6: Conceptual model explaining oral health status (Chen, 1995)

Locker's (1988) conceptual model for oral health was based upon the World Health Organization's Classification of Impairment, Disability and Handicap (WHO, 1980 - see Figure 4). In this model, disease can lead to impairment, which may then lead to a functional limitation or pain/discomfort, either physical or psychological. Either of these may lead to physical, psychological or social disability described by Locker as any limitation in or lack of ability to perform activities of daily living. A final consequence was handicap, characterised by the evidence of disadvantage. The arrows linking impacts should not be interpreted as necessary or sufficient causal paths (see Figure 7).

NOTE:
This figure is included on page 32 of the print copy of the thesis held in the University of Adelaide Library.

Figure 7: Conceptual model for measuring oral health (Locker, 1988)

Gilbert and colleagues (1998) adapted Locker's model and a model by Johnson and Wolinsky (1993) who in turn had modified a model by Nagi (1976), predominately by adding self-rated health as a dimension (Figure 8). The similarity of Gilbert's model to Locker's model is obvious. It categorised "disability" and "handicap" together, relabelled them as "oral disadvantage" and added "self-rated oral health" in an attempt to classify in the conceptual model "what is being measured in oral health surveys."

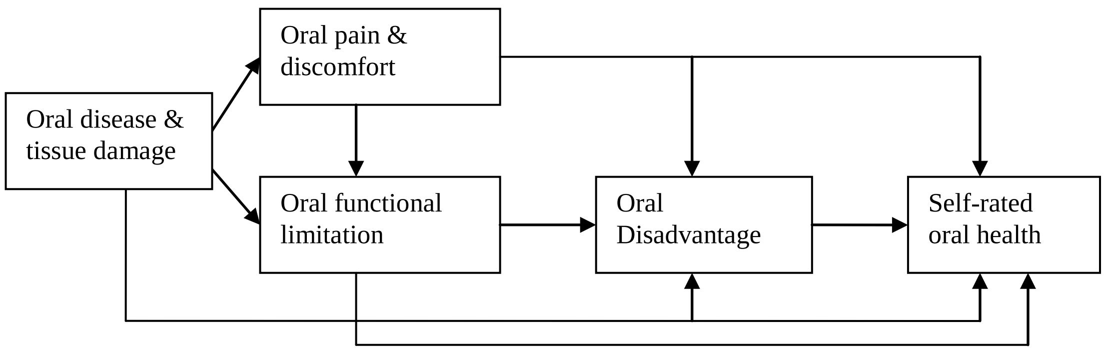


Figure 8: Multidimensional conceptual model of oral health (Gilbert et al. 1998)

The model stressed the importance of the patient perception of oral health. Although the Gilbert model does not forward the debate to any great extent, it is of value in helping show where self-rated oral health fits in Locker's model.

The Atchison and Dubin conceptual model was designed to portray the dynamic variables underlying oral and general health status in populations (see Figure 9) and incorporated concepts from older models, such as Evans and Stoddart (1994) and Anderson's Behavioural Model. It included individual responses to the social and physical environment, along with genetic endowment. It illustrated the key categories of environmental factors that can influence individual behaviours and perceptions and, ultimately, have an impact on oral and general health status.

Atchison and Dubin believe that education, cultural awareness, social support programs, and public policies can have greater impact on the evolution of attitudes, perceptions, knowledge, and practices that foster improved oral health (Atchison and Dubin, 2003).

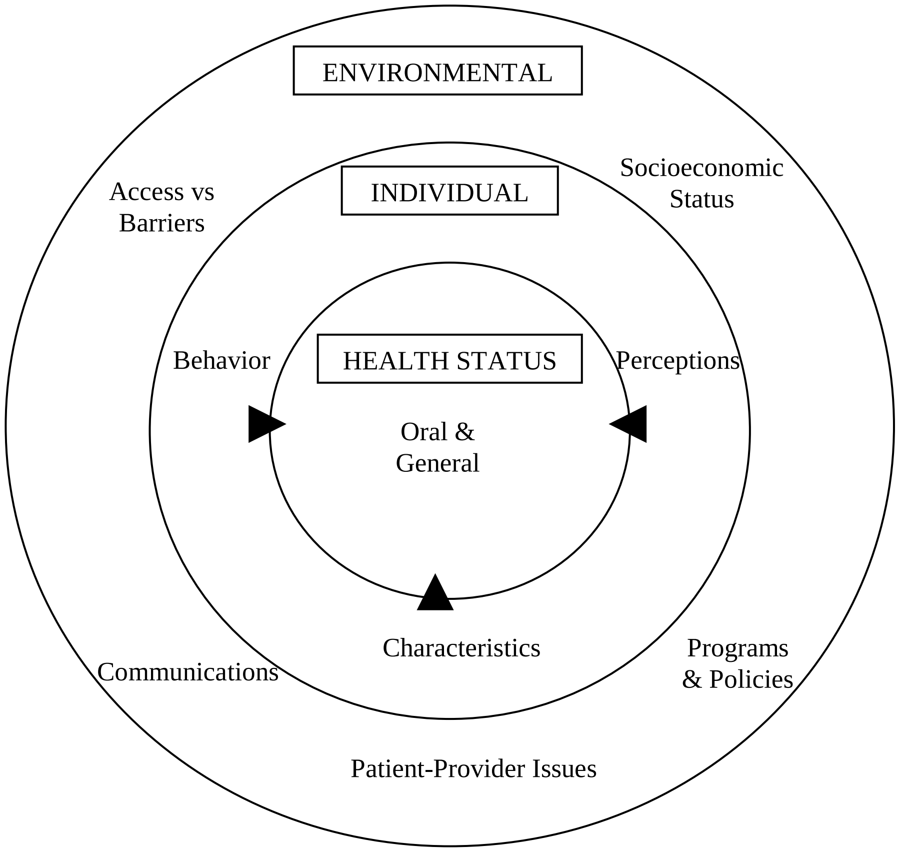


Figure 9: Conceptual model for understanding the dynamic variables underlying oral and general health status in populations (Atchison and Dubin, 2003)

The Atchison and Dubin Model (2003) indicated that many of the variables may be overlapping and may be secondary to underlying factors. It also linked oral health and general health. However, Atchison and Dubin made no attempt to explain the inter-relationships between the dynamic variables. It is the complexity and dynamics of the inter-relationships between the factors affecting oral health that makes the study of the causes of oral health and ill-health problematical.

3.6 Measuring oral health-related quality of life

Global assessments have been used to assess both general and oral HRQoL. For example, in the United States of America, the National Health and Nutrition Examination Survey III (1988-94) asked survey participants:

> Would you say your health in general is excellent, very good, good, fair or poor?
>
> How would you describe the condition of your natural teeth? Possible responses were: excellent, very good, good, fair, or poor.

Similar, but not the same questions, were asked in the Australian National Dental Telephone Interview Survey 2002:

> How would you rate your general health?
>
> How would you rate your dental health?
>
> Possible responses were: excellent, very good, good, average, poor, very poor.

In both surveys, more people rated their oral health as poor than those who rated their general health as poor.

A modification of the global health statement is the global transition health statement. Transition statements asked the subjects if they have noted a change in their health over a specified time period. For example, during the Australian National Survey of Adult Oral Health of 2004-06, subjects were asked for both oral and general health "Over the past year would you say your dental health has (1) worsened a lot?
(2) worsened a little? (3) stayed the same? (4) improved a little? (5) improved a lot?"

During the late 1980s and early 1990s many multi-item questionnaires of oral HRQoL were developed and used. Locker (1992) noted that such measures improved the assessment of priorities of care, improve the understanding of oral health-related behaviours, and that they bring dentistry into line with contemporary concepts of health care by highlighting the broader personal and social consequences of oral disease and disorders. Slade and Spencer (1994) contented that multi-item questionnaires of oral HRQoL also improved the evaluation of dental treatment.

The Social Impacts of Dental Disease (Cushing et al. 1986) was developed in the early 1980s and was one of the first socio-dental indicators. It has 14 items and five impact categories of eating, communication, comfort and well-being, and self-image (Sheiham et al. 1997). The Social Impacts of Dental Disease is easy to apply but Sheiham et al. (1997) considered it needed further development.

The RAND Dental Health Index is an index of three questions on pain, worry and conversation developed for the dental part of the Rand Health Insurance Study, a large scale social experiment to assess the effects of cost sharing on patient health status, quality of care, utilisation, and cost of services. The major strength of this research was the richness of the data set. Its limitations are that it considered only cross-sectional data, underrepresented aged persons, and used limited measures of self-reported dental health (Dolan and Gooch, 1997).

The Sickness Impact Profile (SIP) was developed to measure sickness related changes in functional ability perceived and reported by health care users (Conn et al. 1981). It has been used for oral studies and consists of 73 items in content areas of rest, home tasks, social interaction, speech, intellectual, work, and leisure. The SIP has been used in many studies providing a wealth of data on comparison groups. Its major limitations are the number of questions and its apparent lack of sensitivity to oral-facial impacts on functional status (Reisine, 1997).

The Geriatric (or General) Oral Health Assessment Index (GOHAI) measures patient reported oral functional problems using 12 items in the content areas of chewing, eating, social contacts, appearance, pain, worry and self-consciousness. The GOHAI has been utilised in a number of studies and fulfils its original intent (Atchison, 1997).

The Dental Impact Profile consists of 25 items in the content areas of appearance, eating, speech, confidence, happiness, social life and relationships. The items were placed in a non-apparent order. Strauss (1997) noted a few advantages and disadvantages of the instrument. Advantages were that it was brief and simple, and allowed for both positive and negative impacts. It was useful as a measure of cultural differences, and suggested values of populations. Disadvantages included that it does not measure disability or dysfunction related to dental conditions, it is best administered by an interviewer, it may suggest impacts to respondents who had not previously considered them, and the subscales were not widely used.

Cunningham and Hunt, (2001) note that the best known of the instruments used in the assessment of oral HRQoL is the Oral Health Impact Profile (Slade and Spencer, 1994). The major advantage of OHIP is that it was developed from a representative patient group and not from dentists (Allen, 2003). The OHIP has seven content areas of function, pain, physical disability, psychological disability, social disability and handicap. Slade (1997) noted that there was scope for using the OHIP to investigate the impact of dental care on people’s well being.

Other multi-item oral health questionnaires include the Subjective Oral Health Status Indicators with 42 items in content areas of chewing, speaking, symptoms, eating, communication, social relations; the Oral Health Quality of Life Inventory with 56 items in areas of oral health, nutrition, self related oral health; overall quality of life; Dental Impact on Daily Living with 36 questions in areas of comfort, appearance, pain, daily activities and eating; Oral HRQoL with three items measuring daily activities, social activities and conversation; and the Oral Impacts on Daily Performance with nine items in content areas of performance in eating, speaking, oral hygiene, sleeping, appearance and emotion.

Due to a concern that there was a significant divide between one group of researchers, predominately from psychometric and social survey backgrounds, who had developed instruments measuring oral HRQoL, and another group of researchers, primarily concerned with dental health services and clinical trials who potentially could use those instruments in an assessment of oral health outcomes, a conference on measuring oral health and quality of life was held in 1996 in Chapel Hill in North Carolina (Slade, 1997b). Many of the instruments were then relatively new making it difficult to assess their track record. There had been very little comparative research using more than one instrument within a single study limiting the capacity to compare specific properties of the instruments, and finally, no consensus was reached at the conference (Slade et al. 1998).

3.7 Measuring oral health-related quality of life with in conjunction general health-related quality of life.

A comprehensive approach to the measurement of oral HRQoL combines generic and oral specific measures (Fletcher et al. 1992; Cunningham et al. 2001). The use of a general HRQoL instrument allows the comparison of different health conditions. For example, one could compare the effect of oral conditions compared to bladder conditions on general HRQoL. The use of a general HRQoL instrument also allows one to address the magnitude of the effect of oral conditions on overall health. However, there are problems with solely using a general HRQoL instrument. The rationale for including a disease-specific statement with core quality of life statements with a generic measure is that instruments, like EuroQol, do not tap into oral health as a construct and inclusion of an oral specific measure, such as OHIP-14, is required to ensure construct, concurrent validity and to improve responsiveness.

Global transition statements are patient’s global ratings of change in their health and well-being, and in this study were asked in the twelve-month questionnaire. One cannot interpret the mean value of a global transition statement survey as an average rating of the sample’s oral health, because there is not any physical scale that can be anchored to the response categories. Instead, the usefulness of an average score is to compare factors associated with perceived oral health of groups (Slade, 2002) and that is how the statements were used in this study.

Allen and colleagues (1999) compared OHIP to the generic HRQoL measure SF-36. Their study reinforced the concept that condition specific instruments such as OHIP are more likely to be useful and more able to discriminate between patients seeking different dental treatment than generic instruments.

Brennan and Spencer (2004) noted that generic measures like EuroQol and specific measures like OHIP-14, though instruments showed a degree of overlap, particularly for pain, the partial separation in the domains of both instruments meant that they could be used in combination to capture different elements of quality of life.

In a comparison of discriminant validity, Brennan and Spencer (2005) found there was little difference in the number of associations of either score regardless of whether simple counts, additive scores, or scale score measures were used. In bivariate analysis, OHIP-14 was more sensitive to oral health factors, but the EuroQol performed better or as well as OHIP-14 for patient demographics, visit factors and main dental condition, and was associated with the oral health factor of the number of decayed teeth. Both measures performed similarly in multivariate analysis.

4. Factors influencing quality of life

4.1. Treatment need

There is no general agreement on what constitutes health need (Tsakos et al. 2001). The most widely used definitions refer to the taxonomy suggested by Bradshaw (1972). Normative need is that which the expert or professional, administrator or social scientist defines as need in any given situation. Sheiham and colleagues (1982) criticised the use of normative need. One criticism they had was that by concentrating on the technical aspects of need, the attitudes and behaviour of the patient are frequently not given enough attention.

Felt or perceived need is equated with “want,” expressed as the individual’s own assessment of his/her health care. Investigations have pointed to the influence that perceptions of needs has on the treatment decisions of patients and dentists (Atchison et al. 1993). In the United States, Atchison and Dolan (1990) found in a population of US Medicaid recipients aged 65 years or older, that subjects with greater perceived need for dental care had poorer oral HRQoL than subjects with a lesser perceived need for dental care.

It also acts as an important predictor of the use of dental services, and as an outcome measure of the success of dental programs (Carter and Stewart, 2003). However in the US a variety of other factors – behavioural, cultural, provider, and dental service delivery system – appeared to be more important than the need for care in determining whether underserved groups visit the dentist (Grembowski, 1989).

In the Australian National Survey of Adult Oral Health, 2004-06, subjects were asked about their perceived need for dental extractions, fillings and for dentures, and the results were compared with the National Oral Health Survey of Australia held in 1987-88. Over the 17 years there was a marked increase in perceived need for a dental extraction among people aged less than 45 years, but not for subjects aged 45 years or older (Slade and Sanders, 2007). The perceived need for dental fillings increased by 4% with the greatest increase being in the age group aged 35 years or older. At the same time, the perceived need for dentures halved in the dentate Australian adult population.

4.2 Oral clinical disease or disorders

Studies done in the 1970s gave the perception that oral disease has little influence on quality of life. Gerson (1972) found that among Canadians, the lay perception was that oral conditions should not constitute a justification for exemption from work and that oral conditions should not be regarded as illnesses because they do not conform with the "sick role." In the United Kingdom, headaches, rashes, burns and troubles with teeth were seen as "trivial" problems (Dunnell and Cartwright, 1972). According to the First International Collaborative Study (Davis, 1976), aside from pain or rare life-threatening neoplasms, oral disease was associated only with aesthetics or perceptions of self-esteem, rather than effects on social roles.

Recent studies have found that dental clinical indicators are significant predictors of perceived oral health status (Tsakos et al. 2004; Ekanayke and Perera, 2005). In particular, missing teeth, untreated decay, periodontal attachment loss, and third molar symptoms have been found to be associated with increasing levels of adverse impact on well-being (Slade and Spencer, 1994; Locker and Slade, 1994; Slade et al. 1996; Steele et al. 2004).

Cushing and colleagues (1989) found in a population of UK workers that workers with fewer functioning teeth or more decayed teeth had poorer oral HRQoL. In the USA, Gooch and co-authors (1989) also found that more decayed teeth were associated with poorer oral HRQoL in insured adults aged between 18 and 64 years. However, they found that greater periodontal disease was also associated with poorer oral HRQoL. Another study in the United States by Atchison and Dolan (1990) found in a population of Medicare recipients aged 65+ years an association between having less teeth, wearing a removable denture and poorer oral HRQoL.

In Brazil, Leao and Sheiham (1995) found poorer oral HRQoL in subjects aged 35-44 years who had less teeth, more decayed teeth, more gingival bleeding, more calculus, or greater periodontal pocket depths. Finally, Slade and colleagues (1996) in a comparison of the oral HRQoL of Australians, US citizens and Canadians aged 60 years or older found subjects with less teeth, more decayed teeth, more retained tooth fragments or greater periodontal pocket depths had relatively poorer oral HRQoL.

It is not a stretch of the imagination to predict that if oral diseases are successfully treated, then the subject's oral health-quality of life will improve.

4.3 Sociodemographic characteristics

Sociodemographic characteristics include sex, age, country of birth, and residential location.

4.3.1 Sex

Research shows that the patient's sex affects oral health and oral HRQoL (Inglehart et al. 2002).

In the United States, many, but not all, statistical indicators show women have better oral health status than men (National Center for Health Statistics, 1994; Redford, 1993). Adult females were less likely than males at each age group to have severe periodontal disease as measured by periodontal loss of attachment of 6mm or more for any tooth. On the other hand, compared to men, women are more likely to have temporomandibular joint disease (Lipton et al. 1993).

Women are reported to be more inclined to self-care, to visit the dentist more often, and to be more likely to report symptoms such as pain (US Department of Health and

Human Services, 2000b). However, they could not fully determine the effects of these behaviours on their oral health.

Using a random probability sample of 1,865 adults (1,049 women and 816 men) McGrath and Bedi (2000) found that women perceived oral health as having both a greater negative and a greater positive impact than men on their quality of life in general. Specifically women perceived oral health as causing them more pain, embarrassment and being detrimental to their finances compared to men. Women also more frequently perceived oral health as enhancing their life quality, their moods, their appearance and their general well-being than men.

In Australia, females are more likely to have made a recent dental visit than males (Harford et al. 2004; Spencer and Harford, 2007). Males are more likely to attend dental clinics when a problem with pain exists, resulting in a high need for emergency services, more diagnoses of dental caries, and treatment more often involving oral surgery, including extractions (Slater, 2001; Spencer and Harford, 2007).

These behaviours are reflected in the clinical outcomes. Males are more likely than females to suffer complete tooth loss, have fewer than 21 teeth, to have missing teeth, have more decayed tooth surfaces but less likely to have filled tooth surfaces, to suffer from periodontal disease and to have tooth wear on their lower incisors (Roberts-Thomson and Do, 2007).

However, females were more likely than males to avoid food because of oral health problems and to experience orofacial pain, and there was no statistically significant difference between the sexes of the proportion of people with fair or poor self-rated oral health, or who suffered from tooth-ache (Harford and Spencer, 2007). Obviously, males and females perceive their oral health problems differently.

4.3.2 Age

Tasmania has an older population than mainland Australia (ABS, 2006). Both oral health (Smith and Sheiham, 1979; Atchison and Dolan, 1990; Fiske et al. 1990; Gilbert et al. 1993) and oral health related quality of life are associated with age (Tapsoba et al. 2000; Steele et al. 2004).

For example, older adults in Australia are more likely to have made a dental visit in the last 12 months, to have used a public clinic and are less likely to have visited for a check-up than younger adults (Harford et al. 2004).

Steele et al. (2004) found age was associated with the prevalence of frequent OHIP-14 impacts with those over 65 years of age reporting a better oral HRQoL. As older adults suffer from more edentulism and tooth loss (Sanders and Spencer, 2004), the fact that people of older age have a lower prevalence of frequent impacts than younger people may surprise some readers. Steele et al. (2004) explained the effect of age on oral HRQoL as an age cohort effect and stated that:

> "the current generation of older adults … may … have historically the lowest expectations."

By this he means that there is a cohort effect. Earlier birth cohorts did not expect to have perfect smiles, and expected to lose teeth.

Earlier qualitative research with 23 independently living elderly Canadians gives Steele's theory some credence. MacEntee and colleagues (1997) had found a substantial ability among the elderly to adapt to oral disorders and their consequences, and that this adaptation was probably enhanced by a company of peers who accept oral discomfort as the norm.

Mason and colleagues (2006) investigated how the factors that influence male and female oral HRQoL as measured by OHIP scores occur at different stages of life. They utilised the lifecourse Thousand Families cohort consisting of 1,142 children born in 1947 in Newcastle upon Tyne in Northern England. They concluded that lifecourse influences on oral HRQoL appear different for men and women. In men, self-perceived oral health was mostly explained by factors occurring early in life, while in women, the number of teeth retained in adulthood had a more prominent impact.

Recent research has endorsed the difference in perception of oral HRQoL between adult Australians at various ages. However the response depended on the oral health-related question asked. The percentage of people avoiding food due to dental problems was higher in people born after 1950 than for their younger counterparts (Harford and Spencer, 2007). Similarly, a higher percentage of people born after 1930 until 1970 self-rated their oral health as fair or poor compared to older or younger adults. However, adults born after 1970 were less likely to suffer from toothache, and adults born after 1950 were less likely to suffer from orofacial pain than younger adults.

4.3.3 Country of birth

Australia is a multicultural country (Australian Bureau of Statistics, 1996). Tasmania is not as ethnically diverse as mainland Australia. The most likely individual countries for Tasmanians born overseas to have migrated from are: England, the Netherlands, Scotland, New Zealand, Germany and Italy. Just over 2.6% of Tasmania's population is recognised as Aboriginal (ABS, 2006).

After examining more than a hundred definitions Kroeber and Kluckholm (1952) suggested a very comprehensive definition of culture:

> "Culture consists of patterns, explicit and implicit of and for behaviour acquired and transmitted by symbols, constituting the distinctive achievement of human groups, including their embodiment in artefacts; the essential core of culture consists of traditional (i.e. historically driven and selected) ideas and especially their attached values; culture systems may, on the one hand, be considered as products of action, on the other, as conditioning elements in future action."

Cultural background is an important variable influencing oral health quality of life (Slade et al. 1996; Steele et al. 2004). Steele and colleagues (2004) compared the oral HRQoL in the UK and Australia using national surveys. After adjustment for age, they stratified the Australian sample into three categories by country of birth. The most conspicuous pattern was observed for Australians born in countries other than Australia, UK or Ireland, where mean OHIP-14 severity scores were substantially worse.

There are two theories as to why cultural background is associated with oral HRQoL. Slade and colleagues propose that the cultural factors influencing perceptions of social impact are themselves linked to differences in social norms about what constitutes oral health, the influence of dental professionals on those norms, and ways in which individuals react to societal and professional norms (Slade et al. 1996). They may reflect different societal priorities in oral health and different systems of professional dental education, which are likely to be embedded within the broader attitudes towards general health and illness that societies develop.

Race or ethnic groupings serve as a proxy variable for a multitude of factors that contribute to health status. Rather than genetic variation, it has been proposed that a primary reason for the persistent effect of race on health status is because income, education, and other factors representing societal structure are not equivalent across racial and ethnic groupings (Taylor et al. 2002).

4.3.4 Residential location

Between 10% and 30% of Australians live in rural and remote areas, depending on how these areas are defined (Bourke and Lockard, 2000). Tasmania is more decentralised than mainland Australia (ABS, 2006).

Compared to their urban counterparts, rural Australians are more likely to have poorer health status (Dixon and Welsh, 2000). Rural adults are nearly one and a half times more likely to have no natural teeth than the general population (AIHW, 2002). The most recent available figures show that being rurally located means you are more likely to suffer from complete tooth loss, to have less than 21 teeth, to wear dentures, and to have greater numbers of missing teeth than your city counterparts (Roberts-Thomson and Do, 2007). People who live outside the Australian capital cities are more likely than their metropolitan counterparts to avoid foods due to dental problems (Harford and Spencer, 2007).

People from outside the Australian capital cities have differing dental behaviours compared to their metropolitan counterparts. They are less likely to have attended a private dentist, to have paid for their dental visit, and to have visited a dentist in the last 12 months, and more likely than their city counterparts to not have visited a dentist for 5 years. Rural people are also less likely than their city counterparts to usually attend a dentist at least once a year, to usually attend the same dentist, or to usually attend for a check-up (Spencer and Harford, 2007). They also have higher rates of risk factors for ill health, some of which are also risk factors for poor oral health. These include smoking, excessive alcohol use, poor diet and less physical activity (Taylor et al. 2003). Australians who live outside the capital cities are more likely to avoid foods due to dental problems, and to need dentures than their city counterparts (Harford and Spencer, 2007).

Reasons for the geographic distribution in population oral health are not satisfactorily explained by a single theory. One suggestion is that the probability of accessing a regular source of dental care may be lower in communities with an undersupply of dentists than in areas where the supply is plentiful (Okada and Wan, 1979; Grembowski et al. 1989). Possibly linked to lower supply of dentists, is that rural based dentists may not be as preventively orientated as city dentists. In a study by Brennan and Spencer (2001), capital city dentists had a higher agreement with the preventive orientation scale than rural dentists and preventive orientation was more associated with a higher rate of restorative and total services per visit.

4.4 Socioeconomic factors

Socioeconomic status is an attribute of an individual represented by indicators of education, income, occupation, and employment status. The ABS (2006) found that Tasmania has lower socioeconomic status than mainland Australia.

In countries other than Australia, the evidence indicates that lower social class patients tend to receive less expensive services than others (Conrad et al. 1984; Hazelkorn, 1985). For example, in Brazil, Leao and Sheiham (1995) when studying a population of adults aged between 35 and 44 years found that lower class subjects were more likely to have a poorer oral HRQoL.

A similar inequality in oral health occurs in Australia. Marked socioeconomic inequality in oral health exists in Australian adults (Barnard, 1993; Slade et al. 1992, Sanders and Spencer, 2004; Sanders et al. 2006) and the gap appears to be widening (AIHW, 2001).

The reason why socioeconomic factors are associated with oral health are still open to debate. Sanders and Spencer conjectured that socioeconomic factors do not account for observed health differences directly, but rather are marking other genetic, social and psychological phenomena that drive variation in health (Sanders and Spencer, 2004).

Later, Sanders and colleagues (2006) used data from 3,678 Australian adults and measured socioeconomic status at the small-area level and oral health by either missing teeth or the OHIP-14 score. They found that poor oral health was not explained by personal neglect, where personal neglect was defined as lack of dental visiting or dental self-care or both. Two criticisms can be made of making such a conclusion from this study. The first is that it was a cross-sectional study and hence cause and effect cannot be determined. The second is that it depends on survey participants' perception of their own dental visiting and dental self-care behaviour.

Wamala and colleagues (2006) claimed that access to dental care explains socioeconomic disparities in oral health. They utilised cross-sectional data from the large Swedish National Surveys of Public Health 2004 and 2005 (n=17,362 and 20,037) and developed a socioeconomic disadvantage index consisting of social welfare beneficiary, being unemployed, financial crisis and lack of cash reserves. After controlling for living alone, education, occupational status and lifestyle factors, they found that people with severe socioeconomic disparities were 7-9 times as likely to refrain from seeking required dental treatment.

A few points need to be made here. First, the socioeconomic disadvantage index developed by Wamala and co-authors differs from the definition of socioeconomic status used in this study. For example, their definition excludes level of education and occupational status. Second, the study does not find that access to dental care explained socioeconomic disparities in oral health, but rather that severe socioeconomic disparities were associated with refraining from seeking required dental treatment. Seeking dental care does not necessarily equate with oral health.

Third, like the Sanders and colleagues paper, the data came from a cross-sectional study and hence cause and effect cannot be determined.

Research has shown a relationship between lower socioeconomic status and poorer oral health but how each of the component measures interact with socioeconomic status is still not clear.
Armfield (2005) described how education influences inequality in health in a number of ways. Firstly, it has a significant role in influencing socioeconomic position, being a determinant of a person’s labour market position which in turn influences income, housing and other material resources. Second, education prepares children for life by enabling practical, social and emotional knowledge for achieving a full and healthy life. Third, education plays a role in preparing people for participating in society, teaching about rights and responsibilities and educating people in regards to the use and availability of services.

In the United States, Gooch and colleagues (1989) found in a population of insured adults aged between 18 and 61 years, that having less education was associated with lower oral HRQoL than subjects with more education. Gift and co-authors (1996) had a similar result with a population of US adults aged 18 years or older.

In Australia, a higher proportion of subjects with an education of nine years or less had complete tooth loss, less than 21 teeth, dentures, missing teeth, root decay, a higher mean DMFT, more periodontal disease and more lower incisor tooth wear than subjects with an education of year 10 or more (Roberts-Thomson and Do, 2007).

They were also less likely to have visited a dentist in the last 12 months, to have attended a private dentist, to pay for their dental visit, to usually attend a dentist at least once a year, to usually attend the same dentist, or to usually attend a dentist for a check-up than their more educated counterparts (Spencer and Harford, 2007). Less educated survey participants were less likely to have attended a dentist within the last five years and had more difficulty paying a $100 dental bill than those with at least a year 10 education. In contrast, subjects with the lower level of education were not as likely to avoid or delay visiting a dentist because of cost, than more educated subjects.

A higher proportion of survey participants with education of nine years or less avoided foods, rated their oral health as fair or poor and were more likely to perceive that they required dentures than more educated subjects (Harford and Spencer, 2007). However, they were less likely to feel they required a check-up.

In a study of children's dental decay, Armfield (2005) asserted that out of the indicators for socioeconomic status of income, education, employment, housing transport and mobility and its effect on oral health, the most important indicator is income.

Gooch and colleagues (1989) found an association between lower income and poorer oral HRQoL in a population of US adults.

In Australia people from households with higher incomes are more likely to have made a recent dental visit, to visit a private provider, to visit for a check-up and to visit at least once per year than people from households from lower incomes (Harford et al. 2004). Low income adults without private insurance are 25 times more likely to have had all their teeth extracted than high-income adults with insurance (AIHW, 2001).

4.5 Pattern of attendance

4.5.1 Regularity of attendance

The regularity of attendance is likely to affect the dental service received for two reasons. First, regular attendees are less likely to suffer acute symptoms and require emergency treatment (Sheiham et al. 1985; Todd and Lader, 1991; Murray, 1996; Kay, 1999). Second, the treating dental clinician when deciding on whether to undertake an intervention that is borderline in needing to be done, is more likely to "watch and wait" with a patient who usually attends for a check-up than one who usually attends a dentist with a problem. The treating dental clinician may reason that a regular attendee is more likely to re-attend the dental clinic in the near future than an irregular attendee, so that the condition has less chance to become a larger problem.

Dental attendance has also been found to be associated with subjective oral health. Gift and colleagues (1996) found that subjects in a population of United States adults aged 18 years or older who last made a dental visit more than 2 years ago had poorer oral HRQoL than those who had visited a dentist more recently.

A cross-sectional study utilising the Office for National Statistics and Omnibus Survey of a sample of 1,865 adults in Great Britain showed that dental attendance is positively associated with the perception of an enhanced quality of life (McGrath and Bedi, 2001).

4.5.2 Usual reason for attendance

Kressin and colleagues (1996) in a study in the United States on men aged 47 years or older found that problem-based dental visiting was associated with a poorer oral HRQoL. In the same year a similar result was found by Slade and colleagues when they compared the oral HRQoL of Australians, United States citizens and Canadian adults aged 60+ yrs.

A cross-sectional study of 4,176 Australian dentate adults found that the usual reason for the dental visit, and not the time since last visit or type of dental care supplied, accounted for differences in oral HRQoL (Crocombe et al. 2007). Therefore, it may not be the type of dental care received but rather the mindset towards dental care and its associated influence on behaviour and outlook that influences oral HRQoL.

Australians adults who usually attend a dentist with a dental problem ("problem visitors") rather than for a check-up are more likely to have less than 21 teeth, dentures, missing teeth, coronal and root caries, but less likely to have coronal restorations (Roberts-Thomson and Do, 2007). Problem visitors have a higher total DMFT, poorer periodontal health and more tooth wear than people who usually visit a dentist for a check-up.

Problem visitors are much less likely to have attended a dentist in the last 12 months and much more likely to not have attended for five years or older than subjects who attend a dentist for check-up (Spencer and Harford, 2007). Similarly, problem visitors are less likely to have attended a private sector dentist or to have paid for their dental visit, and much less likely to usually attend a dentist once a year or usually attend the same dentist than their check-up visiting counterparts. Problem visitors were also more likely to delay or avoid dental care because of cost, had cost preventing recommended dental care, and had difficulty paying a $100 dental bill.

Perception of their oral health was also poorer among subjects who usually attended a dentist for a problem rather than a check-up. Problem visitors were more likely to avoid foods due to dental problems, rate their oral health as fair or poor, and to suffer from toothache or orofacial pain than check-up visitors (Harford and Spencer, 2007). They also had a greater treatment need for dentures, extractions and check-ups.

4.6 Access to dental care

Beck et al. (1984) defined access as the:

> "opportunity for each individual to enter into the dental care system and to make use of dentists' services as the best way of preventing and controlling oral disease."

Lewis, Fein and Mechanic (1976) suggest that access is measured by the availability of services in the community, the obtainability of services by any and all subgroups of the population, and the comprehensiveness of services offered by the source of first-contact care or facilities linked within it.

Access to dental care is influenced by whether a subject holds a health care card or not, and by financial barriers.

4.6.1 Eligibility for a health care card

Public funded dental care for adults in Australian states and territories is limited to those who hold health concession cards which are issued by Centrelink, an agency of the Australian Government's Family Assistance Office (NACOH, 2004). Health care card holders are means-tested largely by income and include aged pensioners. Dental services are one of the least subsidised areas of health and have been chronically under-funded for the last decade (Spencer et al. 2007). This has resulted in service rationing of oral health care (NACOH, 2004). Tasmania has a higher proportion of people eligible for public dental care than mainland Australia (Slade et al. 2007).

Health care card holders who visit public dental clinics are at least twice as likely to experience toothache, to avoid certain foods and to suffer from the social embarrassment of bad teeth, compared with non-card holders (Carter and Stewart, 2003). Concession card holders have 3.5 less teeth on average than non-card holders (AIHW, 2001). Although in Australia socio-economically disadvantaged adults are eligible for public funded dental care, the rationing of these resources has led to disadvantaged adults being more likely to receive treatment for acute dental problems (Roberts-Thomson et al. 1995; AIHW Dental Statistics and Research Unit, 2002).

The Australian National Survey of Adult Oral Health demonstrated that people eligible for public dental care were more likely than the rest of the population to have teeth missing due to pathology, but less likely to have those teeth replaced by a crown or a bridge. They were also almost 1.5 times as likely to have untreated dental decay and they had, on average, four more teeth affected by caries than ineligible people (Spencer and Harford, 2007). Barriers to access to dental care in the public system were reflected in the poorer oral health of eligible people (Roberts-Thomson and Do, 2007).

"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 et al. 2007).

The dental care provided by the Tasmanian public sector is similar. Only 26% of eligible adults are actively attempting to access general dental care. Of those, only one third were successful (Tasmanian Auditor General, 2002).

> "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 continue to attempt to access public dental care in Tasmania the waiting time for public dental care is 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."

4.6.2 Financial barriers to dental care

The economics of oral health care and services has received relatively scarce attention by researchers (Stoyanova, 2001) and there have also not been many recent studies into price elasticity of demand for dental services. Price elasticity of demand measures the rate of response of quantity demanded due to a price change.

Earlier studies, mainly from the United States, show price elasticities from -0.002 to –4.18 (Yule and Parkin, 1985). Other research, although now more than ten years old, indicated that post insurance price elasticity for dental care is quite low, -0.069 (Konrad et al. 1987; Sintonen and Maljanen, 1985a, 1985b).

Many people who have a lot of difficulty paying a $100 bill dental bill would be unable to afford to pay for a routine dental care visit, with 18.2% of Australians falling into this category (Spencer and Harford, 2007). Such people were more likely to be eligible for public dental care, not have dental insurance, usually visit a dentist for a problem, be female, be of Indigenous identity, have lower levels of education or have poor oral status than their counterparts. Eligibility for public dental care, dental insurance and usual reason for visiting a dentist were strongly associated with having a lot of difficulty paying a $100 dental bill. There was a moderate association of having a lot of difficulty paying a $100 dental bill with sex, Indigenous identity, schooling and oral health status.

Reported avoidance or delay in seeking dental care due to cost is an indicator of a barrier to the receipt of treatment that is needed. Australians who were more likely to avoid or delay dental care due to cost were people who usually visit a dentist for a problem rather than a check-up, the dentate, those eligible for public dental care, those born between 1950-1990, and women as opposed to men. (Spencer and Harford, 2007). The usual reason for visiting a dentist and dental insurance were strongly associated with having avoided or delayed receipt of dental care due to cost. There was a moderate association with oral health status, eligibility for public dental care and sex.

4.7 Dental care

Although randomised control trials of dental implants have been undertaken (Awad et al. 2000), it was not feasible or ethical to do a randomised control trial of general dental care. To refuse general dental care to people for purely experimental purposes would and should be open to criticism. Other non-current randomised trials are feasible, but they would involve unusual study populations and settings. Hence, information had to necessarily come from an observational study.

Studies demonstrate that dental attendance is associated with the perception of an enhanced quality of life (Peterson and Nortov, 1995; McGrath and Bedi, 2001; Locker, 2001). In a recent cross-sectional study utilising data from the Australian National Survey of Adult Oral Health (Barnard, 1993) we found that the effect of dental treatment received was explained by the usual reason for visit, i.e. a check-up or a problem (Crocombe et al. 2007). However, cross-sectional studies do not show a temporal sequence, hence limiting the capacity to make cause and effect inferences.

Longitudinal studies have looked at individual dental interventions, such as dental implants, wisdom tooth removal, dentures, orthodontics, orthognathic surgery, or tooth loss, and found that the intervention improved oral HRQoL (Awad et al. 2000; Allen et al. 2001; Att and Stappert, 2003; Strassburger et al. 2004; McGrath et al.

2003; John et al. 2004; Heydecke et al. 2004; de Oliveira and Sheiham, 2004; Cunningham et al. 1996; Hatch et al. 1998; Bennett and Phillips, 1999; Locker and Jokovic, 1997; Steele et al. 2004; Dao et al. 1994, Schliephake et al. 1996). For example, one study used a randomised controlled clinical trial of prosthodontic treatments in the Montreal dental school where edentulous patients seeking replacement dentures were assigned at random to receive either a mandibular implant-supported overdenture and maxillary conventional denture or conventional upper and lower dentures (Awad et al. 2000). The 49 item OHIP was recorded at baseline and two months post-treatment. Subjects who received an implant-supported overdenture had a significant reduction in OHIP-49 scores compared to those subjects who received a conventional mandibular denture. However, there was not a significant difference between the two groups in physiological chewing function.

Locker (2001) described well the problem faced when attempting to evaluate routine dental care:

> "One major problem is that unlike a clinical trial that looks at a single intervention in an experimental setting, evaluating routine dental care means that multiple outcomes obtained by multiple interventions directed at multiple disorders in a non-experimental setting must be assessed."

Add to this the fact that most HRQoL measures involve multiple dimensions and a greater number of questions, these difficulties may help explain why there have not been many longitudinal studies that have evaluated the influence of routine dental care on HRQoL.

Five longitudinal studies have investigated the association between routine dental care and oral HRQoL (Fiske et al. 1990; Peterson and Nortov, 1995; Locker, 2001; Fisher et al. 2005; Gagliardi et al. 2008). In the Fiske (1990) study, one hundred elderly British people requesting dental care were interviewed and treated. Assessment was made using a socio-dental index as well as clinical criteria. The index measured four categories of oral handicap (impairment of function, comfort, self-image and social interaction) prior to treatment and any benefit conferred by the treatment. Seventy-four per cent benefited from treatment. The greatest improvements were in self-image and social interaction. Function was the most difficult category to satisfy. One third of subjects whose oral function was compromised before treatment were still in this state after treatment.

In the Peterson and Nortov (1995) study, 187 Denmark pensioners aged 67-70 years were given care that included comprehensive curative and preventive care as well as oral health education. After three years, the percentage of participants who reported poor denture function had declined and, at follow-up, less felt embarrassed by teeth or preferred food that was easy to chew. The changes in self-reported oral health status were supported clinically by a reduction both in the number of untreated decayed tooth surfaces and in the number of teeth with gingival bleeding and pockets.

Locker (2001) conducted a study over a three-year period using four indices concerned with chewing, pain, other oral symptoms and psychosocial impacts of oral conditions to assess the relationship between self-perceived change in oral health status and the provision of dental treatment in an older adult Canadian population. Over the three-year period, one-tenth of subjects reported that their oral health had improved and one-fifth reported that it had deteriorated. Those who improved made significantly more dental visits and received significantly more dental services than those who deteriorated or did not change. He concluded that improvements in the oral health of older adults depends upon access to comprehensive dental treatments which can address fully their clinical and self-perceived needs.

A novel approach to measuring change in oral HRQoL was taken by Fisher and colleagues (2005) when they measured the effect of dental services on recovery from oral disadvantage using data from the prospective longitudinal Florida Dental Care Study cohort. An oral disadvantage was defined as avoiding laughing or smiling because of unattractive teeth or gums, avoiding talking to someone because of unattractive teeth or gums or bad breath, or being embarrassed by the appearance of teeth or gums. Recovery from disadvantage was defined as no longer reporting a disadvantage. The measure, recovery from disadvantage, is relatively straight forward, has a simple yes-no dichotomy and is unidirectional but places some limitations on the research. Although the measure gives recovery from quality of life decrements it does not measure improvement in quality of life if there was not an initial decrement, and does not measure a worsening in quality of life. The types of dental services were corrective treatment, extraction, denture visit, check-up and dental cleaning. They found that dental services were effective in resolving oral disadvantage, and even more effective in resolving oral disadvantage among persons with specific symptoms. However, the study did not relate specific treatments to particular types of disadvantage. All treatments were related to all types of oral disadvantage, even when the plausibility of the association was not clear. For example, tooth extraction to cure the oral disadvantage associated with stained teeth seems extreme.

Gagliardi and colleagues (2008) surveyed South Australian community dwelling adults aged 75 years or older who were eligible for state-funded public dental care. They were asked by physicians, or nurses, six questions regarding oral health care and mailed a questionnaire containing the OHIP-14. Treatment was completed for 232 subjects and 198 completed a follow-up interview. They found that dental care did improve the subjects' subjective oral health, that mean OHIP change was statistically significant, though variable according to patients' stated treatment goal, and that the effect of patient goals on change in OHIP scores varied according to the patient's pre-treatment OHIP score. However, like the Awad study (see above), dental treatment did not influence chewing capacity.

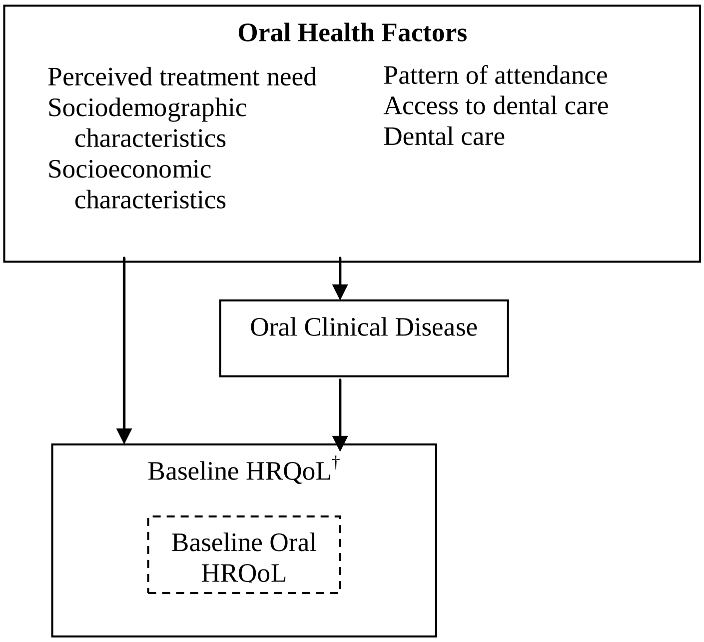
The above studies were limited to older adults (Fiske et al. 1990; Peterson and Nortov, 1995; Locker, 2001; Gagliardi et al. 2008), and/or to subjects with an oral disadvantage (Fiske et al. 1990; Fisher et al. 2005; Gagliardi et al. 2008). This thesis was based on research that investigated the association between dental care and HRQoL and was prospective in order to demonstrate temporal sequence, was based on a population sample for representativeness, and related to a wide range of dental clinical treatment options to be generalisable.

5. Conceptual model development

This section will show how the conceptual model and hypotheses for this study were developed.

From the preceding discussion it was apparent that the literature abounds with papers on variables that influence oral health status. There were many variables that influence oral health status, no matter how it was defined. However, how the variables that influence oral health status dynamically interact was not fully known. Other than by the treatment of dental disease and disorders, it was not clearly understood how to improve HRQoL, or which types of patients might benefit most.

With the above information a simple concept diagram was constructed that indicated the relationship between oral health factors on the baseline oral and general HRQoL that the subject will have at the beginning of this study (see Figure 10). The diagram was proposed for completeness and deals with oral health factors prior to the dental treatment received in this study. A subsequent conceptual model guided the statistical analysis for this study (Figure 11). The antecedent oral health factors may operate either directly or via the influence of oral clinical disease. No attempt was made to show how the variables that effect baseline oral and general HRQoL dynamically interact as the focus of this thesis was on the downstream relationship of dental services and change in HRQoL.



† HRQoL = Health-related quality of life.

Figure 10: Concept diagram relating oral health factors to baseline HRQoL

The problem faced when trying to discuss factors that influence the change in HRQoL is that not much research has been done in this area. Thus, to develop the conceptual model for this study, the assumption was made that many of the factors that influence oral HRQoL also influence the change of oral HRQoL over the one year time period of this study.

One factor that was expected to influence change in HRQoL not mentioned above was baseline oral HRQoL. Economic models predict that the probability of entering an episode of dental care is related to expected rewards versus expected costs. If expected rewards equal or exceed expected costs, the individual will decide to visit the dentist (Langlie, 1977). The perceived disruptiveness of the symptom plays a role in this judgment (Mechanic, 1978).

These principles were relevant for this conceptual model, which postulated that symptomatic patients will be the ones who experience greater interference of the symptom with valued activities. Such interference were expected to manifest as a greater effect of the symptom on baseline HRQoL. The model postulated that such people will be most likely to seek dental care. Extension of this argument is that the greater the interference of the symptom exceeds expected costs of treatment (i.e. monetary charges, time off work and discomfort), the greater the improvement in quality of life, making it worthwhile to invest more in a higher volume, complexity or cost of dental care.

For the asymptomatic patient, expected rewards are defined mainly by the individual's belief that regular check-ups will prevent future problems from occurring (i.e. prevent a decrease in one's HRQoL). For the individual motivated by aesthetics, expected rewards are defined as the individual's belief that dental services will improve one's appearance, an improvement in quality of life (Grembowski et al. 1987).

Hence the model proposes that survey participants who have a poor baseline oral HRQoL have a greater improvement in their quality of life.

This concept diagram for analysis for this study can be simplified to those variables that influence the change in oral and general HRQoL. Such a concept diagram is shown below and in the introduction to this thesis.

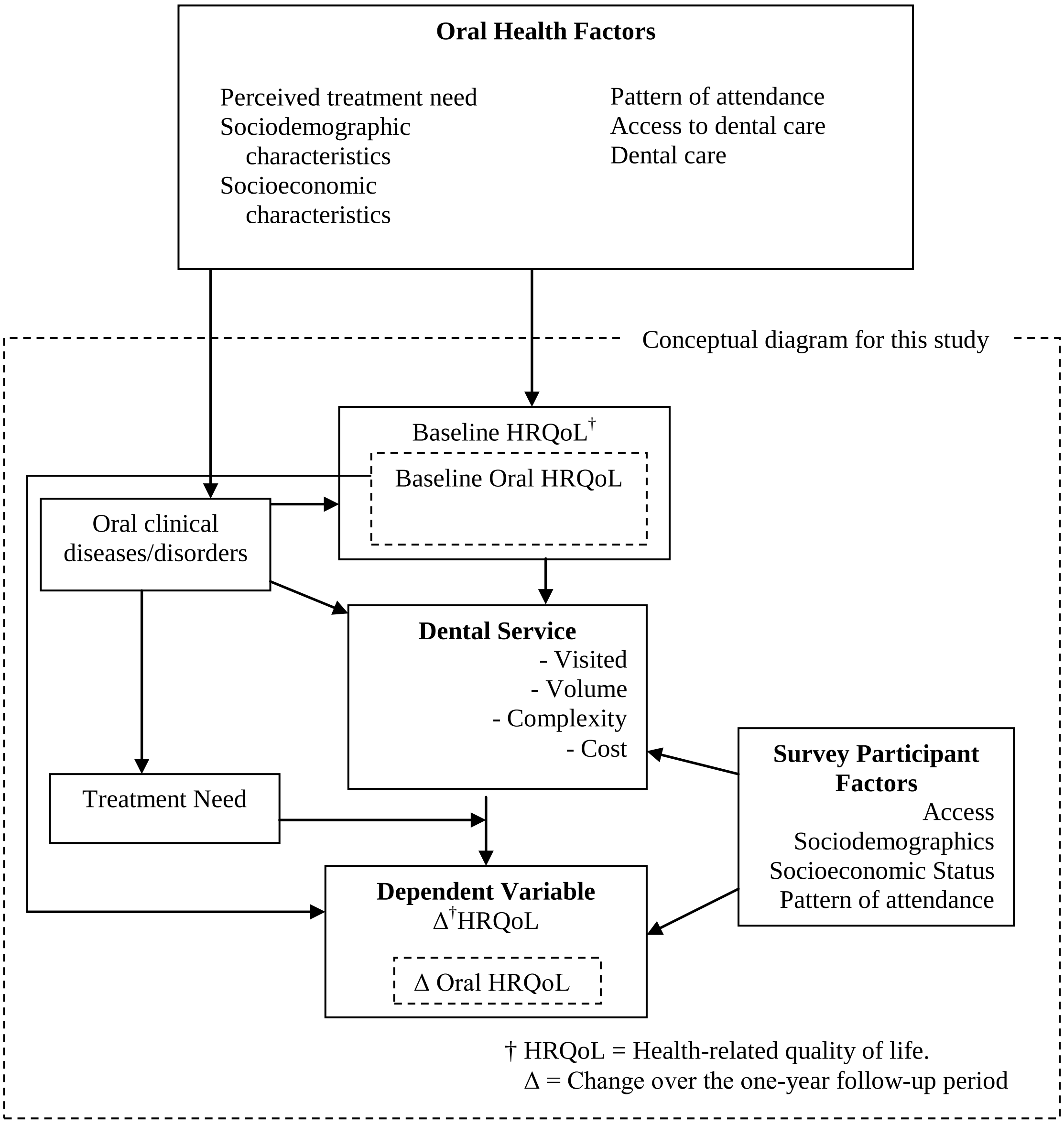


Figure 11: Conceptual diagram for analysis of the effect of dental care on change in HRQoL

The aims and hypotheses of this study were then developed from the conceptual model.

Chapter 3: Methods

This chapter outlines the sampling methodology, collection instruments and data items, aspects of power and sample size, as well as the variables and the analytical approach used.

1. Study design

The project was an observational prospective cohort study of a sample of randomly selected dentate adult Tasmanians surveyed in 2006 and followed over a one-year period. This study design measured how the change in HRQoL was associated with the usual range of dental clinical treatment options provided to the population.

2. Sampling

2.1 Description of sampling design

The survey participants were derived from the Tasmanian component of the National Survey of Adult Oral Health (NSAOH). Subjects were sampled at random from an electronic database of phone numbers listed in the electronic white pages using a multistage, clustered, stratified random sampling methodology.

2.2 Target population

This study was limited to Tasmanian dentate adults, defined as a person 15 years of age or older with one or more natural teeth.

2.2 Key sample design parameters

To optimise the efficiency of fieldwork for dental examiners, a multi-stage sampling design was used. The first stage involved selecting a sample of postcodes in Tasmania, and then secondly, selecting a sample of telephone numbers within each selected postcode. The final stage of selection involved selecting a random person per household. It was decided to only select one person per household to avoid the likely correlation of oral health status within a household.

2.3 Sampling frame

The framework was an electronic white pages database called ‘Marketing Pro’ supplied by Desktop Marketing Systems Pty Ltd. Duplicate phone numbers, address records and postcodes corresponding to Post Office Boxes were removed from the frame prior to selection of postcodes.

The frame was stratified into metropolitan and ex-metropolitan regions. Postcodes were allocated to strata based on the Australian Bureau of Statistics (ABS) postcode geographic classification.

2.4 Sample selection procedures

Within each stratum, postcodes were selected with probability proportional to size, where size was defined as the number of phone records in the postcode. Prior to selection, postcodes within each stratum were sorted by ARIA (Accessibility/Remoteness Index of Australia) to ensure representation. A fixed number of phone records were then selected from each selected postcode.

Utilising experience from previous telephone interview surveys conducted by ARCPOH, twice as many phone numbers were initially selected in each postcode to allow for refusals and non-contacts. Telephone numbers that did not serve residential dwellings, mobile phones and silent phone numbers were excluded from the framework. In Tasmania, 29 postcodes were selected, 14 in Hobart and 15 outside of Hobart. The planned number of interviews was 425 in the capital city of Hobart and 575 outside of Hobart.

To ensure each phone number had an equal chance of selection within a postcode the order of selected phone numbers was randomised. Telephone interview workloads were timed to progress through geographic areas so that dental examinations could be scheduled sufficiently near respondents’ homes. Telephone interviewers worked through postcode listings by calling each phone number up to 6 times to establish contact with an adult member of the household.

Once phone contact had been established with the household, one person aged 15 years or older was sampled at random from the household and asked to complete the telephone interview. If only one person aged 15 years or older resided at the dwelling, they were selected as the target person.

3 Data collection procedures

The collection procedures for the NSAOH comprised a computer-assisted telephone interview (CATI) by trained interviewers, an oral epidemiological examination conducted by calibrated dentist examiners, and a baseline mail self-complete questionnaire. The collection instruments that were added to the Tasmanian component of the NSAOH specifically for this study were a back-up baseline mail self-complete questionnaire of interviewed people who were not examined, a service use log book issued to subjects after the baseline examination, a twelve-month mail self-complete questionnaire; and if the logbooks were misplaced, a dental treatment audit.

Permission was sought and received for all aspects of data collection from the Human Research Ethics Committee of the University of Adelaide. The nature of the interview was explained to subjects at their time of selection and verbal consent was obtained prior to asking questions. Examined subjects were provided with written information about the procedures and were required to provide informed, signed consent prior to being examined.

3.1 Baseline computer-assisted telephone interview

The first phase involved the Tasmanian section of a national telephone interview survey that collected information on access and use of dental services and self-reported oral health status (Appendix A). Approximately 50 questions were asked per person with the average interview taking approximately 15 minutes.

The content of the telephone interview was similar to the 2002 National Telephone Interview Survey (NDTIS, 2002) and questions were asked on the subject’s oral health, use of dental services, pattern of dental visits, perceived dental treatment needs, oral health behaviours, general health, socioeconomic status, and demographics. Of relevance to this study CATI information was collected on the subjects' history of dental attendance, sociodemographic characteristics and perceived treatment needs.

3.2 Baseline epidemiological examination

Respondents in the telephone interview were invited to participate in the second phase of the survey, a standardised dental examination at a designated public dental facility, to collect clinical oral disease data (Appendix B). Oral Health Services Tasmania was responsible for this phase of the survey and they endeavoured to contact respondents within two weeks of completing the telephone interview to schedule an examination. Examined subjects were provided with written information about the procedures and were required to provide signed consent prior to being examined.

To ensure accurate clinical data was obtained, only three dental examiners (Dr Alan Hughes, Dr Peter Pullinger and Dr Len Crocombe) were recruited in Tasmania. They underwent a two-day training and calibration session that included instructions in criteria for epidemiological indices and practice sessions among adults who were not part of the study. During data collection, some of the study subjects underwent replicate examinations, one conducted by a study examiner, and one by a "gold standard" ARCPOH examiner (Associate Professor Kaye Roberts-Thomson). The data was used to measure inter-examiner reliability.

The examination protocol was based on the US National Health and Nutrition Examination Survey 2004 and the UK Adult Dental Health Survey 1998, and involved collecting information on oral mucosal lesions, presence/absence of natural teeth, dental caries experience, tooth wear, dental fluorosis, and periodontal disease.

Clinical reports and study gift packs were given to the examined subjects. Interviews and examinations began in February 2006 and were completed by September of the same year.

3.3 Baseline self-complete questionnaires

3.3.1 NSAOH questionnaire

At the completion of the clinical examination, participants were given a pamphlet explaining that within a few days a questionnaire would be mailed to their homes. The 16-page questionnaire asked about dental satisfaction, oral health behaviour, OHIP-14, EuroQol, facial pain, food and drinks consumed in a usual day, general health behaviour, dental fluorosis risk factors, physical activity, residential history, psychological stress, perceived social support, personal control, subjective social status, financial strain, dental anxiety, equivalised household income, and the effort-reward imbalance at work (Appendix C). Of particular interest to this study was the subjects' baseline quality of life as measured by EuroQol, and OHIP-14.

Enclosed with the questionnaire was a reply-paid envelope and a detailed cover letter. The cover letter explained that the survey was voluntary, outlined the questions in the questionnaire, and explained why a response was important. After two weeks, non-responders were mailed a reminder card. After a further two weeks, the non-responders were sent a further letter with a replacement copy of the questionnaire and a reply-paid envelope. A final letter was sent two weeks later. When the questionnaires were returned to ARCPOH at The University of Adelaide their return was registered. Baseline self-complete questionnaires with reminder mailings were completed in October 2006.

3.3.2 Back-up questionnaire

To ensure that the sample numbers would be adequate and as representative as possible, a back-up baseline self-complete mail questionnaire was posted to all participants who underwent the computer-assisted telephone interview, but whom for various reasons, could not attend the epidemiological examination and therefore had not received the baseline self-complete questionnaire (Appendix D). Enclosed with the questionnaire and logbook was a reply-paid envelope and detailed cover letter. The subjects' baseline OHIP-14 and EuroQol were collected. The same follow-up process was used as with the baseline mail self-complete questionnaire. Back-up questionnaires with reminder mailings were completed on December 2006.

3.4 Follow-up data collection procedures

3.4.1 Twelve month self-complete questionnaire

Twelve months after the receipt at ARCPOH of either of the two baseline self-complete questionnaires, survey participants were sent a mail self-complete questionnaire with a reply-paid envelope and cover letter (Appendix E).

In the twelve-month mail questionnaire data items were collected on the subjects' quality of life as measured by EuroQol, OHIP-14, and global transition statements; if the subject did not attend a dental clinician, reasons why they did not attend; and if the subject refused treatment, why they refused treatment. The same follow-up process was used as with the baseline mail self-complete questionnaire. Twelve-month questionnaires with reminder mailings were completed in December 2007.

3.4.2 Service use logbook

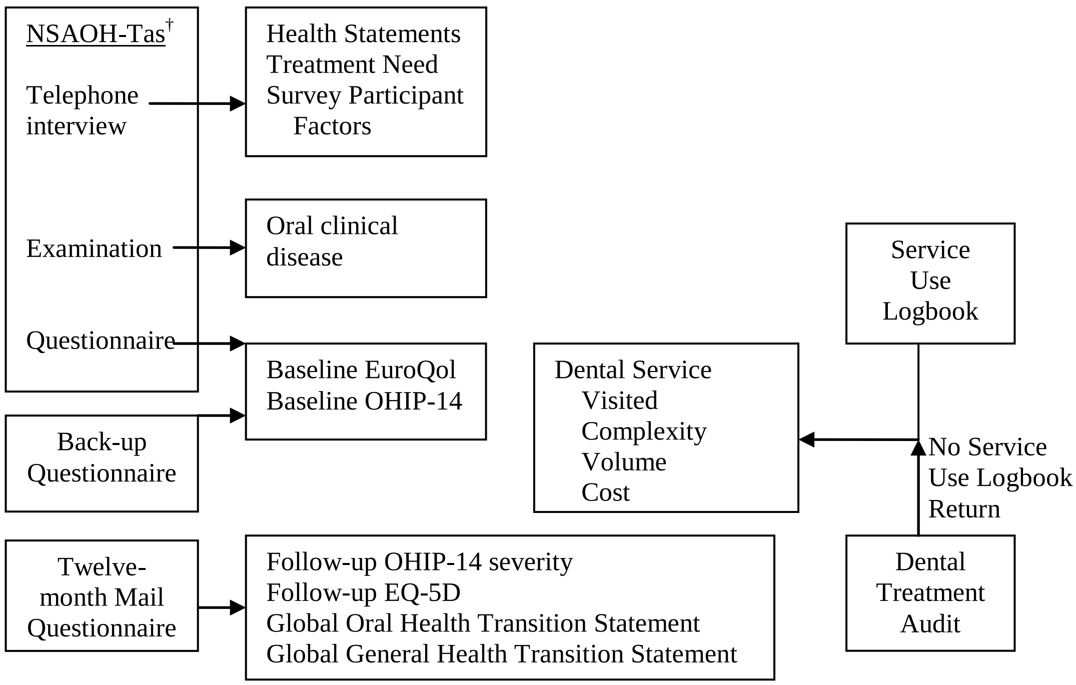
The service use logbook was given to all survey participants at the completion of the epidemiological examination or mailed with the back-up self-complete questionnaire (Appendix F). It consisted of a booklet for the recording of information concerning the details of dental visits (e.g. date of visits, types of services provided) by the service provider. Two articles were placed in the Australian Dental Association – Tasmanian Branch Newsletter informing dentists of the survey, and a letter asking for their support by filling out the logbook, and were sent to Tasmanian dentists from the President of the Australian Dental Association Tasmanian Branch.

The Service Log Book provided information for this study on the complexity, volume and type of dental service; and the treating dental clinician type, sociodemographic characteristics, normative need and dental practice characteristics.

3.3 Dental treatment audit

If the survey participant had misplaced the service use logbook, written permission was sought from the subject at the 12 month follow-up data collection to obtain the information as a treatment audit from their treating dental clinician.

After survey participant permission had been obtained, a mail self-complete questionnaire, in which the dental clinician was asked to use their dental records to answer the same questions as in the service use logbook, was sent to the treating dental clinicians' offices (Appendix G). The same follow-up process was used with the treatment audit as with the baseline mail self-complete questionnaire. The treatment audit was completed in February 2008. Data sources are depicted in Figure 12.



†: NSAOH-Tas = Tasmanian component of NSAOH

Figure 12: Data sources

4 Data management

A visit-level dataset was created first, and data for visits were aggregated to a person-level dataset. Person-level data sets for the CATI, epidemiological examination, baseline and follow-up questionnaires, service use logbook and treatment audit were merged to create an analytic datafile. In this section the variables and the summary measures will be described.

4.1 Dependent variables

Change in HRQoL was measured using change in OHIP-14 severity, change in EQ-5D, global oral and general health statements, and follow-up OHIP-14 severity.

4.1.1 Change in OHIP-14

Summary scores were computed from the OHIP-14 questionnaire completed at baseline and follow-up. At each administration, subjects were asked to indicate how frequently during the preceding year they had experienced 14 adverse impacts attributed to oral disorders. Five response categories were offered: “never”, “hardly ever”, “occasionally”, “fairly often” and “very often.”

Summary measures were first calculated for baseline and 12-month-follow-up OHIP-14.

This study used the same definitions as proposed by Slade (1998).

1. Prevalence of OHIP-14 impacts was defined as the percentage of subjects who reported “fairly often” and “very often.”

2. Extent was summarised for each survey participant by the number of items reported “fairly often” to “very often.”

3. Severity was the sum of the ordinal responses where “never” was coded as 0, “hardly ever” as 1, “occasionally’ as 2, “fairly often” as 3 and “very often” as 4. This meant that a subject could have an OHIP-14 severity ranging from 0 to 56. The severity measure by using all response categories attempts to overcome limitations that may be inherent in restricting summary scores to arbitrary thresholds of impacts.

As proposed by Slade (1998) when defining OHIP-14 severity, subjects with missing values, due to a non-response or answering “don’t know”, to more than two OHIP-14 items were eliminated from the analysis. When computing severity scores, any missing items for an OHIP item were replaced with the sample mean computed from the non-missing responses to the relevant OHIP item. Others have reported that summation scoring methods for the OHIP are as efficient more sophisticated ones that used weights (Allen and Locker, 1997).

To calculate change in OHIP-14 extent and severity, the baseline score was subtracted from the follow-up score so that anybody with a change score less than zero were classified as having better oral HRQoL. A change score of zero equated to the same quality of life, while a positive change score equalled a worse quality of life.

Each of the seven OHIP dimensions consisted of two items (Table 1). The prevalence of an OHIP dimension was defined as the percentage of subjects who reported “fairly often” or “very often.” to either of the items that made up the particular dimension.

Table 1: OHIP-14 quality of life dimensions and questions

Dimension	Question
Functional limitation	Have you had trouble *pronouncing any words* because of problems with your teeth, mouth or dentures? Have you felt that your *sense of taste* has worsened because of problems with your teeth, mouth or dentures?
Physical pain	Have you had *painful aching* in your mouth? Have you found it *uncomfortable to eat any foods* because of problems with your teeth, mouth or dentures?
Psychological discomfort	Have you been *self-conscious* because your teeth, mouth or dentures? Have you *felt tense* because of problems with your teeth, mouth or dentures?
Physical disability	Has your *diet been unsatisfactory* because of problems with your teeth, mouth or dentures? Have you had to *interrupt meals* because of problems with your teeth, mouth or dentures?
Psychological disability	Have you found it *difficult to relax* because of problems with your teeth, mouth or dentures? Have you been a bit *embarrassed* because of problems with your teeth, mouth or dentures?
Social disability	Have you been a bit *irritable with other people* because of problems with your teeth, mouth or dentures? Have you had *difficulty doing your usual jobs* because of problems with your teeth, mouth or dentures?
Handicap	Have you felt that life in general was *less satisfying* because of problems with your teeth, mouth or dentures? Have you been *totally unable to function* because of problems with your teeth, mouth or dentures?

4.1.2 Change in EuroQol

EuroQol was developed by an international team, the EuroQol Group, as a standardised non-disease specific instrument for describing and valuing HRQoL (Brooks, 1996). The EuroQol was 1/ was developed in different disease groups, different settings and countries (Kind, 1996), 2/ is widely used (Cunningham and Hunt, 2001), 3/ is reported to have construct validity and convergent validity (Bowling, 2001) and 4/. has been used extensively at ARCPOH. For example, Brennan and Spencer (2004 & 2005) compared the dimensions, as well compare the discriminant validity, of EQ-5D and OHIP-14.

Even though other general HRQoL measures have some of the favourable qualities mentioned above, EuroQol was chosen for this study because it was the shortest of the general HRQoL measures. For example, SF-36 has 36 questions making it cumbersome for the survey participant to complete resulting to in a possible lower response. Its shortened version with 12 questions was also considered too long.

Table 2: EuroQol dimensions

1. Mobility	**(circle one)**
I have no problems in walking about	1
I have some problems in walking about	2
I am confined to bed	3
2. Self-care (e.g. washing, dressing)	**(circle one)**
I have no problems with self-care	1
I have some problems washing or dressing myself	2
I am unable to wash or dress myself	3
3. Usual activities (e.g. work, study, housework, family or leisure)	**(circle one)**
I have no problems with performing my usual activities	1
I have some problems with performing my usual activities	2
I am unable to perform my usual activities	3
4. Pain/discomfort	**(circle one)**
I have no pain or discomfort	1
I have moderate pain or discomfort	2
I have extreme pain or discomfort	3
5. Anxiety/depression	**(circle one)**
I am not anxious or depressed	1
I am moderately anxious or depressed	2
I am extremely anxious or depressed	3
6. Cognition (e.g. memory, concentration, coherence, IQ)	**(circle one)**
I have no problems in cognitive functioning	1
I have some problems in cognitive functioning	2
I have extreme problems in cognitive functioning	3

The EuroQol provides a description of patient problems by dimensions (descriptive system) and a visual analogue scale score (VAS) for overall rated health (Roset, 1999). It was decided the visual analogue scale was unnecessary for this study due to the availability of an index score.

The EuroQol may be converted to the single summary five-dimension index (EQ-5D) by applying a formula that essentially attaches weights to each of the levels in each dimension (Dolan, 1997). A EuroQol cognitive dimension was later added (Krabbe et al. 1999) to improve content validity but was not included as a sixth dimension of the EuroQol index. In this study the cognitive dimension was analysed as a separate dimension but not as part of the summary EQ-5D measure.

To create the summary measure, each dimension was given a score between "1" and "3" (Table 2) and EQ-5D was calculated using the following formula:

EQ-5D=0.081+(0.069x(MO-1))+(0.104x(SC-1))+(0.036x(UA-1))+(0.123x(PD-1))+
(0.071x(AD-1))+(0.176xM2)+(0.006xS2)+(0.022xU2)+(0.140xP2)
+(0.094xA2)+(0.269xN3).

Where: MO = the mobility score, SC = the self-care score,
UA = the usual activities score, PD = the pain/discomfort score
AD = the anxiety/depression score,
M2 = 1 if mobility = 3 else M2 = 0, S2 = 1 if self-care = 3 else S2 =0,
U2 = 1 if usual activities =3 else U2= 0, P2= 1 if pain discomfort=3 else P2=0,
A2 = 1 if anxiety/depression = 3 else A2 =0,
N3 = 1 if any dimension =3 else 0.

Change in EQ-5D was calculated by subtracting the subject's EQ-5D at follow-up from his/her EQ-5D at baseline. The mean change in EQ-5D was then compared between different groups. As the resultant scores were small they were then multiplied by 100.

4.1.3 Global health transition statements

The oral and general health global transition measures consisted of the following statement and response categories: "Over the past year would you say your dental health has (1) worsened a lot? (2) worsened a little? (3) stayed the same? (4) improved a little? (5) improved a lot?" For this study, the response "stayed the same" was allocated a value of zero, “worsened a lot” and “worsened a little” a score of “2” and “1” respectively, while “improved a little” and “improved a lot” were allocated “-1” and “-2.” In this way, if the survey participants considered their health had improved they received a negative value, and if worsened, a positive value, the same as change in OHIP-14 severity and change in EQ-5D. The mean score of the health global transition statements were multiplied by ten for easier comparison of the results.

4.1.4 Follow-up OHIP-14 severity

Follow-up OHIP-14 severity was used as a secondary outcome measure for some analyses. This dependent variable was included because there has been discussion in the literature on the responsiveness of OHIP-14 severity (Slade, 1998; Locker et al. 2004). By comparing follow-up OHIP-14 severity with both baseline and change in OHIP-14 severity, an indication could be obtained of the responsiveness of the measure.

Uses all of the data, everything else does some form of collapsing Reference period of last year. Congruence between OHIP-14 global change

Both baseline and follow-up OHIP-14 severity range from 0 to 56, and cannot be negative in value. On the other hand, change in mean OHIP-14 severity hypothetically could range from -56 to +56.

4.2 Main explanatory variables

4.2.1 Dental service

The Australian Schedule of Dental Services has been published by the Australian Dental Association (ADA) since 1986. Dental treatment was collected at the level of individual service items, using the three-digit coding scheme of the ADA Schedule of Dental Services and Glossary, Edition 9. Using this coding scheme, items were aggregated into one of ten main areas of service as shown in Table 3. This was done so that four summary measures of dental care could be computed (see 4.2.1.1 – 4.2.1.4).

Table 3: The ten main areas of service in the ADA Schedule of Dental Services (8th Edition)

NOTE:
This table is included on page 73 of the print copy of the thesis held in the University of Adelaide Library.

4.2.1.1 Visiting a dentist

Subjects for whom at least one service item number was recorded were classified as having made a dental visit. Dental attendance was defined as a reported visit during the 12-month follow-up period. Due to the low number of subjects who visited a dental practitioner other than a dentist or dental specialist, there was no analysis of the results depending on the type of dental practitioner. From here on, the terms dentist and dental professional are used interchangeably.

4.2.1.2 Volume of dental services

The volume of dental services was defined as the total number of dental services received by a subject over the 12 months of this study. A dental service was defined as any procedure allocated a single three-digit service number in the ADA Schedule of Dental Services and Glossary, Edition 9. Of those participants who visited a dentist, dental service volume per survey participant over the twelve months of the study was dichotomised at the median value as either low, or high. Less than even items was considered low volume while seven items or more was classified as high volume.

4.2.1.3 Complexity of dental services

Dental service complexity received by those participants who visited a dentist was classified as either low or high, and was measured by the maximum responsibility loading of any dental service received by the survey participant.

The responsibility loading is part of the Relative Value Unit (RVU) scale which was based on a Canadian set established by the Ontario Dental Association as a fee guide for Canadian dentists (Clappison et al. 1965; Abrahms, 1997). The Canadian RVU incorporates a responsibility loading and a time factor. ARCPOH updated this set by estimating the responsibility loading for items that were not part of the original Canadian set and using time factor estimates from the Longitudinal Study of Dentists' Practice Activity. Where responsibility loadings were not given for any dental service, the responsibility loading was estimated by comparing the service with any similar service with a delegated responsibility loading. For example, the responsibility loadings for large restorations of 4 surfaces or more, was calculated by using the incremental increase in responsibility loadings from one to two to three surfaces.

If the maximum responsibility loading of any dental service received by the survey participant was between 1 and 1.25, dental service complexity was classified as low. If the maximum responsibility loading was greater than 1.25, dental service complexity was categorised as high.

4.2.1.4 Cost of dental services

The cost for the total dental treatment per subject over the one year of this study was calculated by using the fee from the ADA Dental Fees Survey, or if that was not available, the fee from the Department of Veterans Affairs multiplied by the ratio of the Department of Veterans Affairs fee for a one-surface amalgam restoration (item no. 511) to the same service ADA Fee Survey mean fee.

The ADA Fees Survey 2007 prepared by ACA Research provided information on the mean fees for the central 90% of returns of the fees charged by private dentists. Dentists were asked to list the fee they most commonly charged for each of a number of items of service. The 70 items of service included the types of services commonly performed by dentists in Australia, such as oral examinations, calculus removal and various restorative services. About 88% of all dental services carried out were surveyed (ADA, 2007).

In cases where the dental service fees had not been surveyed in the ADA Fees Survey 2007, a weighted relevant fee of the Local Dental Officer Fee Schedule, as effective from 1 November 2007, of the Australian Department of Veterans Affairs (DVA) was used. The fee schedule gave those fees that were paid for the dental treatment received by war veterans who held various DVA concession cards. The Local Dental Officer Fee Schedule is based on Australian Schedule of Dental Services and Glossary, 9th edition item numbers. The DVA fee was weighted up utilising the ratio of the fees for similar dental services that were in both the ADA Fees Survey and the Local Dental Officer Fee Schedule.

One Australian Schedule of Dental Services item (No. 119: Bleaching, home application - per arch) was not listed in either the ADA Fees Survey or the Local Dental Officer Fee Schedule and in this case the author’s own private practice fee was weighted up utilising the ratio of the fees for similar dental services that were both the ADA Fees Survey and the author’s own private practice fee list.

Of those participants who visited a dentist, a total treatment cost of less than $500 was classified as low, and $500 or more as high.

4.2.1.5 Z Values

Because volume, complexity and value of services were measured using different metrics, parameter estimates in linear regression models were not readily comparable. To overcome this, the original values of volume, complexity and cost of dental services were transformed to unit normal deviates ("z values") set with a mean of zero and a standard deviation of one were calculated for the volume, complexity and cost of dental services. Each z-value was computed by subtracting the sample mean from the original value, and dividing the result by the sample standard deviation. This yielded a mean of zero and a standard deviation of one for each Z value. When used in regression models, parameter estimates for variables transformed as Z-values represent the estimated effect on the outcome variable of an increase of one standard deviation in the explanatory variable.

4.3 Main covariables

4.3.1 Baseline oral health-related quality of life

The survey participant's baseline OHIP-14 severity was used as the measure of baseline oral HRQoL. Baseline OHIP-14 severity of less than 5 was classified as low, and 5 or above as high. A low OHIP-14 severity score indicated a good baseline oral HRQoL, and a high OHIP-14 severity score indicated a poor baseline oral HRQoL. The baseline oral HRQoL was split approximately 50/50 between high and low between survey participants.

4.3.2 Treatment need

Treatment need was defined as that need for treatment as perceived by the survey participant. At baseline, subjects were asked seven questions on treatment need. They were: if they had a need for extractions, fillings, a scale and clean, dentures, a dental check-up, gum treatment, a dental crown or bridge, or any other treatment. For this study, participants who answered that they had any treatment need except check-up or a scale and clean, were considered to have a dental treatment need. Note that treatment need was collected prior to the NSAOH dentist examination so that the survey participant's perception of their treatment need was not biased by the NSAOH-calibrated dentist's assessment of the level of oral clinical disease, or by the treating dental clinician's assessment of the subject's normative need.

4.4 Potential confounders and effect modifiers

The survey participant factors that were determined as likely to affect the volume, complexity and/or cost of dental service provided over the one-year observational period of this study, were oral clinical disease or disorders, sociodemographic characteristics, socioeconomic factors, pattern of dental attendance, and access to dental care. Each of these factors are discussed below.

4.4.1 Oral clinical disease/disorders

The level of oral clinical disease was obtained from the NSAOH calibrated dentist epidemiological examination. Survey participants were defined as having an oral clinical disease if they had at least one decayed tooth, whether that decay was in the coronal or root portion of the tooth, or if they had a periodontal pocket depth of 4 mm or more. In this way the major two dental diseases of dental caries and periodontal disease were recorded.

Tooth loss, tooth wear, and gingival bleeding were not included because it was ambiguous as to whether these clinical conditions required treatment.

4.4.2 Sociodemographic characteristics

The survey participant's sociodemographic characteristics analysed were age, sex, country of birth, and whether the subject was from Hobart or elsewhere in Tasmania.

The survey participant's sociodemographic characteristics were taken from the telephone interview. Age was split into three groups of 15-44, 45-59, and 60+ years. The measurement of sex was self reported. Country of birth was dichotomised into Australia or overseas. The subjects' postcode was used to indicate whether they were from Hobart greater metropolitan area or not.

4.4.3 Socioeconomic characteristics

Socioeconomic status was measured by education, level of income, occupation and employment status.

The highest level of education was trichotomised into Degree/Teacher/Nursing, Trade/Diploma/Certificate, and no Post-Secondary school education. Total household income was divided into low if less than $30,000, high if equal to or over $60,000, and middle if in between these amounts. Occupation was split into manager/professional/paraprofessional, trades/clerical and blue collar workers/labourers and was based on the Australian Standard Classification of Occupations (ASCO). ASCO identifies the type of occupation that may be expected for those undertaking a program of study (ABS, 1997). Employment status was defined as employed or unemployed. People in part-time employment were classified as employed.

4.4.4 Pattern of attendance

The survey participant pattern of attendance at baseline was measured by the survey participant perception of their regularity of attendance and usual reason for attendance.

Regularity of attendance was dichotomised into at least once every year, or less often than once a year. The usual reason for visiting a dental professional was divided into a check-up or a dental problem.

4.4.5 Access to dental care

Access to dental care was measured using three questions that assessed whether the subjects were eligible for a Health care card, whether they had a lot difficulty in paying a $100 dental bill, or whether they had avoided or delayed dental treatment because of cost.

5 Weighting

Unit record weights for this survey were calculated to reflect probabilities of selection and to adjust for different participation rates across postcodes and among age and sex categories. As the survey was restricted to dentate people aged 15 years and older, estimates of the dentate population in Tasmania were derived from the telephone interview survey and used to calculate final weights. The weighting formula is provided in section 5.1.

5.1 Weighting for telephone interview data

$$\text{Weight } w^{*}_{h,p,j,i} = \frac{N_z}{\sum_{i \in z}(\frac{N_h}{N_{h,p} * d_h}) * (\frac{N^{\#}_{h,p}}{n^{\#}_{h,p}}) * (m_{h,p,j})} * (\frac{N_h}{N_{h,p} * d_h}) * (\frac{N^{\#}_{h,p}}{n^{\#}_{h,p}}) * (m_{h,p,j})$$

where: h = stratum = Tasmania by Hobart or rest of the State,

j = household;

z = post stratification cell = Tasmania by Hobart or rest of the State by age by sex cell;

$N_{h,p}$ = total number of households (records on frame) in postcode p, stratum h;

N_h = total number of households (records on frame) in stratum h;

d_h = number of postcodes selected in stratum h;

$n_{h,p}$ = number of households selected in postcode p, stratum h;

$n^{\#}_{h,p}$ = number of households undertaking telephone interview in postcode p, stratum h;

$m_{h,p,j}$ = number of persons aged 15+ in household j, postcode p, stratum h; and

$k_{h,p,j}$ = number of persons aged 5-14 years in household j, postcode p, stratum h.

5.2 Weighting for examination data

The weighting formula was similar to that for the telephone interview. However, the formula needed to be changed to reflect the different response rates for the examination phase.

Secondly, the formula was changed to use benchmarks that reflect the number of dentate people in Tasmania by residential location by age by sex rather than the Australian Bureau of Statistics (ABS) Estimated Residential Population (ERP) benchmarks. The ERP is obtained by adding to the estimated resident population at the beginning of each period the components of natural increase and net overseas migration on a usual residence basis. The concept of ERP links people to a place of residence within Australia. Dentate benchmarks were estimated by adjusting the ERP by the percentage of dentate persons in a state by Hobart or the rest of the State by age by sex. The estimates were obtained from the telephone interview survey.

$$\text{Weight } w^{*}_{h,p,j,i} = \frac{N_{z,dentate}}{\sum_{i \in z} (\frac{N_h}{N_{h,p} * d_h}) * (\frac{N^{\#}_{h,p}}{e^{\#}_{h,p}}) * (m_{h,p,j})} * (\frac{N_h}{N_{h,p} * d_h}) * (\frac{N^{\#}_{h,p}}{e^{\#}_{h,p}}) * (m_{h,p,j})$$

where: $N_{z,dentate}$ = estimate of dentate population in Tasmania by Hobart or the rest of the State by age by sex; and

$e^{\#}_{h,p}$ = number of households undertaking dental examination in postcode p, stratum h

5.3 Weighting for questionnaire data

The same formula was used for the weight for the sum of the NSAOH and back-up questionnaires except $e^{\#}_{h,p}$. was defined as number of households responding to either the NSAOH or back-up questionnaires in postcode p, stratum h.

6. Statistical analysis

This section describes how the statistics were presented and what analyses were used.

6.1 Participation

The unweighted percentage of eligible people who participated at each stage of the research were calculated. This included participation at the different stages of the telephone interview, epidemiological examination, mail and back-up questionnaires at baseline, and the follow-up mail questionnaire, service use logbook and dental treatment audit.

Bias is defined as the difference between a value observed in a sample survey and the true value that exists in the population. Non-participation bias occurs when the respondents and non-respondents differ in one or more characteristics.

Two methods were used to assess non-participation bias. The first was to use the 'population benchmark' approach where weighted estimates derived from the sample were compared with selected Tasmanian Census data (ABS, 2006). Estimates compared were whether the subject was born in Australia, or were of Aboriginal or Torres Strait Islander descent, and whether the subject spoke a language other than English at home, and the subject's occupation. The criteria used to distinguish findings of similarity with the Census, or under- or over-representation in the study sample was whether 95% confidence intervals for the sample estimates did or did not overlap with the census estimate.

The second was to compare weighted distribution of demographic characteristics at five stages of the study: at the interview, examination, baseline and follow-up questionnaires, and of those subjects for whom treatment details were obtained. Survey participant demographics selected were: employment status, dwelling ownership, income, highest educational qualification, eligibility for a health care card, usual attendance for a dental check-up usually visiting a dentist every 12 months or less, difficulty paying $100 dental bill and avoiding or delaying visiting a dentist due to cost.

6.2 Descriptive statistics

Data were weighted to generate all descriptive statistics, thereby producing population estimates for the target population of dentate Tasmanian adults. Categorical variables were summarised as percentages and corresponding 95% intervals, while ordinal and continuous variables were summarised as means and 95% confidence intervals. Additionally, change scores were plotted as histograms.

6.3 Analyses of association

6.3.1 Bivariate analysis

Bivariate analysis was undertaken to identify and describe associations between the outcome variables and main explanatory variables and to find potential confounders. Five outcome variables were assessed: change in OHIP-14 severity, change in EQ-5D, the global oral and general health transition statements and follow-up OHIP-14 severity. Bivariate associations with dental attendance were evaluated for all subjects. For those subjects who visited a dentist during the 12 month follow-up period, bivariate associations were additionally evaluated with the volume, complexity and cost of dental service received. The number of participants were shown as numerators and weighted for age, sex and residential location, unless otherwise specified.

The associations between the main explanatory variables were evaluated, and the two main covariables of baseline OHIP-14 severity and treatment need, and between the main explanatory variables and potential confounders or effect modifiers. Potential effect modifying variables were: the presence of oral disease; the socio-demographic factors of sex, age, country of birth and whether the subject lived in Hobart or elsewhere in Tasmania; the socioeconomic factors of level of education, household income, occupation and employment status; the pattern of attendance at baseline as measured by regularity and usual reason for visiting a dentist; and finally access to dental care gauged by the eligibility for a health care card, difficulty in paying a $100 dental bill, and avoiding or delaying dental treatment due to cost.

Analysis was also undertaken to find statistically significant associations between the five outcome variables with the main covariables and between the outcomes with potential confounders/effect modifiers.

Colinearity was expected between the volume, complexity and cost of dental services, and so modelled the four main explanatory variables separately as well as undertaking correlation analysis between each of volume, complexity and cost of dental services. Colinearity was evaluated between baseline OHIP-14 severity and five outcome measures of change in OHIP-14 severity, change in EQ-5D, the global oral and general health transition statements, and the follow-up OHIP-14 severity. As well colinearity between baseline EQ-5D with baseline OHIP-14 severity and the five outcome measures was tested. Scatter plots were presented for baseline OHIP-14 severity with both follow-up and change in OHIP-14 severity, and baseline EQ-5D with change in EQ-5D.

6.3.2 Stratified analysis

Relationships between the main explanatory variables and each outcome variable were evaluated within strata classified according to the following variables: low- and high-baseline OHIP-14 severity; presence and absence of perceived treatment need; presence and absence of oral disease; and by survey participant factors. The survey participant factors were divided into the categories of sociodemographic factors, pattern of attendance at a dentist, and access to dental care. Two main assessments were made for the stratified analyses:

1) The degree of consistency between strata in the association between the explanatory variable. In this context, the “association” was signified by the difference in mean outcome values between the groups categorised according to the explanatory variable – for example, the differences in mean OHIP-14 severity change scores between people who visited a dentist and people who did not. Lack of consistency in this association across strata could be suggestive of effect modification – a phenomenon that was evaluated statistically by evaluated statistical interactions in subsequent multivariate models.

2) If stratum-specific associations appeared to be consistent, interest focussed on the degree to which the magnitude of this consistent association might differ from the magnitude of the crude association between the explanatory variable and outcome variable. The crude association was represented by the association for all subjects in the cohort, which was additionally tabulated for comparison.

6.3.3 Multivariate models

This analysis was undertaken with the five measures of HRQoL as dependent variables: change in OHIP-14 severity, change in EQ-5D, global oral and general health transition statements, and follow-up OHIP-14 severity. For each dependent variable, a two-part regression model was used. Dental visiting was the main explanatory variable in the first part of the model, which used data from all subjects. In the second part of the model, the effects of volume, complexity and cost of dental services were evaluated among those subjects who had visited a dentist.

Within both parts of the model, a crude model, labelled Model 1, estimated the association of the main explanatory variable with the HRQoL measure. The multivariate modelling was then extended by adding the first order terms, other than baseline OHIP-14 severity and treatment need, to the crude model. This model was labelled Model 2. Then the main covariables of baseline OHIP-14 severity and treatment need scores were included to create Model 3. In Model 4, interactions between the outcome and main covariables and potential confounders/effect modifiers with the main explanatory variable were included. If a variable had a statistically significant interaction, as defined by a $p<0.05$, with the main explanatory variable both the first order term and the interaction term were included in the final Model 4. If the first order term was also statistically significantly associated with visiting a dentist then the first order term, but not the interaction term, was included in the first order term Model. Our hypothesis was considered to be supported if statistically significant ($p<0.05$) interactions were demonstrated in the final model.

For several combinations of dependent-explanatory variables there were multiple statistically significant interaction terms. In the regression models with multiple interactions, one of the interactions was selected for inclusion in the model. This was done for three reasons. First, some of the interactions were suggesting similar types of effect modification. For example, both education and income were statistically significant interaction terms in some models. Second, it would be unwieldy to explain the findings from models with multiple interactions. The main reason was that the goal was to discover and describe effect modification to better understand the effect of dental care on oral HRQoL, rather than to maximise a statistical criterion;

The criterion for selecting the included interaction term was which interaction seemed most appropriate for that dependent variable. For example, survey participant variables that created statistically significant interactions for several dependent variables were favoured over survey participant variables that created only one or two interactions. It was recognized that alternative interactions probably were equally valid, but the selected interaction served the purpose of showing the degree to which the effect of dental care on HRQoL varied in noteworthy sub-groups of the Tasmanian population. The reasons for selecting a particular interaction term for a particular dependent variable Model were explained in the results.

7 Power and sample size

7.1 Power analysis with OHIP-14

Population estimates for change scores between baseline and follow-up in OHIP-14 dichotomous scores were derived from the South Australian Dental Service (SADS) Aged Care Project, mean (μ) = –1.35, and standard deviation (σ) = 2.75 (Slade, 1998).

A suitable study comparing change in OHIP severity was not available. Nominated effect sizes for change in OHIP dichotomous scores for the current study were based on observed three-fold difference in changes in OHIP scores observed between people who received a check-up versus people who attend only for problem visits (Slade, 1998). A dichotomous change for OHIP was defined as change from “very often” or “fairly often” to “occasionally”, hardly ever” or “never” or vice versa. This was considered to give an indication of results expected with change in OHIP severity, which numbers each of the OHIP categorical responses and subtracts the baseline from the follow-up score. Another relevant finding from the Slade (1988) study was a 6-fold difference in OHIP change scores comparing people who lost one or more teeth during a two-year period with people who lost no teeth.

Sample size calculations were based on two-group differences in means using an alpha of 0.05 and power of 80% (see Table 4). This indicated that for effects of the expected sizes between 3- to 6-times based on the literature, a sample size of between 4 and 18 would be required. Such required numbers fall within the projected n=156-344 dentate persons expected to visit within the timeframe, and within the expected numbers receiving routine dental services.

Table 4: Estimated number of subjects per group

Required Number of Survey Participants per Group	Effect (times) Check-up versus Problem
262	1.5
67	2.0
18	3.0
4	6.0

A later study (Gagliardi et al. 2006) investigated the effect of dental services on OHIP-14 also using subjects of the same SADS Aged Care Project. They noted that the mean difference of OHIP-14 was much greater for the edentate than the dentate. Using the data from this project where the mean difference of OHIP-14 for dentate adults was –3.21, the population estimate standard deviation was 8.032, and coupling them with the results from the National Dental Telephone Interview Survey (NDTIS 2002), power was calculated.

The conclusion was that with a power range of 0.861-0.995, this study will be able to decide if visiting compared to not visiting a dentist are associated with changes in OHIP-14.

Table 5: Power to detect difference in OHIP-14 between those who did and those who did not make a dental visit with the given sample size

	NDTIS 2002	Projected Range of Subjects after Loss to Follow-up (250-550)	Power Range
Dentate people who reported they visited a dentist in last 12 months	62.5%	156–344	0.861-0.995

The next step was to investigate the power to detect change in OHIP-14 of those subjects who received differing dental services. The power range was low for some procedures such as new dentures, root canals, gum treatment, but high for a check-up, fillings, scale and clean, and X-radiographs. The conclusion was that this study will be able to detect associations of volumes, complexities and costs of dental care with changes in OHIP-14.

Table 6: Power to detect difference in OHIP-14 between subjects who received various dental treatment with the given sample size

Treatment Received	NDTIS. 2002	Projected Range of Subjects after Loss to Follow-up (156-344)	Power Range
Check-up	56.1%	87–193	0.775–0.981
Private Sector versus Public Sector	86.1%/13.3%		0.613–0.958
Persons receiving routine dental services:			
Extractions	17.5%	27–60	0.472–0.801
Fillings	45.1%	70–155	0.732–0.973
Scale and clean	72.6%	113–250	0.815–0.991
Persons receiving additional dental services:			
X-ray	41.0%	64–141	0.712–0.963
Fluoride	6.2%	10–21	0.304–0.591
New denture	4.1%	6–14	0.161–0.295
Root canal	6.6%	10–23	0.234–0.450
Gum treatment	0.3%	0–1	0.000–0.068
Orthodontics	2.0%	3–7	0.105–0.163
Crown/bridge	6.2%	10–23	0.216–0.417
Other	3.3%	5–11	0.124–0.239

7.2 Effect sizes with EuroQol

In the above discussion with OHIP-14 some differences in sample size calculations were noted between cross-sectional OHIP-14 and change in OHIP-14 over time. Roset *et al.* (1999) gave the following sample sizes for similar effect sizes.

Table 7: Approximate sample sizes required to detect effect sizes for EuroQol

Effect size	**EQ-VAS**[†]	**EQ-5D Index Catalan Interview Health Survey**	**EQ-5D Index Critically Ill Patients**
	n	**n**	**n**
3.0 times	50	30	75
6.0 times	20	20	30

[†]Footnote: EQ-VAS: EuroQol - Visual Analogue Scale

One caveat is that Roset and colleagues looked at cross-sectional comparisons and not change scores over time. A second caveat is these figures are an approximation read from one of the Roset et al. graphs. These sample sizes are a bit larger than the ones for OHIP-14, but this could reflect the fact that they are not based upon EuroQol change scores.

In terms of comparing the visual analogue scale (VAS) to index scores: at large effect sizes (6.0 times) there is not much variation, with VAS and Index (Catalan Interview Health Survey) requiring a sample of approximately 20 per group and Index (Critically Ill Patients) about 30 per group. There was more variation at the lower effect size (3.0 times), with the Index score having the highest and lowest required sample sizes depending on the population sampled, while the VAS sample size was in between.

These figures when combined with the expected samples sizes for people expected to access dental care were encouraging, especially since they are not based on change in EuroQol scores – it suggested that at the projected effect sizes for this study there was a realistic chance of detecting changes in quality of life.

Chapter 4: Results

This chapter outlines the participation rates, assesses non-participation bias, and presents descriptive statistics. Bivariate, stratified and multivariate analyses were used to first test the hypothesis of whether visiting a dentist is associated with change in HRQoL. Then, of those subjects who did visit a dentist, similar analyses were used to test whether volume, complexity or cost of dental care, or baseline oral HRQoL or treatment need were associated with change in HRQoL. The results section ends with an investigation of the colinearity between the volume, complexity and cost of dental services as well as between baseline OHIP-14 severity and the five outcome measures.

1. Participation

Of the 2,159 Tasmanian telephone numbers selected at random from the 'electronic white pages' sampling frame, 414 were business lines, faxes or modems, and disconnected telephones while 1,745 were eligible household numbers (Figure 12).

1.1 Telephone interview

Of the 1,745 eligible (in-scope) household numbers in Tasmania, 40.3% (n=703) were classified as non-respondents. This group included households that did not answer the call, direct refusals, people who asked to be called back but could not be re-contacted, people who spoke a foreign language for which there was no available translator, and people who were unable to participate due to other reasons such as the failure to schedule an appropriate time for the interview.

The telephone interview participation rate was calculated with 1,042 adults in the numerator, while the denominator, 1,745, included the total sampling frame minus out-of-scope or ineligible units. The telephone interview participation rate was 59.7%.

Among interviewed people, the examination participation rate was 43.7%. The 28 people who were deemed out of scope for the examination because they lived in the 7330 postcode, an area on the northwest coast of Tasmania, were excluded because it was not logistically possible for an examining team to visit the area. Among the 873 interviewed people who were in scope for the examination, 385 were examined, yielding an examination rate of 44.1%, slightly ahead of the participation rate nationwide (43.7%).

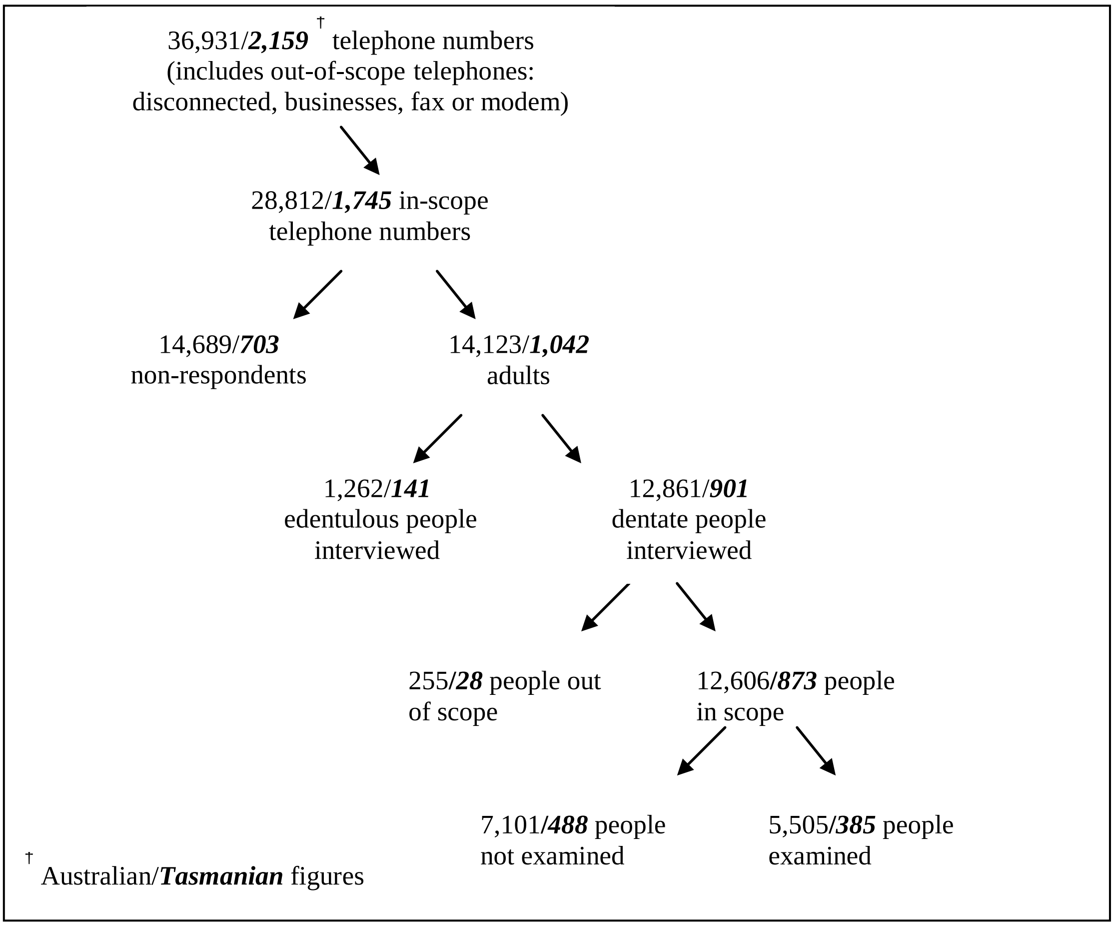


Figure 12: Number of people selected and participating in the National Survey of Adult Oral Health 2004-06 in Australia and Tasmania.

1.2 Questionnaires and treatment details

Of those Tasmanians who underwent a clinical examination, over three-quarters (77.4%) completed the NSAOH mail questionnaire, while of those who did not have the examination, over half (51.6%) completed the back-up mail questionnaire (Figure 13).

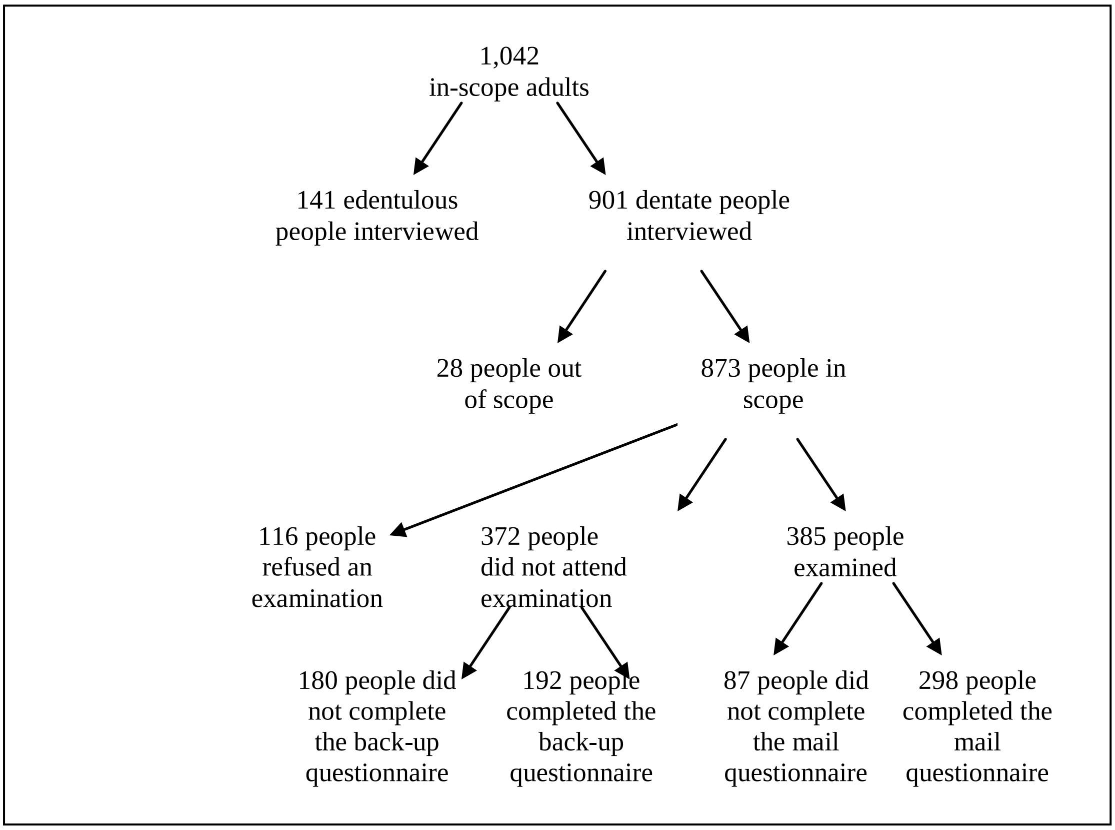


Figure 13: Number of adults participating at baseline in Tasmania.

Four hundred and ninety people completed either the NSAOH mail or the back-up questionnaires, which represented over half (56.1%) of those people in scope who completed the telephone interview.

Nearly three-quarters of those who completed either of the baseline self-complete questionnaires completed the twelve-month follow-up questionnaire (73.5% - Figure 14). The vast majority of people who completed the follow-up questionnaire provided treatment details either via the service use logbooks or the treatment audit, or indicated they hadn't visited a dentist in the questionnaire, (88.9%). Over forty percent (41.2%) of the Tasmanians who were interviewed and in scope in this study completed the follow-up questionnaire.

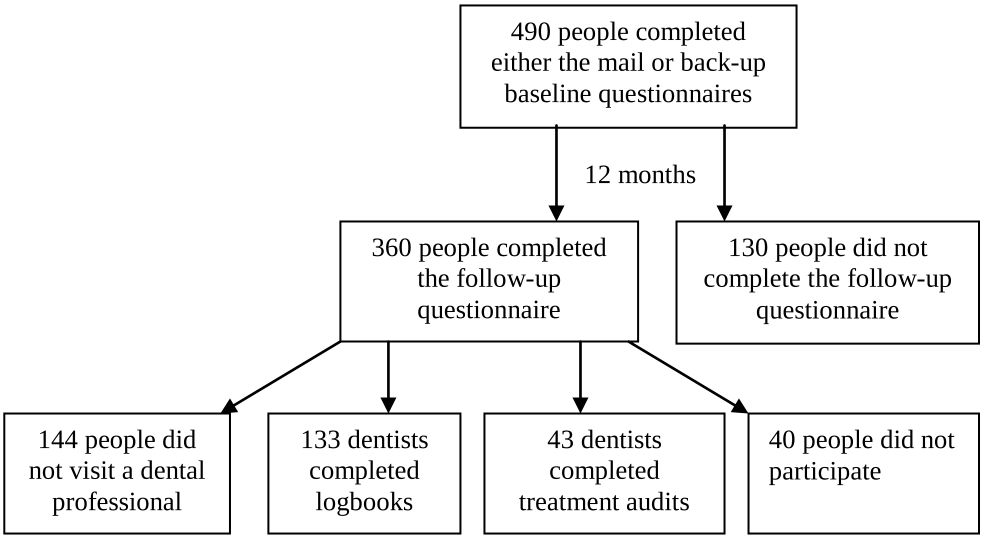


Figure 14: Number of people selected and participating in the follow-up component of this study.

1.4 Regional participation rates

The Tasmanian regions as used in this study are the Statistical Region Sectors as defined by the Australian Standard Geographical Classification (ASGC). The ASGC is used by the Australian Bureau of Statistics (ABS) for the collection and dissemination of geographically classified statistics. Each of the Statistical Region Sectors in Tasmania contains one or more Local Government Area. Local Government Areas do not cross Statistical Region Sector boundaries.

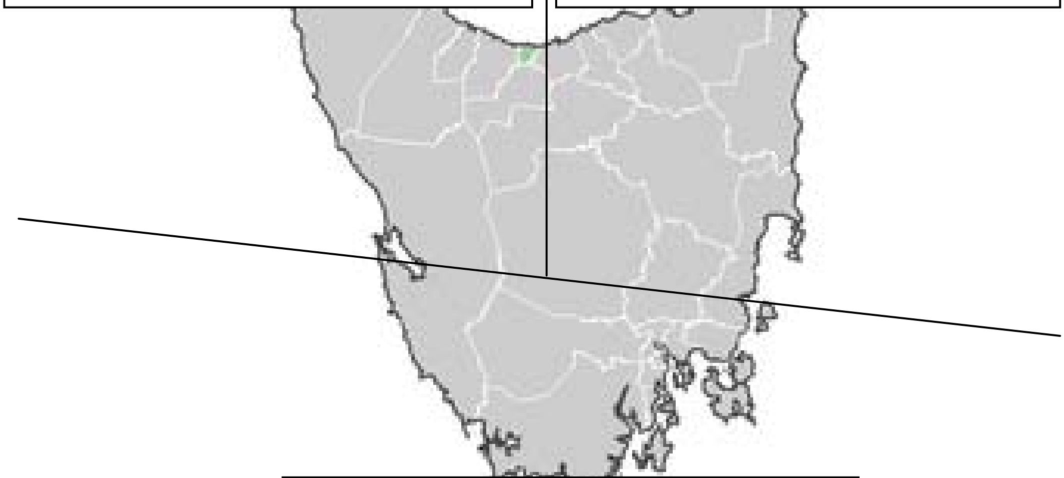
Due to difficulties faced by the Tasmanian Department of Human and Health Services, some people in the northwest of the state were not offered examinations, resulting in a low examination participation rate for the region (35.9%) compared to the northeast (54.4%) and south regions (43.2% - Figure 15). The northeast and south regions contain approximately three quarters of the Tasmanian population (ABS, 2001) so the low northwest examination participation rate did not have a large effect on the total Tasmanian examination participation (44.1%).

A greater proportion of people from the northwest responded to the back-up questionnaire than in the other two regions of Tasmania, with the result that the proportion of interviewed subjects who completed the telephone interview that completed either one or the other baseline self-complete questionnaire was greater in the northwest region (64.6%) than the other two regions (Northeast 56.9%, South 52.0%).

Tasmania	n	Participation
Interviewed	901	
Interviewed in scope	873	
Examined	385	44.1%
Baseline Questionnaires	490	56.1%
Follow-up Questionnaire	362	73.9%
Completed logbook or audit, or did not receive treatment	321	88.7%

Northwest Region	n	Particip.
Interviewed	234	
Interviewed in scope	206	
Examined	74	35.9%
Baseline Questionnaires	133	64.6%
Follow-up Questionnaire	94	70.7%
Completed logbook or audit, or did not receive treatment	82	87.2%

Northeast Region	n	Particip.
Interviewed	202	
Interviewed in scope	202	
Examined	110	54.4%
Baseline Questionnaires	115	56.9%
Follow-up Questionnaire	84	73.0%
Completed logbook or audit, or did not receive treatment	77	91.7%



South Region	n	Participation
Interviewed	465	
Interviewed in scope	465	
Examined	201	43.2%
Baseline Questionnaires	242	52.0%
Follow-up Questionnaire	182	75.2%
Completed logbook or audit or did not receive treatment	161	88.5%

Figure 15: Geographical presentation of the regional participation rates

Of the subjects who completed either of the baseline self-complete questionnaires, a similar proportion of people in all three regions completed the follow-up questionnaire. A similar result was obtained with the percentage of people who had completed the follow-up questionnaire and indicated the treatment they had received.

2. Non-participation bias

2.1 Comparison at different study stages with the Tasmanian population

At every stage of the survey, the proportion of subjects born in Australia was similar to that in the Tasmanian component of the 2006 Census (Table 8), as determined by the Census parameter being within the 95% confidence intervals of the sample.

Aboriginal or Torres Strait Islanders were under-represented at the follow-up questionnaires and treatment detail stages, but not in the initial three stages of the study.

The proportion of subjects who spoke a language other than English at home was under-represented in the interview and baseline self-complete questionnaires, and treatment details stages but representative of the Tasmanian population at the examination and follow-up questionnaire study stages.

Managers/Administrators were under-represented in the early three stages of the study but were representative of the Census at the follow-up questionnaires stage and beyond. Para-professionals were under-represented at all stages except at the clinical examination stage. The proportions of professionals, tradespeople, clerical workers and blue-collar operators or labourers were similar at all stages of the survey and were representative of the Tasmanian population.

Table 8: Characteristics of subjects at stages of the study compared to the Census

Characteristics of Subjects †	Telephone Interview n=901 % 95%CI	Clinical Examination n=385 % 95%CI	Baseline Questionnaires n=490 % 95%CI	Follow-up Questionnaire n=362 % 95%CI	Treatment details n=321 % 95%CI	2006 Census Tasmania‡ %
Born in Australia	87.9% 84.7,91.1	84.8% 80.6,89.1	87.4% 83.6,91.2	84.1% 79.2,88.9	85.1% 80.6,89.6	84.9%
Aboriginal or Torres Strait Islander	3.3% 1.3,5.3	2.4% 0.0,5.2	4.8% 0.00,10.2	0.3% 0.0,0.8	0.3% 0.0,0.9	3.5%
Language not English spoken at home	3.8% 2.0,5.6	5.0% 0.8,9.3	4.0% 1.4,6.6	5.3% 1.5,9.1	4.5% 1.2,7.7	8.0%
Occupation						
Manager/ Administration	8.7% 6.2,11.2	7.8% 3.7,12.0	9.3% 4.4,14.2	11.7% 5.3,18.2	12.2% 5.3,19.0	17.9%
Professional	19.8% 13.3,26.2	22.0% 13.4,30.6	18.9% 11.6,26.1	22.6% 13.0,32.3	20.6% 11.0,30.1	16.9%
Para-Professional	7.9% 4.9-10.8	7.0% 1.0-13.1	6.4% 3.0,9.8	5.7% 2.0,9.4	6.0% 2.0,10.1	11.8%
Tradesperson	15.2% 9.7,20.8	19.5% 8.4,30.5	13.0% 6.4,19.7.1	11.9% 4.8,19.2	12.7% 5.4,20.1	12.8%
Clerical	30.0% 23.0,36.9	26.6% 17.6-35.6	26.9% 18.7,35.1	26.0% 17.9,34.0	25.8% 17.1,34.6	30.8%
Blue-collar operator or labourer	18.4% 13.4,23.4	17.0% 11.3,22.7	25.5% 16.1,34.9	22.1% 13.7,30.3	22.6% 13.3,31.9	19.7%

† Weighted by sex, age and residential location for the appropriate stage to Australian Bureau of Statistics Census in 2006

‡ The 2006 census was held on 8th August 2006 and found 476,481 persons usually resident in Tasmania.

2.2 Sample demographics at different study stages

Sample demographics were investigated by comparing nine variables between the five stages of the study (Table 9). The nine demographic variables investigated were whether the subjects were employed, paying off or fully owned their dwelling, their income, eligibility for a health care card, usual reason and regularity of attendance at a dentist, whether the subjects had a lot of difficulty paying a $100 dental bill, avoided or delayed dental treatment due to cost and their level of education.

None of the variables investigated varied significantly at any of the five stages from the telephone interview to the treatment details stage.

Table 9: Characteristics of subjects at stages of the study

Characteristics of Subjects†	Telephone Interview n=901 % 95%CI	Clinical Examination n=385 % 95%CI	Baseline Questionnaires n=490 % 95%CI	Follow-up Questionnaire n=362 % 95%CI	Treatment details n=328 % 95%CI
Employed‡	63.8% 58.1,69.5	60.1% 51.5,68.6	63.7% 57.6,68.7	60.9% 54.3,67.5	61.4% 54.6,68.1
Paying off or fully own dwelling	85.7% 83.0,88.4	87.2% 81.6,92.8	90.0% 86.8,93.6	89.1% 84.8,89.4	89.5% 85.6,93.4
Income					
Less than $30,000	30.2% 25.4,34.9	30.1% 23.7,36.5	31.7% 26.9,36.9	32.4% 26.0,38.8	31.9% 24.1,38.9
$30,000-less than $60,000	33.4% 29.4,37.4	36.0% 23.7,36.5	30.6% 25.1,36.1	31.5% 25.5,37.4	32.4% 25.5,39.3
$60,000+	36.4 30.0,42.7	33.9% 25.7,42.1	37.7% 30.3,45.1	36.1% 28.6,43.5	35.7% 28.2,43.1
Eligibility for a health care card	32.8% 28.3,37.4	37.6% 30.2,44.9	35.1% 28.1,46.7	34.7% 28.8,40.7	33.2% 27.3,39.1
Usual reason for attendance was for a check-up	51.3% 45.7,56.9	50.9% 43.1,58.7	53.4% 50.0,60.9	56.5% 48.8,64.2	52.6% 44.9,60.2
Usually visits a dentist every 12 months or less	45.5% 40.5,50.5	42.3% 35.1,49.5	52.9% 44.8,61.1	52.9% 45.5,60.4	50.7% 42.8,58.5
Had a lot of difficulty paying $100 dental bill	24.6% 20.8,28.4	26.0% 19.8,32.2	26.3% 19.8,32.8	21.4% 15.9,26.9	21.6% 15.3,27.8
Avoided or delayed visiting a dentist due to cost	34.1% 29.8,38.4	41.3% 32.8,49.8	32.4% 26.0,38.8	34.2% 26.9,41.6	33.3% 26.4,40.2
Highest Qualification					
Degree/Teacher/Nursing	22.0% 15.0,29.1	24.0% 14.7,33.3	20.8% 13.6,28.0	22.5% 13.7,31.4	22.4% 13.0,31.8
Trade/Diploma/Certificate	31.5% 26.1,36.9	35.0% 27.4,42.5	30.9% 24.4,37.4	35.6% 27.5,43.6	34.4% 26.7-42.2
No Post Secondary Education	46.5% 40.4,52.5	41.4% 31.9,51.0	48.3% 40.4,56.1	41.9% 32.5,51.2	43.2 33.4,52.9

† Weighted by sex, age and residential location for the appropriate stage to Australian Bureau of Statistics Estimated Residential Population in Tasmania in 2005.

‡ The category "employed" excluded people who were retired, who nominated home duties as their occupation, students, and unemployed people whether they were looking for work or not.

2.3 Comparison of baseline oral health

Baseline scores for OHIP-14 severity and EQ-5D were compared between people who were retained for follow-up and people who were not (Table 10). Mean scores were higher for people who were lost to follow-up than for people retained in the cohort, although the differences were not statistically significant.

Table 10: Baseline oral health of people with and without follow-up details

	No follow-up		With follow-up	
Measure	n	Mean (95%CIs)	n	Mean (95%CIs)
Baseline OHIP-14 severity	301	7.69 (6.45,8.92)	175	6.88 (5.34,8.43)
Baseline EQ-5D	297	0.19 (0.17.0.21)	175	0.16 (0.13,0.19)

3. Descriptive statistics

3.1 Dependent variables

The prevalence of OHIP-14 impacts of the entire cohort at baseline was higher than at baseline or follow-up for the cohort who completed a follow-up questionnaire. However, within the sample that completed both the baseline and follow-up questionnaires, the frequency of OHIP-14 impacts at baseline and follow-up did not differ to a statistically significant degree, as judged by their overlapping 95% CIs (Table 11).

Table 11: Frequency of OHIP-14 impacts

OHIP-14 Summary Measure	**Baseline of all subjects n=476 % (95% CI)**	**Baseline of subjects who completed follow-up questionnaire n=358 % (95% CI)**	**Follow-up n=362 % (95% CI)**
Frequency of OHIP-14 impacts	19.64 (13.85,27.07)	13.0 (8.70,18.97)	12.26 (8.73,16.96)

The mean OHIP-14 extent of those who completed both the baseline and follow-up questionnaires was similar at baseline and follow-up (Table 12). The mean OHIP-14 severity 95% confidence intervals of those subjects who completed both the baseline and follow-up questionnaires overlapped. However, the mean baseline OHIP-14 extent and mean baseline OHIP-14 severity of all subjects who completed either of the baseline self-complete questionnaires was greater than the baseline OHIP-14 extent and baseline mean OHIP-14 severity of the subjects who completed the follow-up questionnaire n=360, and of the follow-up mean OHIP-14 severity, though in all these cases the 95% confidence intervals overlapped.

Table 12: OHIP-14 extent and severity

OHIP-14 summary measures	Extent mean (95% CI)	Severity mean (95% CI)
Baseline of all subjects n=490	0.54 (0.34,0.74)	7.44 (6.41,8.48)
Baseline of subjects who completed the follow-up questionnaire n=360	0.36 (0.20,0.53)	6.96 (5.34-8.08)
Follow-up n=360	0.36 (0.19,0.53)	6.40 (5.35-7.45)

For the vast majority of respondents who completed both baseline and follow-up OHIP questionnaires, the OHIP-14 extent did not change, but a higher percentage of people showed an improvement rather than a worsening in extent (Table 13). However with OHIP-14 severity, only 17% of the respondents had the same measure at both baseline and follow-up, and there was again a higher percentage of people with an improvement than a worsening.

Table 13: Change in OHIP-14 Extent and severity

Change	Better n	Better % (95% CI)	Same n	Same % (95% CI)	Worse n	Worse % (95% CI)	*p*
Extent	36	9.0 (5.2,12.8)	290	83.3 (78.5,88.0)	32	7.8 (5.0,10.6)	<0.01
Severity	177	47.7 (41.8,53.6)	52	17.0 (11.4,22.6)	129	35.3 (28.1,42.5)	<0.01

The frequency distribution of change in OHIP severity over the year of this study was approximately bell shaped although highly leptokurtic (sharp peak) while the change in OHIP extent was not so bell-shaped (negatively skewed) (Figure 16). Both frequency distributions exhibited a high degree of kurtosis. As the baseline OHIP-14 severity was subtracted from follow-up OHIP-14 severity, the mean net negative change score for OHIP-14 severity shown in Figure 16 is consistent with an overall improvement in heath-related quality of life.

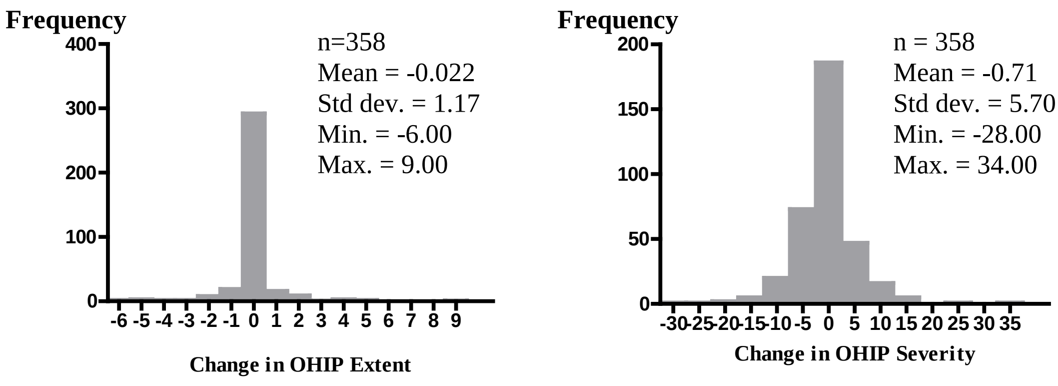


Figure 16: Change in OHIP extent and severity frequency statements

The 95% confidence intervals of the proportion percentage of respondents who answered “often” or “very often” at baseline and follow-up for those subjects who completed both questionnaires overlapped for all 14 of the OHIP-14 items. The OHIP-14 items that had the largest percentage of respondents answering “often” or “very often” to problems with their teeth, mouth or dentures were being self-conscious and uncomfortable to eat any foods at both baseline and follow-up (Table 14). Feeling embarrassed due to their teeth, mouth or dentures was also high at baseline. The least prevalent impacts were with being unable to function and difficulty doing usual jobs.

Table 14: OHIP-14 items

OHIP-14 Items “Often” or “Very often”	**Baseline of all subjects n=476 % (95% CI)**	**Baseline of subjects who completed follow-up questionnaire n=362 % (95% CI)**	**Follow-up n=362 % (95% CI)**
Pronouncing words	1.7 (0.6,2.9)	1.8 (0.4,3.1)	1.3 (0.1,2.5)
Sense of taste	1.7 (0.5,2.8)	1.0 (0.1,2.0)	2.2 (0.5,3.9)
Painful aching	3.4 (1.3,5.5)	1.8 (0.3,3.3)	2.4 (0.9,4.0)
Uncomfortable to eat foods	7.1 (4.2,9.9)	5.3 (2.9,7.3)	5.2 (2.9,7.5)
Self conscious	13.9 (7.6,20.2)	8.3 (3.9,12.7)	6.7 (3.9,9.8)
Felt tense	5.6 (1.9,9.4)	3.5 (0.5,6.6)	4.7 (1.6,7.8)
Diet been unsatisfactory	1.3 (0.2,2.4)	0.8 (0.1,1.6)	1.2 (0.0,2.4)
Interrupt meals	1.9 (0.2,2.4)	1.1 (0.1,2.0)	1.1 (0.0,2.1)
Difficult to relax	2.3 (0.8,3.9)	1.6 (0.3,2.8)	2.3 (0.3,4.2)
Embarrassed	8.6 (3.9,13.4)	6.2 (2.5,9.9)	4.4 (1.2,7.5)
Irritable with other people	1.3 (0.2,2.3)	1.4 (0.2,2.6)	1.2 (0.0,2.5)
Difficulty doing usual jobs	0.6 (0.0,1.5)	0.4 (0.0,1.2)	0.6 (0.0,1.5)
Life less satisfying	4.5 (0.5,8.6)	2.8 (0.9,4.7)	2.8 (0.8,4.8)
Unable to function	0.0 (0.0,0.2)	0.1 (0.0,0.2)	0.3 (0.0,0.7)

The dimensions of OHIP-14 with the greatest influence on oral HRQoL and greatest prevalence at both baseline and follow-up were psychological discomfort, psychological disability and physical pain (Table 15). For all seven dimensions of OHIP-14, the 95% confidence intervals overlapped between baseline and follow-up.

Table 15: OHIP-14 dimensions

OHIP-14 Dimensions "Often" or "Very often"	Baseline of all subjects n=476 % (95% CI)	Baseline of subjects who completed follow-up questionnaire n=362 % (95% CI)	Follow-up n=362 % (95% CI)
Functional limitation	2.6 (1.3,4.0)	2.2 (0.8,3.6)	1.5 (0.4,2.6)
Physical pain	7.5 (4.4,10.5)	5.5 (3.0,8.1)	4.3 (2.5,6.1)
Psychological discomfort	14.3 (8.1-20.5)	9.0 (4.5,13.5)	5.4 (2.8-7.9)
Physical disability	2.0 (0.7,3.2)	1.5 (0.3,2.8)	1.1 (0.01,2.0)
Psychological disability	9.5 (4.7,14.3)	7.0 (3.4,10.6)	3.7 (1.4,6.0)
Social disability	1.3 (0.3,2.3)	1.4 (0.2,2.6)	0.1 (0.0,1.6)
Handicap	4.5 (0.5,8.5)	2.8 (0.9,4.7)	1.9 (0.6,3.2)

For all seven OHIP-14 dimensions, a substantial majority did not differ between the baseline and follow-up stages of the study (Table 16). The dimension most commonly reported at both baseline and follow-up was psychological discomfort, followed by the dimensions of psychological disability and physical pain.

Table 16: Change in OHIP-14 dimensions

OHIP-14 Dimensions "Often" or "Very often"	Better % (95% CI)	Same % (95% CI)	Worse % (95% CI)
Functional limitation	1.9 (0.8-3.1)	97.2 (95.6-98.8)	0.8 (0.2-1.6)
Physical pain	5.3 (2.8-7.9)	92.5 (89.6-95.3)	2.1 (1.0-3.3)
Psychological discomfort	11.1 (5.2-17.1)	86.7 (80.7-92.6)	2.2 (0.7-3.7)
Physical discomfort	1.5 (0.4-2.6)	97.9 (96.7-99.2)	0.6 (0.0-1.3)
Psychological disability	8.0 (3.3-12.8)	89.7 (84.8-94.7)	2.2 (0.5-4.0)
Social disability	0.6 (0.0-1.4)	99.3 (98.4-100.)	0.1 (0.0-0.3)
Handicap	3.3 (0.0-6.7)	95.9 (92.4-99.3)	0.8 (0.0-1.6)

3.1.2 EuroQol

Although the EuroQol summary measure, the mean EQ-5D, reduced over the year, this reduction was not statistically significant (Table 17). The baseline mean EQ-5D for n=490 that included subjects who did not answer the follow-up questionnaire did not differ much from baseline for n=362 who did answer the follow-up questionnaire. This was a result that differed from that with OHIP-14 severity. The reduction is interpretable as a small improvement in HRQoL.

The EQ-5D of over half of the respondents remained the same, and a slightly greater percentage of people had an improvement than a worsening of their EQ-5D, though the confidence intervals overlapped. If a subject had a decrease in their EQ-5D over the one year of this study, it was defined that they had a better HRQoL. An increase in EQ-5D indicated a worse HRQoL, while zero meant the subject's quality of life stayed the same.

Table 17: EuroQol summary measure

EQ-5D	mean (95% CI)
Baseline of all subjects n=490	0.18 (0.16-0.20)
Baseline of subjects who completed follow-up questionnaire n=362	0.19 (0.17-0.20)
Follow-up n=362	0.17 (0.15-0.18)

Change in EQ-5D	% (95% CI)
Better	26.2 (20.4-32.1)
Same	56.6 (48.9-64.4)
Worse	17.1 (11.9-22.3)

An answer of greater than '1' in the six questions in EuroQol indicates that the subject had problems in that dimension. The EuroQol dimensions with the greatest proportion of survey participants, who had problems both at baseline and follow-up, were pain/discomfort and anxiety/depression (Table 18). Self care was the problem faced by the least proportion of participants at both the baseline and follow-up stages of the study. Other than with cognition, the dimensions showed a reduction between baseline and follow-up, but the 95% confidence intervals overlapped.

Table 18: EuroQol dimensions

EuroQol Dimensions (Response > '1')	Baseline of all subjects n=490 % (95% CI)	Baseline of subjects who completed follow-up questionnaire n=362 % (95% CI)	Follow-up n=362 % (95% CI)
Mobility	12.7 (9.1-16.3)	14.1 (10.0-18.1)	8.8 (5.9-11.7)
Self-care	1.2 (0.3- 2.1)	1.0 (0.10-2.0)	0.7 (0.0-1.3)
Usual activities	11.8 (7.7-16.0)	10.7 (7.9-13.6)	9.4 (7.6-11.2)
Pain/discomfort	39.6 (33.5-45.6)	43.4 (37.6-49.5)	33.8 (28.2-39.3)
Anxiety/depression	26.5 (19.2-33.9)	26.5 (18.5-34.4)	22.5 (16.9-28.1)
Cognition	13.1 (9.3-16.8)	14.4 (9.6-19.2)	15.6 (10.5-20.7)

Three-quarters or more of the respondents did not record a change in any of the six EuroQol dimensions over the one-year study period (Table 19). In all the EuroQol dimensions there were a greater proportion of subjects where the dimension had improved rather than worsened.

The pain/ discomfort dimension of EQ-5D were the highest at both baseline (39.6 and 43.4) and follow-up (33.8), followed by the dimension of anxiety/depression.

Table 19: Change in EuroQol dimensions

EuroQol Dimensions (Response > '1')	Better % (95% CI)	Same % (95% CI)	Worse % (95% CI)
Mobility	8.6% (3.6-13.6)	88.6% (83.4-93.7)	2.9% (0.7-5.00)
Self-care	0.5% (0.0-1.0)	99.4% (98.8-100.)	0.1% (0.0-0.3)
Usual activities	5.1% (2.7-7.4)	90.6% (87.7-93.5)	4.3% (2.3-6.4)
Pain/discomfort	17.4% (11.8-22.9)	75.0% (67.7-82.3)	7.6% (3.6-11.6)
Anxiety/depression	12.0% (6.1-17.8)	81.5% (73.7-89.3)	6.5% (1.8-11.2)
Cognition	6.9% (3.6-10.2)	87.7% (83.3-92.1)	5.4% (2.9-7.9)

The frequency distribution of change in EQ-5D over the year of this study was not as bell-shaped as the frequency distribution of change in OHIP severity, or either of the global health transition statements. It also exhibited a high degree of kurtosis (Figure 17).

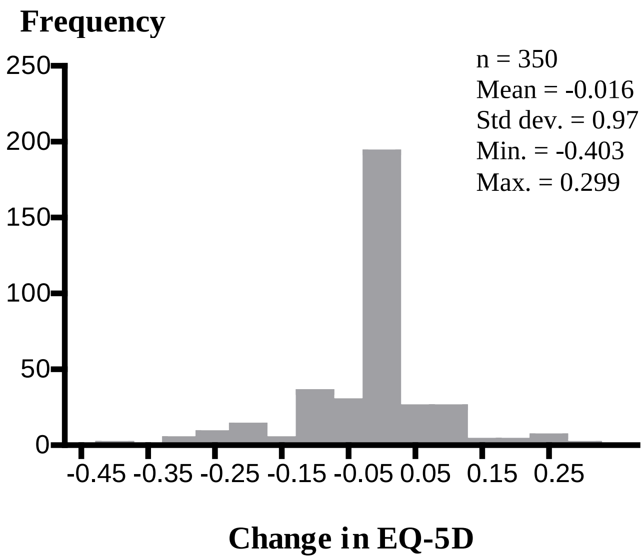


Figure 17: Change in EQ-5D frequency distribution

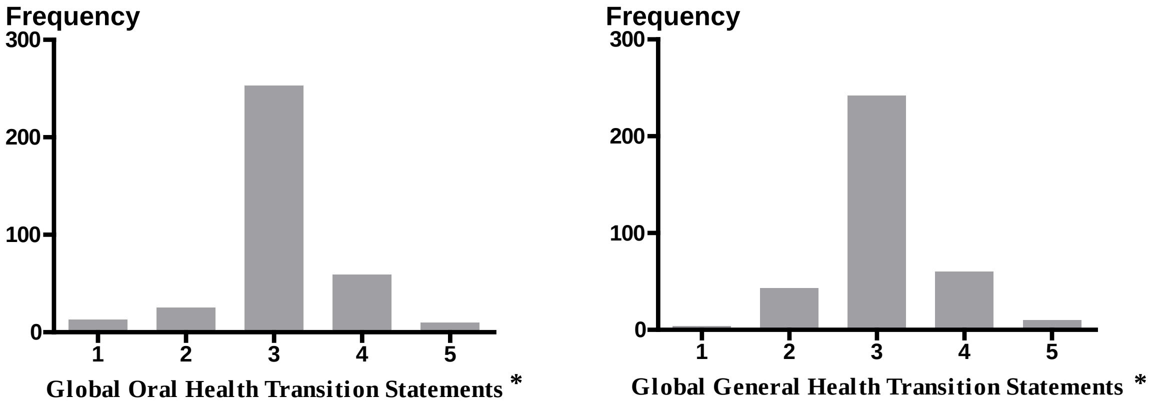
3.1.3 Global transition statements

The majority of people reported that the oral and general health transition statements that their health had stayed the same over the 12 month follow-up period (Table 20).

Table 20: Global transition statements of people who were followed up (n=360)

Global transition statements	Follow-up n	%	(95% CI)	Change in health	Follow-up n	%	(95% CI)
Oral Health							
Improved a lot	13	5.7	(1.4,10.1)	Better	38	12.4	(5.8,16.9)
Improved a little	25	6.6	(3.3,10.1)				
Stayed the same	253	68.7	(60.7,76.7)	Same	253	68.7	(60.7,76.7)
Worsened a little	59	15.2	(9.6,20.7)				
Worsened a lot	10	3.8	(0.0,8.2)	Worse	69	18.9	(12.0,25.9)
General Health							
Improved a lot	4	0.4	(0.0,0.8)	Better	47	15.1	(9.5,20.7)
Improved a little	43	14.7	(9.0,20.4)				
Stayed the same	242	67.0	(58.8,75.1)	Same	242	67.0	(58.8,75.1)
Worsened a little	60	15.8	(10.2,21.4)				
Worsened a lot	10	2.1	(0.5,3.7)	Worse	70	17.9	(11.8,24.1)

The frequency distributions of the global transition statements, whether for oral health or general health, were approximately bell-shaped, and both exhibited a high degree of kurtosis (Figure 18).



"1" = Improved a lot, "2"= improved a little, "3" = stayed the same, "4" = Worsened a little, "5" = Worsened a lot

Figure 18: Frequency of global transition statements

3.1.4 Follow-up OHIP-14 severity

The minimum value for follow-up OHIP-14 severity was zero and the maximum was 54 and the distribution was highly positively skewed (Figure 19).

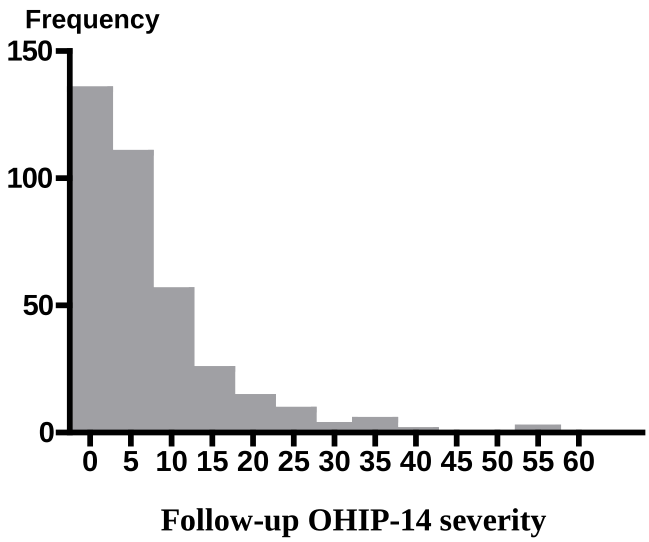


Figure 19: Frequency distribution of follow-up OHIP-14 severity scores

3.1.5 Relationship between change in OHIP-14 severity and global oral health

There was a “U” shape pattern in the relationship between global oral health transition and mean change in OHIP-14 severity (Figure 20).

Change in mean OHIP-14 severity

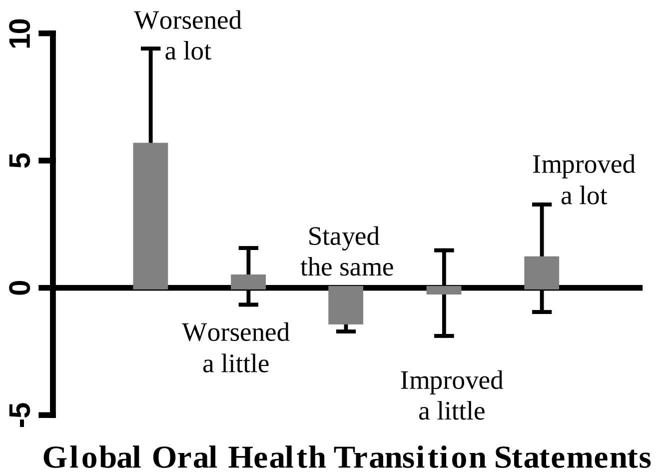


Figure 20: Relationship of change in mean OHIP-14 severity with 95% CIs and global oral health transition statements

3.1.6 Relationship between change in EQ-5D and global general health

The mean change in EQ-5D was lesser in amount compared to change in OHIP-14 severity, and other than in the case of the general health statement “improving a little”, showed decrease in EQ-5D (Figure 21). The small negative EQ-5D change score is interpretable as a small improvement in heath-related quality of life. The results trended towards an “inverted U” shape.

Change in mean EQ-5D with 95% confidence intervals

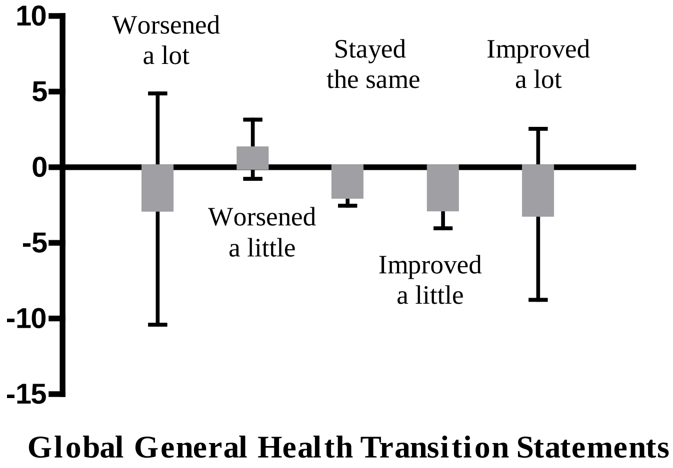


Figure 21: Relationship of mean change in EQ-5Dx100 with 95% CIs and global general health transition statements

3.2 Main explanatory variables

Of the survey participants for whom treatment details were known, just over half (54.8%) visited a dentist. Of the 176 survey participants who received dental care, a mean of more than six services was received, with a total mean cost of over $600 and a mean maximum responsibility loading of 1.38 (Table 21).

Table 21: Dental services received by n=176 people who received dental care

Dental service	mean	(95% CI)
Total Volume	6.18	(5.28-7.08)
Maximum responsibility loading	1.38	(1.33-1.42)
Total Cost	$667.21	($522.48-$811.94)

The volume and cost distributions showed that most participants who visited a dentist received a low volume and cost of dental services. The dental service complexity frequency distributions were not bell-shaped, and were dominated by three levels of maximum responsibility loading (Figure 22).

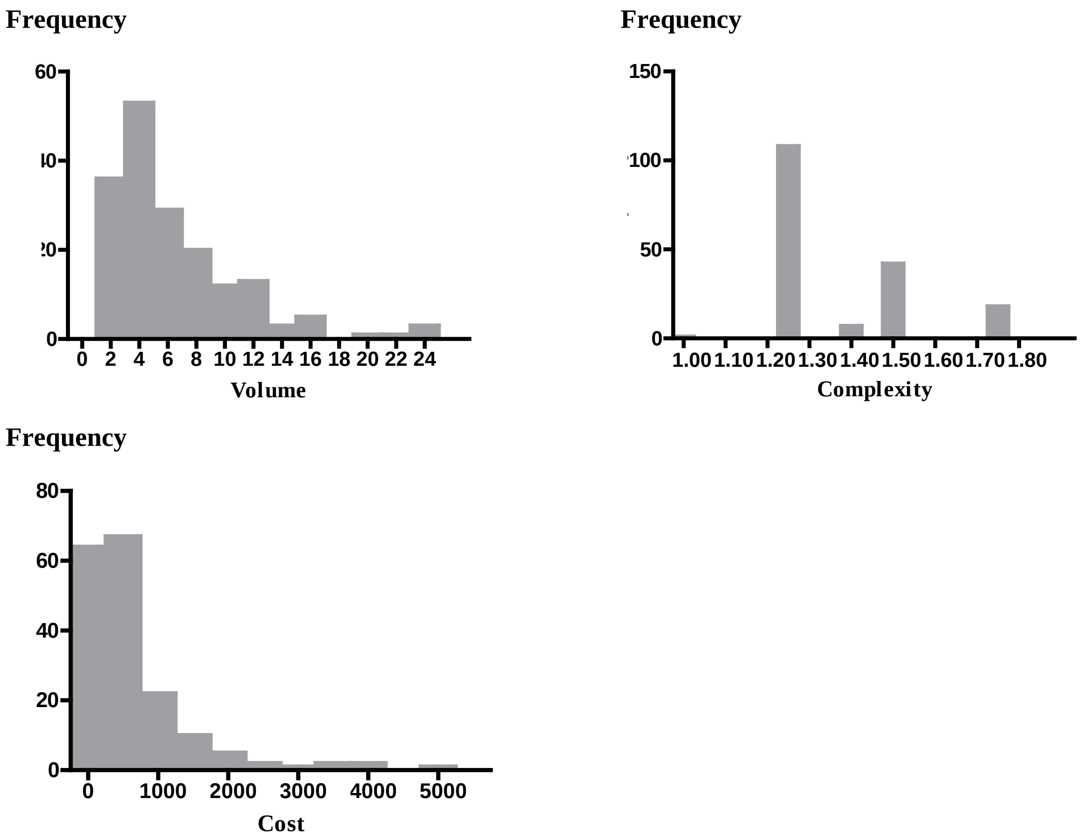


Figure 22: Frequency distributions for volume, complexity and total cost of dental services of n=176 people who received dental care

3.3 Main covariables

3.3.1 Baseline health-related quality of life

Of those subjects who completed the follow-up questionnaire, the mean baseline severity was 13.0 (95%CIs: 8.70-18.97) and the mean EQ-5D was 0.19 (0.17-0.20).

Both the oral and general HRQoL measures at baseline were skewed towards the lower end of the spectrum indicating that most people had a good oral and general HRQoL (Figure 23).

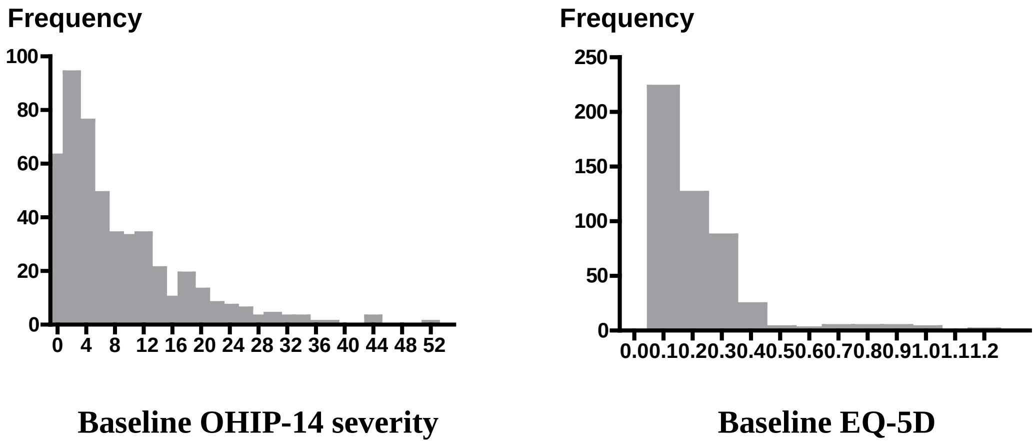


Figure 23: Frequency distributions for baseline OHIP-14 severity and baseline EQ-5D for those people who completed the baseline self-complete questionnaires

3.3.2 Treatment need

Over three-quarters of the subjects felt they needed some dental treatment, and just under half felt they required a treatment need other than a check-up or a scale and clean (Table 22). The dental treatment needs cited most frequently were check-ups, scale and clean, followed by restorations and extractions.

Table 22: Treatment need

Treatment need	Interviewed dentate subjects n=901 % (95% CI)	Subjects who completed follow-up questionnaire n=362 % (95% CI)
Extractions	11.1 (7.6-14.7)	9.3 (4.0-14.5)
Fillings	29.7 (25.8-33.6)	28.7 (22.6-34.7)
Scale and clean	57.2 (53.4-61.0)	55.3 (47.7-62.9)
Dentures	6.4 (3.5-9.2)	8.2 (3.6-12.9)
Dental check-up	63.2 (60.1-66.3)	61.1 (55.2-67.0)
Gum treatment	7.6 (5.1-10.1)	7.8 (4.4-11.1)
Dental crown or bridge	5.9 (4.2-7.6)	6.0 (3.5-8.4)
Any other treatment	5.6 (3.5-7.6)	4.5 (1.7-7.3)
Any treatment need	77.8 (73.8-83.1)	75.3 (68.4-82.2)
Any treatment need except check-up or scale/clean	43.7 (39.1-48.3)	42.4 (35.1-49.7)

3.4 Potential confounders and effect modifiers

3.4.1 Oral clinical disease/disorders

Most people examined had calculus present in their mouths and almost all of them had at least one tooth that was decayed, restored or missing (Table 23). Nearly a quarter of the people had dental caries, or a periodontal pocket of four millimeters or more, on at least one tooth, and over half were missing at least one tooth. Cervical wear on tooth buccal root surfaces was uncommon.

Table 23: Level of oral clinical disease or disorders

Oral clinical disease or disorders	Subjects[†] who experienced the problem with at least one tooth % (95% CI)	Subjects[†] n=385 mean (95% CI)
Decayed teeth	22.4 (16.7-28.1)	0.38 (0.21-0.55)
Decayed root surface	6.8 (4.2-9.4)	0.12 (0.08-0.16)
Missing teeth	59.5 (52.7-66.4)	5.57 (4.57-6.58)
Periodontal pocket depth 4+ mm	22.3 (15.3-29.3)	0.89 (0.35-1.43)
Clinical attachment loss 4+ mm	45.2 (37.9-52.5)	3.53 (2.70-4.36)
Buccal root surfaces with cervical wear	1.1 (0.7-2.1)	0.35 (-0.03-0.10)
Calculus (from 6 teeth)	70.6 (63.2-78.0)	1.07 (0.93-1.21)
No. of DMF teeth	93.0 (87.9-98.0)	14.2 (12.9-15.5)

[†] n=385 Subjects who had a NSAOH Examination

Over a third of the examined subjects (37.4%) had one or more dental diseases as defined by having dental caries, either on the coronal or root surfaces of the teeth, or a periodontal pocket depth of 4mm or more.

3.4.2 Survey participant factors

The data in Table 24 were weighted for age, sex and residential location and so reflect that in the Tasmanian population. Over half the survey participants were 45 years of age or older (55.1%), there was an even split of the sexes, and under half the respondents lived in Hobart (43.8%). More than three-quarters of the people were born in Australia.

The highest categories of education (degree, teacher, nurse) and income ($60,000+) contained the lowest proportion of survey participants, but less than a quarter of respondents reported a blue collar or labourer occupation. Just over half the respondents were employed, visited a dentist every 12 months or less, and usually visited a dentist for a check-up.

Over three-quarters of respondents had no or only a little difficulty in paying a $100 dental bill, over 40% were eligible for a health care card, and just over a third had avoided or delayed dental treatment due to cost.

Table 24: Socio-demographic factors at follow-up (n=362)

Participant Factor		**%**	**95%CIs†**
Socio-demographic factors			
Age	15 - <45 yrs	45.0	37.8,52.1
	45 - <60 yrs	32.4	26.9,37.8
	60+ yrs	22.7	18.9,26.4
Sex	Male	50.8	44.6,57.0
Country of Birth	Australia	84.1	79.2,88.9
Residential location	Hobart	43.8	36.9,50.7
Socioeconomic factors			
Level of education	Deg./Teach/Nurse	22.5	13.7,31.4
	Trade/Dip./Cert.	35.6	27.5,43.6
	No Post Sec. Edu.	41.9	32.5,51.2
Household income	Less than $30,000	32.4	26.0,38.8
	$30-< $60,000	31.5	25.5,37.4
	$60,000+	36.1	28.6,43.4
Occupation	Manage/Prof/Para.	40.1	29.7,50.4
	Trades/Clerical	37.9	28.6,47.2
	Blue Col./Lab.	22.0	13.7,30.3
Employment status	Employed	60.9	54.3,67.5
Pattern of attendance			
Regularity	≤12 months	52.9	45.5,60.2
Usual reason	Check-up	56.5	48.8,64.2
Access to dental care			
Health care card	Yes	34.7	28.8,40.7
Diff. pay $100 dental bill	None – a little	78.6	73.1,84.1
Avoided due to cost	Yes	34.2	26.9,41.6

† Weighted by age, sex and residential location

3.5 Other Variables

3.5.1 Type of dental services received by those who visited a dentist during the follow-up period

Among the 176 people who made one or more dental visits during the 12 month follow-up period, the most common types of dental care were diagnostic, preventive and restorative services (Table 25). Periodontic, endodontic, prosthodontic, orthodontic or general/miscellaneous services were received by less than 10% of those survey participants who received dental care. When diagnostic and preventive services were excluded, over a third of the subjects received dental care.

Table 25: Type of dental services received

ADA codes	Type of dental services received, n=176	Subjects† %	95% CI
Items 011-099	Diagnostic	86.1	(80.0-92.3)
Items 111-199	Preventive	71.1	(60.1-82.1)
Items 211-299	Periodontic	4.5	(0.6-8.4)
Items 311-399	Oral surgery	10.8	(5.5-16.1)
Items 411-499	Endodontic	6.4	(2.3-10.5)
Items 511-599	Restorative	58.5	(47.3-69.6)
Items 611-699	Crown and bridge	10.0	(3.5-16.5)
Items 711-799	Prosthodontic	3.0	(0.3-5.7)
Items 811-899	Orthodontic	2.5	(0.0-5.5)
Items 911-979, 981-999	General/miscellaneous	9.2	(2.2-16.2)
	Any service except diagnostic or preventive services	38.3	(27.3-49.4)

† Subjects who had received dental care

3.5.2 Type of dental practitioner

Of the people who visited a dentist, the vast majority (94.9%) went to a private sector dental practice and only just over five percent (5.1%) went to a public sector clinic. Of those who held a health care card, and hence eligible for public sector dental care, some 88.7% of the survey participants visited a private sector dentist. Over three-quarters of the visits (76.1%) were to male practitioners.

Of 511 visits to dental practitioners, the vast majority were to dentists (94.9%). Eleven visits were to dental specialists, 11 to dental hygienists and 4 to dental prosthetists. There were not any visits to dental therapists, reflecting the fact that dental therapists registered in Tasmania have an age restriction on the patients they are allowed to treat.

4. Analyses of association

Bivariate analysis was undertaken to estimate crude effects of dental care on quality of life and to find potential confounders. This was followed by stratified analysis to test within stratum significance and significant interaction effects. Finally, two-stage multivariate modelling was undertaken to learn more about the relationship between the independent variables and the dependent variable. The first stage was to model the influence of visiting a dentist or not on the five measures of HRQoL. The second was to model the influence of volume, complexity and cost of dental care on HRQoL of those people who visited a dentist.

4.1 Bivariate analyses

4.1.1 Main variables and outcomes

4.1.1.1 Main variables and change in mean OHIP-14 severity

There was no statistically significant association between change in mean OHIP-14 severity with visiting a dentist or not (Table 26). Nor was there a significant association between change in mean OHIP-14 severity and the volume, complexity and cost for dental service of those subjects who visited a dentist. In all cases, no matter which main explanatory variable was used, the 95% confidence intervals always included zero signifying that a statistically significant change in mean OHIP-14 severity did not occur. There were 42 subjects with follow-up OHIP whose visit status was not known and these were excluded from this and following results.

Table 26: Relationship between visiting a dentist, volume, complexity and cost of dental services and change in mean OHIP-14 severity

Main Variable:	**Outcome: Change in mean OHIP-14 severity**			
Dental Service	**n**	**Mean**	**95%CIs**	***p***
Visited				
Yes	175	-0.73	-1.61,0.15	0.14
No	143	-0.69	-1.44,0.05	
Of those who visited				
Volume				
Low (1-6 items)	103	-0.88	-2.09,0.33	0.05
High (7+ items)	58	-0.13	-1.52,1.26	
Complexity				
Low (1-1.25)	108	-0.83	-1.78,0.11	0.23
High (>1.25)	67	-0.59	-2.11,0.93	
Cost				
Low ($1-$499)	110	-1.32	-2.32,0.33	0.26
High ($500+)	65	0.06	-1.14,1.26	

4.1.1.2 Main variables and change in EQ-5D

A similar result to change in mean OHIP-14 severity was found with the relationship of the main variables and change in EQ-5D, with the exception that of those subjects who visited a dentist, the total cost for dental services was associated with change in EQ-5D in such a fashion that dental services of a higher cost were associated with a greater decrease, and hence improvement in HRQoL, than dental services of a lower cost (Table 27).

Table 27: Relationship between visiting a dentist, volume, complexity and cost of dental services and change in EQ-5Dx100

Main Variable:	**Outcome: Change in EQ-5Dx100**			
Dental Service	**n**	**Mean**	**95%CIs**	***p***
Visited				
Yes	173	-1.8	-3.8,0.1	0.50
No	138	1.8	-4.1,0.4	
Of those who visited				
Volume				
Low (1-6 items)	103	-1.0	-3.8,1.9	0.27
High (7+ items)	57	-3.2	-5.6,0.9	
Complexity				
Low (1-1.25)	107	-1.0	-3.4,1.5	0.23
High (>1.25)	66	-3.0	-5.7,-0.3	
Cost				
Low ($1-$499)	109	-1.0	-3.5,1.5	0.01
High ($500+)	64	-3.0	-5.5,-0.4	

4.1.1.3 Main variables and oral health global transition statements

There was a statistically significant association with whether a survey participant visited a dentist or not, and the oral health global transition statement, but not with the volume, complexity or cost of dental treatment received (Table 28). Those who visited a dentist over the 12 months of this study had indicated a mean improvement in their oral health while those who did not visit a dentist indicated a mean worsening in their oral health.

Table 28: Relationship between visiting a dentist, volume, complexity and cost of dental services and oral health transition statementsx10

Main Variable:	**Outcome: (Global Oral Health) x 10**			
Dental Service	**n**	**Mean**	**95%CIs**	***p***
Visited				
Yes	176	-0.79	-2.76, 1.17	0.02
No	144	2.44	0.41,4.47	
Of those who visited				
Volume				
Low (1-6 items)	104	-0.34	-2.86,2.18	0.11
High (7+ items)	58	-1.84	-5.40,1.72	
Complexity				
Low (1-1.25)	109	-1.24	-3.56,1.09	0.62
High (>1.25)	67	-0.18	-3.09,2.73	
Cost				
Low ($1-$499)	110	1.06	-0.23,2.35	0.13
High ($500+)	66	-3.22	-7.47,1.01	

4.1.1.4 Main variables and general health global transition statements

There was also a statistically significant association between whether a survey participant visited a dentist or not and the general health global transition statement, but unlike global oral health, there was an association between the general health global transition statement and both the volume and cost of dental care received. There was a larger improvement in general HRQoL for high volume compared to low volume, and with high cost compared to low cost dental care (Table 29). Complexity of care was not significantly associated with global change in general health.

Table 29: Relationship between visiting a dentist, volume, complexity and cost of dental services and general health transition statementsx10

Main Variable:	**Outcome: (Global General Health)x10**			
Dental Service	**n**	**Mean**	**95%CIs**	***p***
Visited				
Yes	176	0.07	-0,86,1.01	<0.01
No	144	1.40	0.22,2.58	
Of those who visited				
Volume				
Low (1-6 items)	104	0.70	-0.45,1.86	<0.01
High (7+ items)	58	-1.17	-2.93,0.60	
Complexity				
Low (1-1.25)	109	0.39	-0.88,1.66	0.84
High (>1.25)	67	-0.37	-1.88,1.14	
Cost				
Low ($1-$499)	110	0.99	-0.35,2.33	0.03
High ($500+)	66	-1.13	-2.74,0.49	

4.1.1.5 Main variables and follow-up OHIP-14 severity

Neither visiting a dentist nor the three measures of dental service utilisation were associated with the follow-up OHIP-14 severity (Table 30).

Table 30: Relationship between visiting a dentist, volume, complexity and cost of dental services and follow-up OHIP-14 severity

Main Variable:	Outcome: Follow-up Severity			
Dental Service	**n**	**Mean**	**95%CIs**	***p***
Visited				
Yes	176	6.12	469,7.54	0.75
No	144	5.72	4.25,7.18	
Of those who visited				
Volume				
Low (1-6 items)	104	5.73	4.03,7.43	0.38
High (7+ items)	58	6.22	3.65,8.75	
Complexity				
Low (1-1.25)	109	5.30	3.63,6.98	0.22
High (>1.25)	67	7.24	5.25,9.23	
Cost				
Low ($1-$499)	110	5.94	4.21,7.66	0.62
High ($500+)	66	6.35	4.42,8.27	

4.1.2 Main explanatory variables and main covariables

During the 12-month follow-up period, one half (52.6%) of all adult Tasmanians made a dental visit, and approximately 40% of those who made a visit were classified as having high volume, complexity or cost of care (Table 31). However, these percentages receiving different levels of care did not differ to a statistically significant degree between people classified according to baseline OHIP-14 severity score or perceived treatment need.

Table 31: Relationship between visiting a dentist, volume, complexity and cost of dental services and main covariables

			Among those who visited a dentist					
	Visiting		Volume		Complexity		Cost	
Other explanatory variables	Visited a dentist % 95%CIs	*p*	High 7+ items % 95%CIs	*p*	High >1.25 % 95%CIs	*p*	High $500+ % 95%CIs	*p*
All people	52.6 43.3,61.9	0.57	37.0 26.2,47.9	0.02	41.8 29.4,52.4	0.19	43.3 32.2,54.3	0.22
n	176		58		67		66	
Baseline OHIP-14								
Low (0-<5)	48.9 37.1,60.8	0.33	35.6 19.6,51.6	0.82	37.5 23.1,51.9	0.37	45.8 30.9,60.7	0.62
n	87		30		30		36	
High (5+)	56.8 44.4,69.2		38.5 24.5,52.4		46.1 29.7,62.5		40.8 27.6,54.0	
n	89		28		37		30	
Treatment need								
Yes	46.9 32.0,61.9	0.26	34.6 12.1,57.1	0.78	57.9 41.8,73.9	0.01	46.7 26,67.3	0.68
n	63		21		32		28	
No need	56.3 46.0,66.6		38.4 25.1,51.7		33.0 18.6,47.5		41.4 27.0,55.9	
n	113		37		35		38	

4.1.3 Main explanatory variables and potential confounders/ effect modifiers

There were not any statistically significant associations between oral disease with either visiting, or volume, complexity or volume of dental care of those subjects who did visit a dentist (Table 32). Although not shown in Table 32, there was a significantly statistical association between baseline OHIP-14 severity and treatment need. People who reported having a treatment need recorded a higher baseline OHIP-14 severity than people without a treatment need. Individual treatment needs that were significantly associated with baseline OHIP-14 severity and in the same direction, were the needs for an extraction, a filling, a denture, a dental check-up, or a dental crown or bridge. Although they did not show a significant association there was a trend for baseline OHIP-14 severity scores to be associated with need for a scale/clean, gum treatment, or any other treatment.

Table 32: Relationship between visiting a dentist, volume, complexity and cost of dental services and oral disease

			Among those who visited a dentist					
	Visiting		**Volume**		**Complexity**		**Cost**	
Other explanatory variables	Visited a dentist % 95%CIs	*p*	High 7+ items % 95%CIs	*p*	High >1.25 % 95%CIs	*p*	High $500+ % 95%CIs	*p*
Oral disease								
Yes	53.3	0.93	36.3	0.93	46.6	0.56	45.9	0.77
	36.7,69.9		15.7,56.8		27.8,65.4		27.9,63.8	
n	44		15		20		17	
No disease	52.3		37.3		40.1		42.4	
	41.0,63.7		24.5,50.2		25.2,54.9		27.6,57.2	
n	132		43		47		49	

Sex, age and country of birth were not associated with dental attendance (Table 33). However, people who lived in Hobart were more likely to have visited a dentist than those living outside of Hobart. There was a significant statistical association between sex and volume and cost for dental care. Males were more likely to have dental treatment of a higher volume and cost than females.

Table 33: Relationship between visiting a dentist, the volume, complexity and cost of dental services and sociodemographic factors

			Among those who visited a dentist					
	Visiting		**Volume**		**Complexity**		**Cost**	
Socio-Demographic Factors	Visited a dentist % 95%CIs	*p*	High 7+ items % 95%CIs	*p*	High >1.25 % 95%CIs	*p*	High \$500+ % 95%CIs	*p*
Sex								
Male	55.8	0.23	48.7	0.01	47.6	0.19	55.7	0.01
	44.8,66.7		31.6,65.9		31.0,64.2		39.6,71.8	
n	66		29		29		33	
Female	49.5		24.3		35.4		29.8	
	39.6,59.4		14.9,33.7		20.9,49.9		17.6,41.9	
n	110		29		38		33	
Age								
15 - <45 yrs	49.5	0.45	36.0	0.38	37.1	0.41	36.3	0.52
	37.2,61.9		16.5,55.5		15.3,58.8		13.6,59.1	
n	45		12		16		12	
45 - <60 yrs	51.1		45.0		51.3		47.8	
	39.1,63.1		29.1,60.8		36.7,65.8		31.7,64.0	
n	65		25		29		27	
60+ yrs	60.5							
	46.3,74.7							
n	66		21		22		27	
Country of Birth								
Australia	53.6	0.47	36.3	0.67	41.5	0.90	43.8	0.79
	43.8,63.4		24.4,48.2		27.1,55.9		30.6,57.1	
n	147		49		56		57	
Other	46.9		42.0		43.5		39.8	
	28.5,65.4		15.2,68.8		17.6,69.3		14.0,60.5	
n	29		9		11		9	
Location								
Hobart	65.2	0.01	39.0	0.67	39.7	0.71	47.1	0.44
	51.5,78.8		21.0,57.0		21.9,57.5		31.4,62.8	
n	88		31		32		36	
Other	42.9		34.8		44.3		38.8	
	30.7,55.2		21.8,47.7		24.6,63.9		21.7,55.9	
n	88		27		35		30	

The percentage of people who visited a dentist was highest for subjects in the degree/teacher/nursing category compared both to people in the trade/diploma/certificate category, and people with no post-secondary school education (Table 34). Dental visiting was less frequent at lower compared to higher levels of household income. Neither education, nor household income were associated with the three measures of dental care received for those subjects who visited a dentist. Both occupation and employment status were not associated with any of the four main variables.

Table 34: Relationship between the visiting a dentist, volume, complexity and cost of dental services and socioeconomic factors

			Among those who visited a dentist					
	Visiting		Volume		Complexity		Cost	
Socioeconomic Factors	Visited a dentist % 95%CIs	*p*	High 7+ items % 95%CIs	*p*	High >1.25 % 95%CIs	*p*	High $500+ % 95%CIs	*p*
Level of education								
Deg./Teach/Nurse	74.1	0.02	52.0	0.21	48.8	0.76	48.2	0.87
	58.9,89.2		34.1,69.8		28.1,69.4		30.7,65.7	
n	49		25		21		23	
Trade/Dip./Cert.	47.9		38.5		43.3		45.9	
	34.2,61.6		21.5,55.6		24.8,61.9		29.7,62.1	
n	57		17		20		21	
No Post Sec. Edu.	45.2		26.9		39.0		41.5	
	31.4,59.0		3.6,50.3		16.8,61.1		18.7,64.3	
n	60		15		25		21	
Household income								
Less than $30,000	38.8	0.02	29.3	0.16	45.8	0.76	41.7	0.96
	24.3,53.2		15.9,42.6		28.4,63.2		25.3,58.2	
n	61		19		27		25	
$30,000-<$60,000	50.6		27.8		38.6		44.5	
	36.4,64.8		14.7,50.0		18.9,58.4		22.8,66.2	
n	51		16		16		19	
$60,000+	64.6							
	50.7,78.5							
n	51		19		22		20	
Occupation								
Manage/Prof/Para.	65.8	0.40	51.8	0.22	53.0	0.71	51.4	0.11
	50.0,81.6		33.1,70.6		34.5,71.6		31.9,71.0	
n	45		19		21		19	
Trades/Clerical	47.7		23.6		38.6		20.1	
	31.7,63.8		8.5,38.8		15.2,62.0		5.0,35.2	
n	36		9		13		9	
Blue Col./Lab.	58.1		39.0		46.5		58.4	
	29.1,87.0		0.0,92.4		0.0,100.0		0.0,88.5	
n	15		5		7		6	
Employment status								
Employed	57.1	0.11	39.8	0.25	46.9	0.16	42.9	0.89
	47.4,66.8		24.3,55.2		30.6,63.1		28.6,57.3	
n	96		33		41		34	
Not employed	45.4		29.4		33.2		41.9	
	31.2,59.7		18.3,40.2		19.0,47.5		30.7,53.1	
n	79		24		26		31	

People, who at baseline, reported a more frequent history of dental attendance and those who usually visited a dentist for a check-up rather than a problem, were more likely to have visited a dentist over the 12 months of this study (Table 35). However, among people who attended the dentist, in the 12 month follow-up period, neither measures of pattern of attendance at baseline were associated with the three measures of dental care use.

Table 35: Relationship between baseline history of dental attendance and subsequent dental attendance, volume, complexity and cost of dental services

			Among those who visited a dentist					
	Visiting		Volume		Complexity		Cost	
Pattern of attendance reported at baseline	Visited a dentist % 95%CIs	*p*	High 7+ items % 95%CIs	*p*	High >1.25 % 95%CIs	*p*	High $500+ % 95%CIs	*p*
Last dental visit								
≤12 months	71.7 60.9,82.5	<0.01	39.1 26.1,52.1	0.47	42.4 27.5,52.2	0.85	44.8 29.9,59.7	0.68
n	122		41		45		46	
> 12 months	33.0 23.1,42.8		32.4 16.7,48.2		40.5 23.3,57.8		39.9 22.4,57.4	
n	54		17		22		20	
Usual reason								
Check-up	68.5 18.9,44.1	<0.01	36.5 25.3,47.7	0.88	37.0 22.5,51.5	0.20	41.2 27.7,54.6	0.56
n	122		43		41		46	
Problem	35.2 53.7,75.9		38.2 15.4,61.0		52.1 31.2,73.1		47.9 27.3,68.5	
n	54		15		26		20	

Eligibility for a health care card was the only measure of access to dental care that was significantly associated with any of the four main variables. People who had a health care card were less likely to have dental treatment of a high complexity than people who did not have a health care card (Table 36).

Table 36: Relationship between visiting a dentist, the volume, complexity and cost of dental services and access to dental care

			Among those who visited a dentist					
	Visiting		Volume		Complexity		Cost	
Access to dental care	Visited a dentist % 95%CIs	*p*	High 7+ items % 95%CIs	*p*	High >1.25 % 95%CIs	*p*	High $500+ % 95%CIs	*p*
Health care card								
Yes	45.7 30.5,60.8	0.19	26.5 13.1,39.9	0.14	27.8 16.3,39.2	<0.01	36.2 25.3,47.2	0.13
n	72		20		23		26	
No	56.0 46.3,65.8		41.3 27.2,55.5		47.5 33.3,61.7		46.2 33.0,59.3	
n	104		38		44		40	
Difficulty Paying a $100 dental bill								
None - a little	40.4 20.5,60.2	0.08	24.3 1.6,47.0	0.26	50.7 24.7,76.7	0.36	55.9 28.6,83.2	0.31
n	28		9		16		12	
A lot	56.0 47.7,64.2		39.6 27.5,51.7		40.0 27.4,52.6		40.8 28.3,53.3	
n	148		49		51		54	
Avoided due to cost								
Yes	42.4 30.8,53.9	0.05	40.9 22.6,59.2	0.60	52.3 33.5,71.1	0.22	38.6 18.2,58.9	0.57
n	48		17		21		16	
No	57.7 46.8,68.6		35.6 23.0,48.2		37.9 22.6,53.3		45.0 32.4,57.7	
n	128		41		46		50	

4.1.4 Main covariables and outcomes

4.1.4.1 Main covariables and change in mean OHIP-14 severity

Subjects with a high baseline OHIP-14 severity score had a mean increase in OHIP-14 severity while subjects with low baseline OHIP-14 severity score had a mean decrease in OHIP-14 severity (Table 37) and the difference was statistically significant. Treatment needs were not statistically significantly associated with change in mean OHIP-14 severity but showed a trend towards a decrease in OHIP-14 severity.

Table 37: Relationship between main covariables and change in mean OHIP-14 severity

	Outcome: Change in mean OHIP-14 severity			
Main covariables	**n**	**Mean**	**95%CIs**	***p***
Baseline OHIP				
Low (0-<5)	178	1.07	0.44,1.70	<0.01
High (5+)	180	-2.16	-3.20,-1.12	
Treatment need				
Yes	150	-0.59	-0.64,0.46	0.84
No need	208	-0.49	-1.06,0.08	

4.1.4.2 Main covariables and change in EQ-5D

The mean change in EQ-5D was not statistically significantly associated with either baseline OHIP-14 severity or treatment need (Table 38).

Table 38: Relationship between main covariables and change in mean EQ-5Dx100

	Outcome: Change in EQ-5D x100			
Main covariables	**n**	**Mean**	**95%CIs**	***p***
Baseline OHIP				
Low (0-<5)	178	-1.9	-4.1,0.2	0.62
High (5+)	172	-1.8	-3.6,-0.1	
Treatment need				
Yes	148	-2.8	-5.3,-0.2	0.29
No need	202	-1.2	-2.6,0.1	

4.1.4.3 Main covariables and global oral health transition statements

The mean global oral health transition rating was marginally greater for people with high baseline OHIP-14 scores, signifying greater worsening in oral health for people in this group compared to people with low baseline OHIP-14 scores, although the relationship was not statistically significant (Table 39). Subjects without a treatment need had a mean negative oral health transition statement score while those with a treatment need had a mean positive oral health transition statement score, though the relationship was again not statistically significant.

Table 39: Relationship between main covariables and global oral health transition statementsx10

	Outcome: (Global Oral Health) x 10			
Main covariables	**n**	**Mean**	**95%CIs**	***p***
Baseline OHIP				
Low (0-<5)	180	0.36	-1.99,2.71	0.22
High (5+)	180	0.56	-1.52,2.64	
Treatment need				
Yes	152	1.76	-1.32,4.84	0.14
No need	208	-0.52	-1.77,0.73	

4.1.4.4 Main covariables and global general health transition statements

People with a high baseline OHIP-14 severity score had a mean positive global oral health transition statement score whereas for people with a low baseline OHIP-14 severity score it was close to zero, although the difference was not statistically significant (Table 40). A similarly non-statistically significant relationship was observed with treatment need.

Table 40: Relationship between main covariables and global general health transition statementsx10

	Outcome: (Global General Health)x10			
Main covariables	**n**	**Mean**	**95%CIs**	***p***
Baseline OHIP				
Low (0-<5)	180	0.02	-1.36,1.41	0.63
High (5+)	179	0.90	-0.20,2.01	
Treatment need				
Yes	152	0.40	-1.41,1.94	0.91
No need	207	0.50	-0.53,1.53	

4.1.4.5 Main covariables and follow-up OHIP-14 severity

There was a statistically significant relationship between follow-up OHIP-14 severity and baseline OHIP-14 severity (Table 41). Subjects with high baseline OHIP-14 severity had a higher follow-up OHIP-14 severity than subjects with a low OHIP-14 severity. Similarly there was a statistically significant relationship between follow-up OHIP-14 severity and treatment need. Subjects with a treatment need had a higher follow-up OHIP-14 severity than subjects without a treatment need.

Table 41: Relationship between main covariables and follow-up OHIP-14 severity

	Outcome: Follow-up Severity			
Main covariables	**n**	**Mean**	**95%CIs**	***p***
Baseline OHIP				
Low (0-<5)	180	2.73	2.04,3.42	<0.01
High (5+)	180	10.19	86.4,11.74	
Treatment need				
Yes	152	8.93	7.20,10.66	<0.01
No need	208	4.49	3.63,5.35	

4.1.4.6 Pearson's correlation coefficient between baseline OHIP-14 severity and the outcome measures

To ascertain the responsiveness of OHIP-14 severity, further analysis of the association was undertaken between baseline OHIP-14 severity and the three outcome measures of those subjects who visited a dentist.

There was a positive and statistically significant association between baseline and follow-up OHIP-14 severity (Table 42). The Pearson's correlation coefficient between baseline and change in mean OHIP-14 severity was negative and somewhat weaker. The positive correlation between baseline OHIP-14 severity and the global oral health transition was weaker again, while baseline OHIP-14 severity was not significantly associated with change in EQ-5D or the global general health transition statement.

There were statistically significant positive correlations between follow-up OHIP-14 severity with change in mean OHIP-14 severity and the global oral and general health transition statements but not with change in EQ-5D. There were not any statistically significant correlations between change in mean OHIP-14 severity with change in EQ-5D, the global oral and general health transition statements, change in EQ-5D (*p*=0.05) or the global oral health transition statement (*p*=0.06). There was a statistically significant positive correlation between the global oral health transition statement and the global general health transition statement.

Table 42 Pearson's correlation coefficients between baseline OHIP-14 severity and outcome measures of those subjects present at follow-up

	Baseline OHIP-14 severity	Follow-up OHIP-14 severity	Change in OHIP-14 severity	Change in EQ-5D	Oral Health Transition Statement	General Health Transition Statement
Baseline OHIP-14 severity	1.00	0.76	-0.34	-0.02	0.22	0.07
P-value		<0.01	<0.01	0.64	<0.01	0.16
Follow-up OHIP-14 severity		1.00	0.35	0.04	0.29	0.13
P-value			<0.01	0.44	<0.01	0.01
Change in OHIP-14 severity			1.00	0.10	0.10	0.08
P-value				0.05	0.06	0.14
Change in EQ-5D				1.00	0.08	0.09
P-value 0					0.12	0.10
Oral Health Transition					1.00	0.31
P-value						<0.01

The scatter plot of baseline versus follow-up OHIP-14 severity shows a clear positive relationship between the two variables, confirming the result of the high correlation and low *p* values (Figure 25A).

The scatter plot of baseline versus change in mean OHIP-14 severity confirms the negative although not as strong relationship, between the two (Figure 25B).

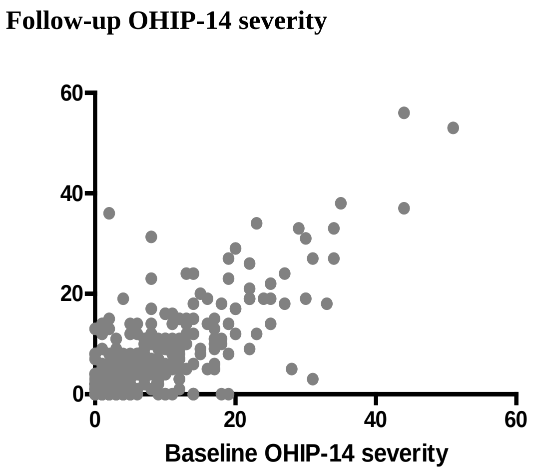


Figure 25A: Scatter plot of baseline OHIP-14 severity and follow-up OHIP-14 severity

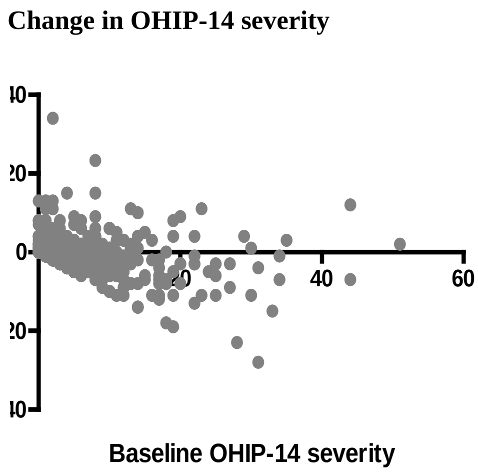


Figure 25B: Scatter plot of baseline OHIP-14 change in OHIP-14 severity

4.1.5 Potential confounders/effect modifiers and outcomes

4.1.5.1 Potential confounders/effect modifiers and change in OHIP-14 severity

Presence or absence of oral disease was not statistically associated with change in mean OHIP-14 severity, although the lower mean value for people who had oral disease at baseline signified a marginally greater improvement in oral HRQoL for this group compared to people who had no oral disease (Table 43).

Table 43: Relationship between oral disease and change in mean OHIP-14 severity

Potential confounders/ effect modifiers	Outcome: Change in mean OHIP-14 severity n	Mean	95%CIs	*p*
Oral disease				
Yes	89	-1.26	-2.54,0.02	0.10
No disease	269	-0.27	-0.83,0.28	

None of the survey participant socio-demographic factors (Table 44), socioeconomic factors (Table 45), pattern of attendance measures (Table 46), or access to dental care measures were statistically associated with change in mean OHIP-14 severity (Table 47).

Table 44: Relationship between socio-demographic factors and change in mean OHIP-14 severity

	Outcome: Change in mean OHIP-14 severity			
Socio-Demographic Factor	n	Mean	95%CIs	*p*
Sex				
Male	132	-0.48	-1.48,0.51	0.87
Female	226	-0.58	-1.31,0.15	
Age				
15 - <45 yrs	114	-0.16	-0.79,0.47	0.56
45 - <60 yrs	127	-1.51	-2.63,-0.39	
60+ yrs	117	0.12	-1.26,1.51	
Country of Birth				
Australia	301	-0.32	-0.92,0.27	0.16
Other	57	-1.65	-2.91,-0.40	
Residential location				
Hobart	156	-0.81	-1.89,0.27	0.42
Other	202	-0.31	-1.11,0.48	

Table 45: Relationship between socioeconomic factors and change in mean OHIP-14 severity

	Outcome: Change in mean OHIP-14 severity			
Socioeconomic Factor	**N**	**Mean**	**95%CIs**	***p***
Level of education				
Deg./Teach/Nurse	77	-1.11	-2.18,-0.03	0.66
Trade/Dip./Cert.	122	-0.28	-1.44,0.87	
No Post Sec. Edu.	139	-0.49	-1.45,0.48	
Household income				
Less than $30,000	141	-0.87	-2.29,0.55	0.98
$30,000-<$60,000	103	-0.38	-1.61,0.84	
$60,000+	93	-0.64	-1.35,0.07	
Occupation				
Manage/Prof/Para.	80	-0.79	-1.77,0.20	0.94
Trades/Clerical	76	-0.87	-2.05,0.31	
Blue Col./Lab.	32	-0.48	-2.63,1.68	
Employment status				
Employed	188	-0.75	-1.51,0.01	0.35
Not employed	165	-0.23	-1.26,0.80	

Table 46: Relationship between pattern of attendance and change in mean OHIP-14 severity

	Outcome: Change in mean OHIP-14 severity			
Pattern of attendance reported at baseline	**N**	**Mean**	**95%CIs**	***p***
Regularity				
≤12 months	183	-0.92	-1.63,-0.21	0.13
> 12 months	175	-0.09	-1.14,0.95	
Usual reason				
Check-up	194	-0.81	-1.51,-0.12	0.27
Problem	163	-0.18	-1.19,0.82	

Table 47: Relationship between access to dental care and change in mean OHIP-14 severity

	Outcome: Change in mean OHIP-14 severity			
Access to dental care	**n**	**Mean**	**95%CIs**	***p***
Health care card				
Yes	151	-0.22	-1.50,1.06	0.55
No	207	-0.69	-1.46,0.08	
Diff. pay $100 dental bill				
None, hardly any, a little	280	-0.60	-1.31,0.12	0.31
A lot	78	-0.30	-2.21,1.61	
Avoided due to cost				
Yes	126	-0.23	-1.46,0.99	0.50
No	232	-0.69	-1.31,-0.06	

4.1.5.2 Potential confounders/effect modifiers and change in EQ-5D

Of all the potential confounders/effect modifiers, only difficulty in paying a $100 dental bill was statistically associated with change in EQ-5D (Tables 48-52). Those subjects who had a lot of difficulty paying a $100 dental bill had a larger reduction in their EQ-5D score those who had none, hardly any, a little difficulty paying a $100 dental bill.

Table 48: Relationship between oral disease and change in EQ-5Dx100

Potential confounder/ effect modifier	**Outcome: Change in EQ-5D x100**			
	n	**Mean**	**95%CIs**	***p***
Oral disease				
Yes	86	-2.8	-6.1,0.6	0.49
No	264	-1.6	-2.8,-0.4	

Table 49: Relationship between socio-demographic factors and change in EQ-5Dx100

Socio-Demographic Factor	**Outcome: Change in EQ-5D x100**			
	n	**Mean**	**95%CIs**	***p***
Sex				
Male	131	-2.2	-4.9,0.6	0.73
Female	219	-1.6	-2.6,-0.6	
Age				
15 - <45 yrs	112	-2.1	-4.3,0.2	0.27
45 - <60 yrs	125	-2.8	-5.4,-0.3	
60+ yrs	113	-0.2	-2.3,-1.9	
Country of Birth				
Australia	293	-2.2	-3.8,-0.6	0.39
Other	57	-0.1	-3.3,3.1	
Residential location				
Hobart	191	-1.0	-2.8,0.8	0.20
Other	198	-2.6	-4.4,-0.7	

Table 50: Relationship between socioeconomic factors and change in EQ-5Dx100

	Outcome: Change in EQ-5D x100			
Socioeconomic Factor	**n**	**Mean**	**95%CIs**	***p***
Level of education				
Deg./Teach/Nurse	77	-1.6	-3.5,0.2	0.32
Trade/Dip./Cert.	120	-0.4	-1.7,0.9	
No Post Sec. Edu.	143	-3.3	-5.6,-0.9	
Household income				
Less than $30,000	135	-3.1	-6.1,-0.1	0.25
$30,000->$60,000	102	-0.2	-1.7,1.4	
$60,000+	93	-1.8	-3.3,-0.4	
Occupation				
Manage/Prof/Para.	80	-0.7	-2.8,1.4	0.11
Trades/Clerical	76	-1.5	-3.3,0.3	
Blue Col./Lab.	29	-3.4	-7.3,0.5	
Employment status				
Employed	185	-1.6	-2.8,-0.3	0.44
Not employed	160	-2.5	-5.2,0.1	

Table 51: Relationship between pattern of attendance and change in EQ-5Dx100

Pattern of attendance reported at baseline	Outcome: Change in EQ-5D x100 n	Mean	95%CIs	*p*
Regularity				
≤12 months	180	-2.1	-4.3,0.0	0.88
> 12 months	170	-1.6	-3.2,-0.1	
Usual reason				
Check up	192	-2.4	-4.0,0.7	0.26
Problem	157	-1.3	-3.0,0.3	

Table 52: Relationship between access to dental care and change in EQ-5Dx100

	Outcome: Change in EQ-5D x100			
Access to dental care	**N**	**Mean**	**95%CIs**	***p***
Health care card				
Yes	146	-3.1	-6.1,-0.4	0.25
No	204	-1.3	-2.5,-0.1	
Diff. pay $100 dental bill				
None, hardly any, a little	278	-1.0	-2.2,0.2	0.04
A lot	72	-5.6	-9.6,-1.6	
Avoided due to cost				
Yes	122	-2.9	-5.2,-0.7	0.28
No	228	-1.4	-3.0,0.3	

4.1.5.3 Potential confounders/effect modifiers and global oral health transition statements

The only potential confounder/effect modifier that was associated with the global oral health transition statement was country of birth (Tables 53-57). Subjects born outside Australia had an improvement, while subjects born in Australia, had a worsening of their global oral health transition statement score.

Table 53: Relationship between oral disease and global oral health transition statementsx10

Potential confounder/ effect modifier	Outcome: (Global Oral Health) x 10 n	Mean	95%CIs	*p*
Oral disease				
Yes	89	-1.28	-4.11,1.54	0.12
No	271	1.06	-0.71,2.84	

Table 54: Relationship between socio-demographic factors and global oral health transition statementsx10

	Outcome: (Global Oral Health) x 10			
Socio-Demographic Factor	**n**	**Mean**	**95%CIs**	***p***
Sex				
Male	134	-0.43	-3.23,2.40	0.17
Female	226	1.38	0.42,2.33	
Age				
15 - <45 yrs	114	0.37	-2.57,3.31	0.92
45 - <60 yrs	128	0.18	-1.34,1.69	
60+ yrs	118	1.03	-0.63,2.68	
Country of Birth				
Australia	302	0.96	-0.59,2.51	<0.01
Other	58	-2.20	-5.92,1.51	
Residential location				
Hobart	157	-1.55	-4.25,1.14	0.03
Other	203	2.03	-0.15,4.21	

Table 55: Relationship between socioeconomic factors and global oral health transition statementsx10

	Outcome: (Global Oral Health) x 10			
Socioeconomic Factor	**n**	**Mean**	**95%CIs**	***p***
Level of education				
Deg./Teach/Nurse	77	-0.88	-2.33,0.56	0.18
Trade/Dip./Cert.	124	-0.41	-3.18,2.37	
No Post Sec. Edu.	139	1.62	-0.93,4.17	
Household income				
Less than $30,000	142	2.20	-1.26,5.67	0.26
$30,000-<$60,000	104	-0.60	-2.71,1.51	
$60,000+	93	-0.09	-2.07,1.89	
Occupation				
Manage/Prof/Para.	80	-0.82	-2.40,0.76	0.63
Trades/Clerical	76	1.35	-0.50,3.20	
Blue Col./Lab.	32	0.01	-5.83,5.84	
Employment status				
Employed	188	0.18	-1.36,1.73	0.43
Not employed	167	0.93	-2.04,3.90	

Table 56: Relationship between pattern of attendance and global oral health transition statementsx10

	Outcome: (Global Oral Health) x 10			
Pattern of attendance reported at baseline	**n**	**Mean**	**95%CIs**	***p***
Regularity				
≤12 months	184	0.49	-1.89,2.88	0.76
> 12 months	176	0.42	-1.15,1.99	
Usual reason				
Check-up	196	-0.03	-2.34,2.27	0.39
Problem	163	1.05	-0.72,2.82	

Table 57: Relationship between access to dental care and global oral health transition statementsx10

	Outcome: (Global Oral Health) x 10			
Access to dental care	**n**	**Mean**	**95%CIs**	***p***
Health care card				
Yes	153	1.20	-2.15,4.56	0.49
No	207	0.06	-1.40,1.52	
Diff. pay $100 dental bill				
None, hardly any, a little	282	0.46	-0.66,1.58	0.58
A lot	78	0.45	-4.98,5.88	
Avoided due to cost				
Yes	126	0.95	-1.77,3.68	0.63
No	234	0.20	-1.75,2.15	

4.1.5.4 Potential confounders/effect modifiers and global general health transition statements

As with change in EQ-5D, relationships between potential confounders/effect modifiers, the global general health transition scores were small and statistically non-significant (Tables 58-62). The only exception was difficulty paying a $100 dental bill. People who had a lot of difficulty paying a $100 dental bill had a net worsening in global general health, while there was virtually no change, on average, for people who said they had none, hardly any, or a little difficulty paying a $100 dental bill.

Table 58: Relationship between oral disease and global general health transition statementsx10

Potential confounder/ effect modifier	Outcome: (Global General Health)x10			
	n	Mean	95%CIs	*p*
Oral disease				
Yes	88	-0.39	-1.90,1.11	0.22
No	271	0.75	-0.36,1.86	

Table 59: Relationship between socio-demographic factors and global general health transition statementsx10

	Outcome: (Global General Health)x10			
Socio-Demographic Factor	n	Mean	95%CIs	*p*
Sex				
Male	134	0.17	-1.30,1.64	0.45
Female	225	0.75	-0.07,1.58	
Age				
15 - <45 yrs	114	-0.10	-1.55,1.35	0.13
45 - <60 yrs	127	0.35	-0.82,1.53	
60+ yrs	118	1.71	0.55,2.87	
Country of Birth				
Australia	301	0.48	-0.49,1.46	0.22
Other	58	0.31	-1.84,2.46	
Residential location				
Hobart	157	-0.27	-1.92,1.38	0.16
Other	202	1.03	-0.01,2.07	

Table 60: Relationship between socioeconomic factors and global general health transition statementsx10

	Outcome: (Global General Health)x10			
Socioeconomic Factor	**n**	**Mean**	**95%CIs**	***p***
Level of education				
Deg./Teach/Nurse	77	-0.73	-1.91,0.45	0.16
Trade/Dip./Cert.	124	0.31	-1.76,2.39	
No Post Sec. Edu.	138	0.83	-0.50,2.16	
Household income				
Less than $30,000	141	2.30	-0.50,4.11	0.05
$30,000-<$60,000	104	-0.08	-1.16,1.00	
$60,000+	93	-0.74	-2.31,0.84	
Occupation				
Manage/Prof/Para.	80	-0.64	-1.91,0.62	0.35
Trades/Clerical	76	-0.03	-1.70,1.65	
Blue Col./Lab.	32	0.71	-1.88,3.30	
Employment status				
Employed	188	-0.11	-1.20,0.98	0.07
Not employed	166	1.16	-0.10,2.43	

Table 61: Relationship between pattern of attendance and global general health transition statementsx10

	Outcome: (Global General Health)x10			
Pattern of attendance reported at baseline	**n**	**Mean**	**95%CIs**	***p***
Regularity				
≤12 months	184	0.11	-1.19,1.41	0.16
> 12 months	175	0.85	-0.26,1.95	
Usual reason				
Check-up	196	0.22	-1.30,1.74	0.62
Problem	162	0.69	-0.32,1.69	

Table 62: Relationship between access to dental care and global general health transition statementsx10

	Outcome: (Global General Health)x10			
Access to dental care	**n**	**Mean**	**95%CIs**	***p***
Health care card				
Yes	152	1.51	-0.15,3.18	0.07
No	201	-0.10	-1.02,0.81	
Diff. pay $100 dental bill				
None, hardly any, a little	282	0.04	-0.75,0.83	<0.05
A lot	77	2.00	-0.64,4.65	
Avoided due to cost				
Yes	125	1.39	-0.23,3.02	0.15
No	234	-0.03	-1.14,1.09	

4.1.5.5 Potential confounders/effect modifiers and follow-up OHIP-14 severity

Follow-up OHIP-14 severity score was associated with more of the potential confounders/effect modifiers than the other outcomes (Tables 63-67). The statistically significant associations were with the presence of oral disease, household income, both measures of pattern of attendance, and all three measures of access to dental care. Subjects with an oral disease at baseline (Table 63), with lower household incomes (Table 65), who visited a dentist less regularly than every 12 months, usually visited a dentist for a problem (Table 66), held a health care card, had a lot of difficulty paying a $100 dental bill, or avoided or delayed dental care due to cost (Table 67) and were more likely to have a high follow-up OHIP-14 severity score than their counterparts.

Table 63: Relationship between oral disease and follow-up OHIP-14 severity

Potential confounder/	Outcome: Follow-up Severity			
effect modifier	n	Mean	95%CIs	*p*
Oral disease				
Yes	89	8.1	6.3,9.9	0.01
No	271	5.8	4.8,6.8	

Table 64: Relationship between socio-demographic factors and follow-up OHIP-14 severity

	Outcome: Follow-up Severity			
Socio-Demographic Factor	n	Mean	95%CIs	*p*
Sex				
Male	134	6.18	4.89,7.47	0.54
Female	226	6.62	5.35,7.89	
Age				
15 - <45 yrs	114	5.57	4.26,6.89	0.47
45 - <60 yrs	128	7.32	6.11,8.53	
60+ yrs	118	6.71	4.53,8.89	
Country of Birth				
Australia	302	6.21	5.10,7.32	0.14
Other	58	7.40	5.70,9.11	
Residential location				
Hobart	157	6.06	4.01,8.10	0.58
Other	203	6.66	5.50,7.82	

Table 65: Relationship between socioeconomic factors and follow-up OHIP-14 severity

	Outcome: Follow-up Severity			
Socioeconomic Factor	**n**	**Mean**	**95%CIs**	***p***
Level of education				
Deg./Teach/Nurse	77	5.06	3.22,6.90	0.65
Trade/Dip./Cert.	124	7.02	5.42,8.61	
No Post Sec. Edu.	139	6.24	4.72,7.75	
Household income				
Less than $30,000	142	8.18	6.68,9.69	<0.01
$30,000-<$60,000	104	7.00	4.87,8.33	
$60,000+	93	484	3.21,6.46	
Occupation				
Manage/Prof/Para.	80	5.72	4.05,7.40	0.21
Trades/Clerical	76	5.75	3.57,9.73	
Blue Col./Lab.	32	7.65	4.81,10.49	
Employment status				
Employed	188	6.16	4.96,7.35	0.07
Not employed	167	6.77	5.41,8.12	

Table 66: Relationship between pattern of attendance and follow-up OHIP-14 severity

Pattern of attendance	Outcome: Follow-up Severity			
reported at baseline	**n**	**Mean**	**95%CIs**	***p***
Regularity				
≤12 months	184	5.12	4.10,6.15	<0.01
> 12 months	176	7.82	6.09,9.56	
Usual reason				
Check-up	196	4.84	3.87,5.81	<0.01
Problem	163	8.44	6.75,10.13	

Table 67: Relationship between access to dental care and follow-up OHIP-14 severity

	Outcome: Follow-up Severity			
Access to dental care	**n**	**Mean**	**95%CIs**	***p***
Health care card				
Yes	153	8.07	6.53,9.61	<0.01
No	207	5.51	4.43,6.58	
Diff. pay $100 dental bill				
None, hardly any, a little	282	5.12	4.28,5.95	<0.01
A lot	78	11.1	8.44,13.76	
Avoided due to cost				
Yes	126	9.90	7.81,11,99	<0.01
No	234	4.57	3.73,5.42	

4.1.6 Colinearity

As noted in the methodology, colinearity between the volume, complexity and cost of dental services was expected and so the three main explanatory variables were modelled separately. To check if this assumption was correct, correlation analysis was undertaken between volume, complexity and cost of dental services. The results showed statistically significant and moderate to high correlations between each of the three main explanatory variables of those subjects who visited a dentist, with the greatest correlation being between volume and cost of dental service, followed by complexity with cost, and then volume with complexity.

A scatterplot of the relationship between volume and cost of dental services depicted a strong linear relationship which was confirmed with a Pearson's correlation coefficient of 0.73 (*p*<0.05 - Figure 24B). Scatterplots of dental service volume with complexity (Figure 24A) and dental service cost with complexity (Figure 24C) did not show such a clear linear relationship and the correlation coefficients were smaller, although still statistically significant.

Pearson's Correlation Coefficient = 0.40
P<0.01

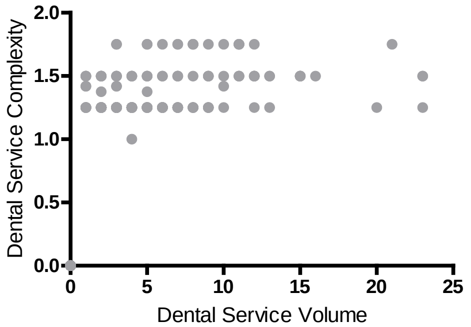


Figure 24A: Scatter plot of volume and complexity of dental services

Pearson's Correlation Coefficient = 0.73
P<0.01

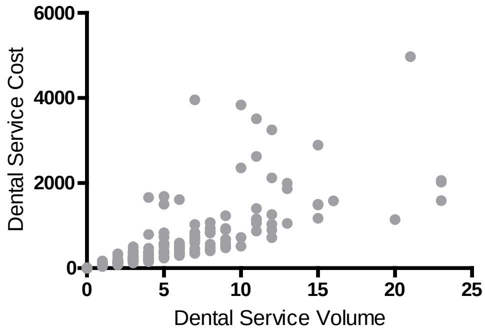
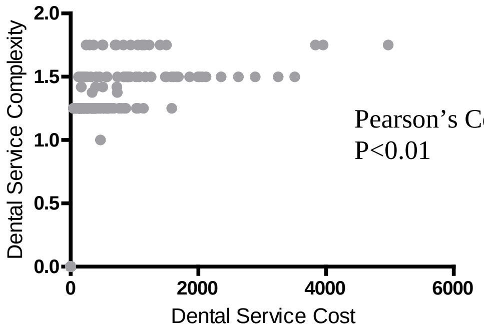


Figure 24B: Scatter plot of volume and cost of dental services



Pearson's Correlation Coefficient = 0.50
P<0.01

Figure 24B: Scatter plot of cost and complexity of dental services

4.1.7 Summary of bivariate analysis

With the measures of change in mean OHIP-14 severity, change in EQ-5D, and the global general health transition statement, none of the survey participant factors were associated with both the main explanatory variables and the outcomes. Hence there were no confounders with these three outcome measures (Table 68). Residential location was associated with both the outcome when measured by the global oral health transition statement and the main explanatory variable of dental attendance.

Table 68: Summary of confounders

	Outcome variable †				
Survey participant variable	ΔOHIP-14	ΔEQ-5D	SROH‡	SRGH‡	Follow-up OHIP-14
Baseline OHIP	–	–	–	–	–
Perceived treatment need	–	–	–	–	–
Oral disease	–	–	–	–	–
Sex	–	–	–	–	V, $
Age	–	–	–	–	–
Country of birth	–	–	–	–	–
Residential location	–	–	A	–	–
Education	–	–	–	–	–
Household income	–	–	–	–	A
Occupation	–	–	–	–	–
Employment status	–	–	–	–	–
Regularity of dental attendance	–	–	–	–	A
Reason for dental attendance	–	–	–	–	A
Health care card	–	–	–	–	C
Difficulty paying $100 dental bill	–	–	–	–	–
Avoided dental care due to cost	–	–	–	–	–

† Δ = Change in
‡ SROH = self-reported oral health, SRGH = Self-reported general health
* A = Dental attendance (yes *vs.* no); V = Volume of dental services (1-6 items *vs.* 7+ items); C = complexity of dental services (1-1.25 *vs.* >1.25); $ = cost of dental services ($1-499 *vs.* $500 or more)

A few survey participant factors were associated with at least one of the main variables and the outcome when the latter was measured by the follow-up OHIP-14 severity score. Household income, regularity of attendance, and usual reason for attendance were associated with dental attendance. Of those who attended a dentist over the 12 months of this study, sex was associated with the volume and cost of dental treatment, and the outcome, while eligibility for a health care card was associated with the complexity of dental treatment received and the outcome.

4.2 Stratified analyses

Stratified analyses for each of the main explanatory variables for all five outcome measures appear in the following section. Stratified analyses was undertaken with two main covariables: baseline OHIP score and perceived treatment need. Two groups were classified by low or high baseline oral HRQoL impact defined by dichotomising baseline OHIP scores at their median value. Treatment need was also stratified and subjects were defined as having a treatment need if they perceived they needed any treatment except a check-up or scale and clean. Within each stratum the bivariate analyses were repeated, and compared mean difference in HRQoL and their 95% confidence intervals among strata to assess potential effect modification. Interaction *p* values were calculated. Similar analyses were done with the potential confounders/ effect modifiers.

As mentioned previously, other than for follow-up OHIP-14 severity, a negative value for the dependent variable indicated an improvement in HRQoL, zero indicated no change, and a positive result denoted a worsening in HRQoL. Follow-up OHIP-14 severity cannot have a negative value and the greater the result, the worse the follow-up oral HRQoL.

To assist in the explanation of these findings, differences in mean values of the outcome variables between groups classified according to the main explanatory variables were described using interpretations and labels used in the following table (Table 69). The term "association" was used to highlight differences between dental care groups (e.g. between people who attended a dentist during follow-up versus people who did not attend a dentist during the follow-up), and to distinguish those differences from temporal differences in oral HRQoL that were observed over the 12 month period. Temporal differences were described as "change" in HRQoL. An increase in OHIP-14 or EQ-5D scores, or a positive oral or general health transition statement was described as a harmful association. On the other hand, a beneficial association was a decrease in OHIP-14 or EQ-5D scores, or a positive oral or general health transition statement.

Table 69: Interpretations and labels describing effect of dental care

Dental visit: Yes Mean change (95%CIs)	Dental visit: No Mean change (95%CIs)	*p*	Interpretation	Label describing association of dental care with HRQoL
-0.8 (-2.0,1.5)	-0.6 (-1.7,2.1)	0.71	• Non-sig.† improvement in HRQoL for dental visit group and non-visit group (95%cis include 0) • Non-sig. differences between visit groups in mean change score (*p*=0.71)	• No association of dental visits with HRQoL
-0.6 (-1.9,1.7)	1.2 (-0.3,3.1)	0.07	• Non-sig. improvement in HRQoL for visit group • Non-sig. worsening in HRQoL for non-visit group • Non-sig. differences between visit groups in mean change scores	• No association of dental visits with HRQoL
1.2 (-0.7,3.1)	-2.1 (-3.0,-0.4)	0.02	• Non-sig. worsening in HRQoL for visit group • Sig.‡ improvement in HRQoL for non-visit group • Sig. difference between visit groups in mean change scores	• Significant harmful association of dental visits with HRQoL

†: Non-sig. = Not statistically significant
‡: Sig. = Statistically significant

4.2.1 Change in mean OHIP-14 severity

4.2.1.1 Association between dental attendance and change in OHIP-14 severity stratified by main covariables

For the cohort of all people, the small difference in OHIP-14 change scores between people who attended the dentist (mean change = -0.73) and people who did not (mean change = -0.69) signified a weak beneficial association between dental attendance and oral HRQoL (Table 70).

Within strata classified according to baseline OHIP-14 severity, the association was similarly weak. However, the stratum specific associations between dental attendance and change in OHIP-14 score did not differ to a statistically significant degree (p=0.60 for the interaction). More notable was the within low baseline OHIP-14 severity stratum finding that people who attended the dentist had a marginally greater deterioration in oral HRQoL relative to people who did not attend a dentist, whereas dental attendance was associated with marginally greater improvement in oral HRQoL in crude analysis.

Within strata classified according to perceived treatment need, differences in mean OHIP-14 change scores between people who visited a dentist and people who did not, were greater than the crude difference. Furthermore, among people who reported a treatment need, those who attended a dentist had a larger improvement in oral HRQoL than people who did not attend a dentist, consistent with the crude beneficial association with dental visits. In contrast, dental attendance had the opposite, adverse association with oral HRQoL within the stratum of no treatment needs. However, the interaction was not statistically significant and mean differences between attendees and non-attendees were not statistically significant in either stratum.

4.2.1.2 Association between volume, complexity and cost of dental care and change in OHIP-14 severity stratified by the main covariables

For the cohort of all people, there was a slight hazardous association between high volume, complexity or cost dental care compared to low volume, complexity or cost dental care with oral HRQoL.

Within both strata classified according to baseline OHIP-14 severity, the association of low versus high dental care with oral HRQoL was amplified for people with high baseline OHIP-14 severity. In the low baseline OHIP-14 severity stratum, high dental care had a less hazardous association with oral HRQoL than low dental care. However, none of the within-stratum associations were statistically significant. The stratum specific associations between volume of dental care and change in OHIP-14 score differed to a statistically significant degree (p<0.05 for the interaction) but did not for complexity or cost of dental care.

Within strata classified according to perceived treatment need, differences in mean OHIP-14 change scores between people who received low versus high volume dental care were greater in the treatment need stratum and less in the no treatment need stratum than the crude difference. In contrast to the crude association, among people who reported a treatment need, those who received high complexity dental care had a marginally greater improvement in oral HRQoL than people who received low complexity dental care. In both strata of treatment need, people who received low cost dental care had an improvement in oral HRQoL relative to people who received high cost dental care, a result consistent with the crude analysis. In the stratum with no perceived treatment needs, improvements in oral HRQoL were greater for people who received less care, rather than more care, for all three measures of volume, complexity and cost of dental care. Furthermore, mean differences between those who received low and high volume, complexity and cost of dental care were statistically significant in the no treatment need stratum. None of the treatment need interactions with volume, complexity and cost of dental care were statistically significant,

Table 70: Relationship between change of OHIP-14 severity, the volume, complexity and cost of dental services and main covariables

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
All people	-0.73	-0.69	0.14	-0.88	-0.13	0.05	-0.83	-0.59	0.23	-1.32	0.06	0.26
	-1.61,0.15	-1.44,0.05		-2.09,0.33	-1.52,1.26		-1.78,0.11	-2.11,0.93		-2.32,0.33	-1.14,1.26	
n	175	143		103	58		108	67		110	65	
Main covariables												
Baseline OHIP												
Low (0-<5)	1.00	0.95	0.81	1.14	0.84	0.29	1.08	0.87	0.49	0.75	0.67	0.17
	0.08,1.92	0.07,1.83		-0.11,2.40	-0.51,2.19		-0.05,2.21	-0.65,2.39		-0.22,1.73	-0.13,2.74	
n	86	77		53	30		56	30		51	45	
High (5+)	-2.43	-2.90	0.07	-3.40	-1.03	0.18	-2.99	-2.49	0.16	-3.22	-1.29	0.13
	-3.61,-1.26	-3.81,-1.99		-5.53,-1.45	-3.19,1.14		-4.07,-1.92	-3.67,-1.31		-5.03,-1.42	-3.03,0.45	
n	89	66		50	28		52	88		59	30	
	Interaction	*p*=0.60		Interaction	*P*<0.05		Interaction	*p*=0.27		Interaction	*p*=0.37	
Treatment need												
Yes	-1.44	-0.75	0.81	-1.61	-0.26	0.77	-1.22	-1.58	0.82	-1.74	-1.08	0.81
	-2.99,0.11	-2.34,0.83		-3.40,0.16	-3.29,2.77		-3.03,0.58	-4.12,0.95		-4.28,0.80	-2.79,0.63	
n	62	65		36	21		30	32		35	27	
No need	-0.35	-0.65	0.13	-0.50	-0.07	0.02	-0.70	0.36	0.03	-1.12	0.73	0.04
	-1.29,0.59	-1.44,0.15		-2.18,1.19	-1.24,1.10		-1.84,0.43	-1.38,2.10		-2.15,0.08	-0.76,2.22	
n	113	78		67	37		78	35		75	38	
	Interaction	*p*=0.44		Interaction	*p*=0.47		Interaction	*p*=0.48		Interaction	*p*=0.52	

† Within stratum

4.2.1.3 Association between dental attendance and change in OHIP-14 severity stratified by oral disease

Within strata classified according to the presence of oral disease, differences in mean OHIP-14 change scores between people who visited a dentist and people who did not were greater than the crude difference (Table 71). Furthermore, among people who had an oral disease, dental attendance was associated with a lesser improvement in oral HRQoL, in contrast with the crude analysis that indicated a marginally beneficial association of dental visits with oral HRQoL. Dental attendance had a similar association with oral HRQoL within the stratum with no oral disease to that found in crude analysis. There was no meaningful effect modification or confounding of visit-change in OHIP-14 severity relationship.

4.2.1.4 Association between volume, complexity and cost of dental care and change in OHIP-14 severity stratified by oral disease

For people without baseline oral disease, there was a beneficial association of low dental care with oral HRQoL compared to the respective high values of dental care. In contrast to the crude analysis, among people with an oral disease, those who received high complexity dental care had an improvement in oral HRQoL while people who received low complexity dental care had deterioration in oral HRQoL. None of the within-stratum associations and interactions were statistically significant.

Table 71: Relationship between change of OHIP-14 severity, the volume, complexity and cost of dental services and oral disease

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Oral disease[‡]	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
Yes	-1.10	-1.82	0.13	-0.53	-0.63	0.23	0.16	-2.54	0.70	-1.54	-0.59	0.42
	-3.32,1.11	-3.01,-0.63		-3.62,2.57	-4.33,3.07		-2.04,2.36	-6.32,1.23		-4.69,1.62	-3.52,2.35	
n	44	35		26	15		24	20		27	17	
No disease	-0.60	-0.30	0.35	-1.01	0.04	0.10	-1.15	0.22	0.22	-1.25	0.32	0.06
	-1.34,0.15	-1.06,0.46		-2.25,0.23	-1.13,1.21		-1.84,-0.46	-1.22,1.55		-2.20,-0.31	-1.02,1.66	
n	131	108		77	43		84	47		83	48	
	Interaction	p=0.36		Interaction	p=0.89		Interaction	p=0.07		Interaction	p=0.79	

[†] Within stratum

[‡] Crude association for all people is shown in Table 70

4.2.1.5 Association between dental attendance and change in OHIP-14 severity stratified by sex and age

For males dental attendance was associated with a greater improvement in oral HRQoL (Table 72). However, the stratum specific and within-stratum associations between dental attendance and change in OHIP-14 score did not differ to a statistically significant degree (p=0.26 for the interaction). Notable was the within-stratum finding that females who attended the dentist had a lesser improvement in oral HRQoL relative to females who did not attend a dentist, whereas dental attendance was associated with marginal improvement in oral HRQoL in crude analysis.

Within strata classified according to age, differences in mean OHIP-14 change scores between people who visited a dentist and people who did not were greater than the crude difference. Furthermore, in the two strata encompassing people aged 45 years or older, those who attended a dentist had a larger improvement in oral HRQoL than people who did not attend a dentist, consistent with a beneficial association of dental visits with oral HRQoL found in crude analysis. In contrast, dental attendance had a reduced beneficial association with oral HRQoL within the stratum aged less than 45 years. However, the interaction was not statistically significant and mean differences between attendees and non-attendees were not statistically significant in any of the three strata.

4.2.1.6 Association between volume, complexity and cost of dental care and change in OHIP-14 severity stratified by sex and age

Of the males who attended a dentist, those who had a low volume had a statistically significant greater reduction in OHIP-14 severity than those who had a high volume of dental services. In contrast, females who received a high volume of dental services had a mean increase in OHIP-14 severity, although this difference was not statistically significant. Although the relationships were not statistically significant, subjects who received a low complexity or cost of dental service had a greater mean reduction in OHIP-14 severity than those who received a dental service of a high complexity or cost. The exception was males and complexity of dental service. There were not any significant interactions between the change in mean OHIP-14 severity, sex and any of the three main explanatory variables of those subjects who visited a dentist.

For subjects aged between 45-59 years, there was a greater reduction in OHIP-14 severity for those subjects who received a low volume or low cost compared to a high volume or high cost dental care, and the associations of volume and cost with oral HRQoL were statistically significant. Otherwise there were not any within stratum significant differences in change in mean OHIP-14 severity by volume, complexity and cost of dental services of those subjects of any age who visited a dentist. There were not any significant interactions between the change in mean OHIP-14 severity, age and volume, complexity or cost of dental services of those survey participants who visited a dentist.

Table 72: Relationship between change of OHIP-14 severity, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socio-Demographic Factor[‡] Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*[†]	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*[†]	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*[†]	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*[†]
Sex												
Male	-1.05	-0.31	0.46	-1.11	-0.51	0.04	-0.86	-1.26	0.85	-2.01	-0.26	0.12
	-2.25,0.15	-1.80,1.18		-2.97,0.765	-2.10,1.07		-2.51,0.79	-3.19,0.67		-3.95,-0.07	-1.70,1.18	
n	65	49		31	29		36	29		33	32	
Female	-0.39	-1.01	0.36	-0.73	0.70	0.19	-0.81	0.39	0.20	-0.85	0.70	0.13
	-1.30,0.53	-2.15,0.12		-2.08,0.62	-1.60,3.01		-1.59,.0.03	-1.74,2.52		-1.81,0.11	-1.285,2.69	
n	110	94		72	29		72	38		77	33	
	Interaction	*p*=0.26		Interaction	*p*=0.79		Interaction	*p*=0.34		Interaction	*p*=0.91	
Age												
15 - <45 yrs	-0.14	-0.44	0.47	-0.41	0.20	0.98	-0.02	-0.36	0.59	-0.45	0.38	0.59
	-1.51,1.22	-1.19,0.30		-2.69,1.87	-2.14,2.54		-1.77,1.74	-2.86,2.14		-2.03,1.14	-2.08,2.85	
n	45	56		28	12		29	16		33	12	
45 - <60 yrs	-1.69	-1.20	0.09	-1.95	-0.60	0.01	-2.65	-0.77	0.20	-3.14	-0.11	0.02
	-3.63,0.25	-2.72,0.32		-4.57,0.73	-2.72,1.52		-4.76,-0.54	-3.91,2.36		-5.96,-0.31	-2.29,2.07	
n	65	47		35	25		36	29		38	27	
60+ yrs	-0.54	-0.49	0.82	-0.63	0.06	0.45	-0.47	-0.65	0.74	-0.91	-0.13	0.38
	-1.37,0.29	-2.92,1.94		-1.60,0.33	-1.78,1.90		-1.52,0.58	-2.06,0.76		-1.86,0.04	-1.40,1.14	
n	65	40		40	21		43	22		39	26	
	Interaction	*p*=0.90		Interaction	*p*=0.56		Interaction	*p*=0.23		Interaction	*p*=0.19	

[†] Within stratum
[‡] Crude association for all people is shown in Table 70

4.2.1.7 Association between dental attendance and change in OHIP-14 severity stratified by country of birth and residential location

Only one of the survey participants from a country other than Australia did not visit a dentist (Table 73) and hence 95% confidence interval results were not given for this category. However, participants not born in Australia who visited a dentist had a reduction in their OHIP-14 severity. The same was true with Australian-born participants, whether or not they visited a dentist, but the difference between non-visitors and visitors was small and not significant. There was not a statistically significant interaction between the change in mean OHIP-14 severity, country of birth and visiting a dentist.

Among residents of Hobart, there was a statistically significant greater mean decrease in OHIP-14 severity who did not visit a dentist than those people who did visit a dentist. Although not statistically significant, the opposite trend was true for those subjects outside of Hobart - in this stratum, visiting a dentist resulted in a greater mean decrease in OHIP-14 severity. These opposing associations of dental attendance with oral HRQoL produced a statistically significant interaction between the change in mean OHIP-14 severity, dental attendance and residential location.

4.2.1.8 Association between volume, complexity and cost of dental care and change in OHIP-14 severity stratified by country of birth and residential location

For subjects born in Australia, having a high volume or high cost dental services was associated with a significantly greater increase in OHIP-14 severity compared to having a low volume or low cost (respectively). A similar trend in the association of high complexity care with oral HRQoL was seen for Australian-born subjects, although the association was not statistically significant. In the stratum born outside Australia, the association of high levels of dental care with oral HRQoL was in the opposite direction but was not statistically significant. Non-Australian-born people who received a greater volume, complexity or cost of dental care had a greater reduction in OHIP-14 severity than those who received a lower volume, complexity or cost of dental care. There was not a statistically significant interaction between the change in mean OHIP-14 severity, and volume, complexity or cost of dental care with country of birth.

For people who resided in Hobart, the difference in mean OHIP-14 change scores between people who received low compared to high volume of dental care was statistically significant (p=0.01). There was not a statistically significant difference in OHIP-14 severity with a high complexity and high cost of dental care. For Tasmanian people outside of Hobart, the volume, complexity or cost of dental care had little influence on the reduction in OHIP-14 severity. There was not a statistically significant interaction between the change in mean OHIP-14 severity, and volume, complexity or cost of dental care with whether the subject lived in Hobart or elsewhere in Tasmania.

Table 73: Relationship between change of OHIP-14 severity, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socio-Demographic Factor‡ Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Country of Birth												
Australia	-0.54	-0.51	0.16	-0.81	0.31	0.04	-0.68	-0.35	0.26	-1.27	0.42	0.04
	-1.48,0.40	-1.37,0.36		-2.12,0.50	-1.20,1.83		-1.73,0.38	-2.01,1.31		-2.47,-0.08	-0.89,1.73	
n	156	123		84	49		90	56		90	56	
Other	-1.96	-6.00	0.48	-1.37	-2.64	0.74	-1.85	-2.10	0.45	-1.63	-2.47	0.88
	-3.57,-0.36	-		-3.79,1.06	-4.23,-1.04		-3.71, 0.01	-4.66,-0.45		-3.87,0.61	-4.21,-0.72	
n	29	1		19	9		18	11		20	9	
	Interaction	*p*=0.88		Interaction	*p*=0.14		Interaction	*p*=0.68		Interaction	*p*=0.12	
Location												
Hobart	-0.38	-2.03	<0.01	-0.86	0.33	0.01	-0.91	0.40	0.06	-1.23	0.61	0.06
	-1.78,1.02	-3.21,-0.85		-2.46,0.73	-1.86,2.53		-2.53,0.71	-2.11,2.92		-2.65,0.18	-0.99,2.20	
n	87	52		54	31		55	32		52	35	
Other	-1.13	-0.05	0.14	-0.91	-0.74	0.99	-0.74	-1.63	0.99	-1.42	-0.69	0.53
	-2.24,-0.03	-0.86,0.75		-3.00,1.18	-2.38,0.90		-1.75,0.26	-3.44,-0.18		-2.97,0.14	-2.60,1.23	
n	88	91		49	27		53	35		58	30	
	Interaction	*P*<0.01		Interaction	*p*=0.71		Interaction	*p*=0.18		Interaction	*p*=0.44	

† Within stratum

‡ Crude association for all people is shown in Table 70

4.2.1.9 Association between dental attendance and change in OHIP-14 severity stratified by level of education and household income

Only two people who had degree or were a teacher or a nurse did not visit a dentist and so 95% confidence intervals were not given in this circumstance (Table 74). In the three strata of education, there was a reduction in OHIP-14 severity, whether or not the subject visited a dentist. In two of the educational level strata, people who did not visit a dentist had a greater reduction in OHIP-14 severity than people who did visit a dentist. Whereas in the stratum without post-secondary school education, people who did not visit a dentist had a smaller reduction in OHIP-14 scores than people who did visit a dentist. There was not a statistically significant interaction between the change in mean OHIP-14 severity, level of education and visiting a dentist.

In the highest-income stratum, there was a greater reduction in OHIP scores for people who did not attend the dentist compared with people who did (p=0.01). For the middle-income stratum, the association of dental attendance with oral HRQoL was in the same direction, suggesting poorer oral HRQoL outcomes for those who attended, though the association was not statistically significant. In contrast, in the low-income stratum, there was a smaller reduction in OHIP scores for people who did not attend the dentist compared with people who did, although this favourable association of dental attendance with oral HRQoL was not statistically significant. There was not a statistically significant interaction between the change in mean OHIP-14 severity, household income and visiting a dentist.

4.2.1.10 Association between volume, complexity and cost of dental care and change in OHIP-14 severity stratified by level of education and household income

For all three strata of education, those who received low volume dental care had a greater improvement in oral HRQoL than those who received high volume of dental care, a finding consistent with the crude analysis. Other than in the stratum of people without a post-secondary education, those who received low complexity dental care had a greater improvement in oral HRQoL than people who received high complexity dental care, a result consistent with the crude analysis. In all three strata, the association was not statistically significant.

Other than in the trade/diploma/certificate stratum, people who received low cost dental care had an improved oral HRQoL while those who received high cost dental care had deterioration of oral HRQoL. In the trade/diploma/certificate stratum, people who received high cost dental care had a greater improvement in oral HRQoL than people who received low cost dental care. Only in the stratum of degree/teacher/nurse was the association with dental service volume statistically significant (p=0.02). The stratum specific associations between volume, complexity and cost of dental care and change in OHIP-14 score did not differ to a statistically significant degree.

Within the two strata of household income less than $30,000 and of $60,000 or more, those who received low volume dental care had a greater improvement in oral HRQoL, though in both cases the association was not statistically significant (p=0.06 & 0.05 respectively). In the middle income stratum, those receiving low volume of dental care had a greater deterioration in oral HRQoL than people receiving high volume dental care, though the association was not statistically significant.

Within all three strata classified according to household income, differences in mean OHIP-14 change scores between people who received low and high complexity dental care, were greater than the crude difference. Furthermore, among people in the low and high income strata, those who received low complexity dental care had a larger improvement in oral HRQoL than people who received high complexity dental care, consistent with a beneficial association with dental visits. In contrast, low complexity dental care had an opposite, adverse association with oral HRQoL within the stratum with a household income from $30,000 to under $60,000.

In all three income household strata, people who received low cost dental care had a greater improvement in oral HRQoL than people who received high cost dental care, consistent with the crude effect. None of the interactions with volume, complexity and cost of dental care were statistically significant.

Table 74: Relationship between change of OHIP-14 severity, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socioeconomic factor‡ Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
Level of education												
Deg./Teach/Nurse	-1.34	-9.87	0.10	-1.10	-0.32	0.02	-1.39	-0.87	0.37	-1.28	0.31	0.06
	-2.21,-0.07	-		-1.95,-0.25	-2.40,1.76		-2.49,-0.29	-3.04,1.30		-4.27,-0.70	-2.24,2.86	
n	49	2		22	25		28	21		26	23	
Trade/Dip./Cert.	-0.31	-0.72	0.59	-0.55	-0.03	0.43	-0.74	0.23	0.57	-0.03	-0.65	0.98
	-1.77,1.16	-2.12,0.68		-2.42,1.31	-2.60,2.54		-2.14,0.67	-2.65,3.12		-2.32,2.26	-2.16,0.86	
n	56	50		34	17		36	20		36	20	
No Post Sec. Edu.	-0.65	-0.48	0.81	-0.85	0.00	0.73	-0.35	-1.10	0.60	-1.40	0.42	0.64
	-1.78,0.49	-2.08,1.09		-2.93,1.23	-1.64,1.65		-2.04.1.34	-2.36,0.15		-2.74,-0.06	-1.71,2.55	
n	60	69		38	15		35	25		39	21	
	Interaction	*p*=0.51		Interaction	*p*=0.79		Interaction	*p*=0.13		Interaction	*p*=0.12	
Household income												
Less than \$30,000	-1.35	-1.01	0.45	-2.38	0.68	0.06	-2.04	-0.54	0.10	-2.32	-0.01	0.04
	-3.42,0.71)	-2.71,0.68		-4.57,-0.19	-2.55,3.90		-4.04,-0.04	-4.14,3.06		-4.47,-0.17	-2.77,2.75	
n	61	65		37	19		34	27		36	25	
\$30,000-<\$60,000	0.29	-1.07	0.87	1.20	0.64	0.79	0.51	-0.03	0.98	-0.07	0.78	0.46
	-1.97,2.56	-1.97,-0.18		-0.79,3.18	-3.42,4.69		-1.41,2.42	-4.93,4.86		-3.56,3.41	-1.89,3.44	
n	50	42		30	16		34	16		32	18	
\$60,000+	-0.82	-1.28	0.01	-0.90	-0.36	0.05	-1.04	-0.56	0.38	-1.53	0.03	0.13
	-1.94,0.30	-2.40,-0.16		-2.19.0.40	-2.01,1.30		-2.28,0.20	-2.32,1.19		-2.93,-0.13	-1.27,1.33	
n	51	29		30	19		29	22		31	20	
	Interaction	*p*=0.36		Interaction	*p*=0.17		Interaction	*p*=0.47		Interaction	*p*=0.60	

† Within stratum

‡ Crude association for all people is shown in Table 70

4.2.1.11 Association between dental attendance and change in OHIP-14 severity stratified by occupation and employment status

Within strata classified according to employment status, none of the three within-stratum associations were statistically significant (Table 75). The stratum specific associations between dental attendance and change in OHIP-14 score did not differ to a statistically significant degree (p=0.14 for the interaction). Notable was the within trades/clerical and blue collar worker/labourer strata findings that people who attended the dentist had a lesser improvement in oral HRQoL relative to people who did not attend a dentist, whereas dental attendance was associated with marginally greater improvement in oral HRQoL in the analysis of crude variables.

The associations of dental attendance with change in OHIP-14 severity were statistically significant in each stratum of employed and unemployed, and they tended to be of a greater magnitude than the crude association of dental attendance with change in OHIP-14 severity. However there was no effect modification.

4.2.1.12 Association between volume, complexity and cost of dental care and change in OHIP-14 severity stratified by occupation and employment status

The beneficial association of high-volume dental services with change in OHIP-14 severity was greater for trade/clerical workers than for management/professional workers, while high-volume services had a harmful association with oral HRQoL for a small number of blue collar workers. This was a statistically significant modifying effect of occupation on the relationship between volume and change in OHIP-14 severity. Greater complexity of care had a more beneficial association with oral HRQoL for management/professional workers than for trade/clerical workers, and, again, it had a harmful association with oral HRQoL for blue collar workers in what was another statistically significant interaction. In contrast, high cost dental care was beneficially associated with oral HRQoL in all strata of occupation, and there was no significant effect modification.

The associations of volume, complexity and cost of care with change in OHIP-14 severity were not significantly modified by employment status, although it again was notable that greater complexity was associated with poorer oral HRQoL in the unemployed stratum, just as greater complexity was associated with poorer oral HRQoL in the lowest-status category of employment.

Table 75: Relationship between change of OHIP-14 severity, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Socioeconomic factor‡ Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Occupation												
Manage/Prof/Para.	-1.44	-0.43	0.20	-1.24	-0.77	0.07	-1.71	-1.21	0.31	-2.59	-0.36	0.14
	-2.74,-0.15	-1.71,0.85		-2.95,0.48	-2.74,1.19		-3.05,-036	-3.26,0.83		-4.85,-0.34	-2.46,1.74	
n	45	24		24	19		24	21		26	19	
Trades/Clerical	-0.68	-0.87	0.39	-1.05	1.66	0.20	-1.21	0.17	0.20	-0.74	-0.43	0.35
	-2.70,1.35	-2.51,0.76		-2.96,0.87	-4.09,7.42		-2.88,0.47	-5.02,5.36		-3.32,1.75	-2.25,1.39	
n	36	33		24	9		23	13		27	9	
Blue Col./Lab.	-0.13	-1.51	0.71	-1.71	-1.21	0.31	-0.15	-0.11	0.92	-2.38	1.47	0.16
	-3.03,2.76	-5.26,2.24		-3.05,-0.36	-3.26,0.83		-11.11,10.80	-2.38,2.17		-5.00,0.23	-2.95,5.89	
n	15	15		24	21		8	7		9	6	
	Interaction	*p*=0.14		Interaction	*p*=0.45		Interaction	*p*=0.84		Interaction	*p*=0.05	
Employment status												
Employed	-0.89	-0.88	0.11	-1.16	0.08	0.04	-1.16	-0.59	0.12	-1.72	0.20	0.06
	-2.10,0.31	-1.93,0.18		-2.86,0.54	-2.00,1.83		-2.16,0.29	-2.45,1.26		-3.20,-0.24	-1.27,1.68	
n	96	72		55	33		55	41		62	34	
Not employed	-0.46	-1.07	0.77	-0.41	-0.41	0.67	-0.40	-0.58	0.77	-0.55	-0.33	0.53
	-1.37,0.45	-5.44,3.29		-1.64,0.81	-2.16,1.35		-1.31,0.51	-2.69,1.53		-1.35,0.25	-1.92,1.25	
n	78	6		48	24		52	26		48	30	
	Interaction	*p*=0.93		Interaction	*p*=0.40		Interaction	*p*=0.60		Interaction	*p*=0.08	

† Within stratum

‡ Crude association for all people is shown in Table 70

4.2.1.13 Association between dental attendance and change in OHIP-14 severity stratified by pattern of attendance

Consistent with the crude analysis, people who reported regularly visiting a dentist at least every 12 months who attended the dentist over the one year of this study had a marginally greater improvement in oral HRQoL relative to people who did not attend a dentist (Table 76). Of people who reported visiting a dentist less than 12 monthly, those who did not visit a dentist had a greater improvement in oral HRQoL. The stratum specific associations between dental attendance and change in OHIP-14 score did not differ to a statistically significant degree (p=0.77 for the interaction). Nor were the within-stratum associations statistically significant.

Among people who reported that they usually visited a dentist for a check-up, there was little difference in improvement in oral HRQoL, between those who did or did not attend a dentist. Among people who reported that they usually visited a dentist for a problem, those who did not visit a dentist had a greater improvement in oral HRQoL than those that attended a dentist. However, the interaction was not statistically significant and mean differences between attendees and non-attendees were not statistically significant in either stratum.

4.2.1.14 Association between volume, complexity and cost of dental care and change in OHIP-14 severity stratified by pattern of attendance

Within both strata classified according to regularity of dental attendance, those people who received low volume or cost of dental care had a greater improvement in oral HRQoL than those who received high volume or cost dental care, a similar result to that found in the crude analysis. In contrast to the crude analysis, of people who usually visit a dentist 12 monthly or less, those who received high complexity dental care had a greater improvement in oral HRQoL than those who received low complexity dental care. On the other hand, of people who usually attend a dentist less often than 12 monthly, those who received high complexity dental care had a worsening in oral HRQoL, and those who received low complexity dental care had an improvement in oral HRQoL. However, the within-stratum associations and the stratum specific associations between dental volume, complexity and cost and change in OHIP-14 score did not differ to a statistically significant degree.

Similar to the crude analysis, within both strata classified according to usual reason for dental attendance, those people who received low volume or cost dental care had a greater improvement in oral HRQoL than those who received high volume or cost dental care. In the stratum of people who usually visit a dentist for a problem the association was statistically significant (p=0.02). Among people who reported usually visiting a dentist for a problem, those who received low complexity dental care had an improvement in oral HRQoL while people who received high complexity dental care suffered deterioration in oral HRQoL, and the association was statistically significant (p=0.02). In contrast to the crude association of complexity of dental care with oral HRQoL, among people who reported usually visiting a dentist for a check-up, those who received high complexity dental care had a greater improvement in oral HRQoL than those who received low complexity dental care. The stratum specific associations between dental service volume, complexity and cost and change in OHIP-14 score, did not differ to a statistically significant degree (p=0.70 for the interaction).

Table 76: Relationship between change of OHIP-14 severity, the volume, complexity and cost of dental services and pattern of attendance

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Pattern of attendance reported at baseline‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
<u>Regularity</u>												
≤12 months	-1.00	-0.93	0.09	-0.79	-0.69	0.09	-0.86	-1.13	0.57	-1.38	-0.47	0.06
	-1.90,-0.26	-2.47,0.62		-1.77,0.19	-1.70,0.32		-1.75,0.02	-2.64,0.38		-2.71,-0.05	-1.65,0.71	
n	121	36		72	41		76	45		76	45	
> 12 months	-0.18	-0.59	0.28	-1.06	1.37	0.09	-0.77	0.68	0.20	-1.21	1.36	0.44
	-2.30,1.93	-1.69,0.51		-4.00,1.83	-1.81,4.56		-3.82,2.28	-2.16,3.51		-3.98,1.56	-1.11,3.84	
n	54	107		31	17		32	22		34	20	
	Interaction	*p*=0.77		Interaction	*p*=0.33		Interaction	*p*=0.38		Interaction	*p*=0.45	
<u>Usual reason</u>												
Check-up	-0.96	-0.95	0.19	-0.80	-0.63	0.26	-0.73	-1.34	0.81	-1.41	-0.31	0.11
	-1.76,-0.16	-2.49,0.59		-1.80,0.20	-1.75,0.49		-1.39,-0.07	-3.09,0.04		-2.45,-0.37	-1.54,0.93	
n	121	44		70	43		80	41		76	45	
Problem	-0.24	-0.58	0.33	-1.07	0.90	0.02	-1.11	0.56	0.02	-1.12	0.73	0.19
	-2.07,1.60	-1.69,0.53		-1.55,0.15	-2.05,3.86		-4.32,2.11	-1.64,2.77		-3.74,1.49	-1.51,2.96	
n	54	98		33	15		28	26		34	20	
	Interaction	*p*=0.81		Interaction	*p*=0.37		Interaction	*p*=0.20		Interaction	*p*=0.70	

† Within stratum

‡ Crude association for all people is shown in Table 70

4.2.1.15 Association between dental attendance and change in OHIP-14 severity stratified by access to dental care

Within strata classified according to eligibility for a health care card, differences in mean OHIP-14 change scores between people who visited a dentist and people who did not were greater than the crude difference (Table 77). Furthermore, among people who held a health care card, those who attended a dentist had a larger improvement in oral HRQoL than people who did not attend a dentist, consistent with the crude beneficial association between dental visits and oral HRQoL. The reverse was true for people who did not hold a health care card, but the association was not statistically significant (p=0.05). The interaction was not statistically significant.

Within the stratum of people who had none, hardly any or a little difficulty paying a $100 dental bill, the association showing that dentist attendance resulted in a lesser improvement in oral HRQoL than not attending a dentist was statistically significant (p=0.03). For people who had a lot of difficulty paying a $100 dental bill, those who attended a dentist had an improvement in oral HRQoL, while for those who did not attend a dentist oral HRQoL deteriorated, though the association was not statistically significant. The stratum specific associations between dental attendance and change in OHIP-14 score did not differ to a statistically significant degree (p=0.42 for the interaction).

Among people who avoided or delayed dental care due to cost, those who attended a dentist had a larger improvement in oral HRQoL than people who did not attend a dentist, consistent with the crude beneficial effect of dental visits. In contrast, dental attendance had the opposite association with oral HRQoL within the stratum of not avoiding or delaying dental care due to cost. However, the interaction was not statistically significant and mean differences between attendees and non-attendees were not statistically significant in either stratum.

4.2.1.16 Association between volume, complexity and cost of dental care and change in OHIP-14 severity stratified by access to dental care

Within both strata classified according to eligibility for a health care card, people who received low volume or cost dental care had a greater improvement in oral HRQoL relative to people who received high volume or cost dental care, a result similar to that in crude analysis. Further, for those people who did not hold a health care card, the association with dental service volume was statistically significant (p=0.03) but the association with dental service cost was not statistically significant (p=0.05). In contrast to the result found in crude analysis, in the health care card holders stratum people who received high complexity dental care had a greater improvement in oral HRQoL than people who received low complexity dental care. The opposite was true in the not hold a health care card stratum. The stratum specific associations between volume and cost of dental care and change in OHIP-14 score did not differ to a statistically significant degree (p=0.84 for the interaction).

Within both strata classified according to difficulty paying a $100 dental bill, people who received low volume or cost dental care had a greater improvement in oral HRQoL relative to people who received high volume or cost dental care, a result similar to that in the crude analysis. Further, for those people who had none, hardly any, or a little difficulty paying a $100 dental bill, the association with dental service volume was statistically significant (p=0.03) while the association with dental service cost was not statistically significant (p=0.05). There was no difference in the improvement in oral HRQoL with low and high complexity of dental care in the stratum of none, hardly any, or a little difficulty paying a $100 dental bill. Among people who had a lot of difficulty paying a $100 dental bill, those who received low complexity dental care had a larger improvement in oral HRQoL than people who received high complexity dental care, consistent with the crude beneficial association of low complexity dental care with oral HRQoL. In this stratum the association was not statistical significant (p=0.07). The stratum specific associations between dental service volume, complexity and cost and change in OHIP-14 score did not differ to a statistically significant degree.

Within both strata classified according to avoiding or delaying dental care due to cost, people who received low volume or cost dental care had a greater improvement in oral HRQoL relative to people who received high volume or cost dental care, a result similar to that in the crude analysis. For those people who reported they did not avoid or delay dental care due to cost, the association with dental service volume was not statistically significant (*p*=0.08) while in the stratum of people who reported having avoided or delayed dental care due to cost, the association with dental service cost was also not statistically significant (*p*=0.07).

Among people who avoided or delayed dental care due to cost, those who received low complexity dental care had a larger improvement in oral HRQoL than people who received high complexity dental care, consistent with the crude beneficial association of low complexity dental care with oral HRQoL. The opposite was true in the stratum of people who did not avoid or delay dental care due to cost. The stratum specific associations between dental service volume, complexity and cost and change in OHIP-14 score did not differ to a statistically significant degree (*p*=0.93 for the interaction).

Table 77: Relationship between change of OHIP-14 severity, the volume, complexity and cost of dental services and access to dental care

	Some or no dental services			Among those survey participants who visited a dentist								
				Volume of dental services			Complexity of dental services			Cost for dental services		
Access to dental care‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*†	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*†	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*†	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	*p*†
Health care card												
Yes	-0.83	-0.04	0.60	-1.71	0.07	0.62	-0.35	-2.04	0.88	-0.92	-0.68	0.63
	-2.13,0.46	-2.14,2.06		-3.36,-0.07	-1.77,1.91		-1.66,0.95	-5.12,1.03		-2.73,0.89	-2.24,0.87	
n	71	61		44	20		48	23		46	25	
No	-0.69	-1.08	0.05	-0.51	-0.18	0.03	-1.09	-0.24	0.17	-1.52	0.28	0.05
	-1.87,0.49	-2.04,-13		-2.14,1.11	-1.94,1.58		-2.61,0.43	-1.99,1.50		-3.14,0.10	-1.13,1.69	
n	104	82		59	38		60	44		64	40	
	Interaction	*P*=0.51		Interaction	*p*=0.84		Interaction	*p*=0.22		Interaction	*p*=0.37	
Diff. pay \$100 dental bill												
None, hardly any, a little	-0.73	-1.25	0.03	-0.80	-0.20	0.03	-0.73	-0.73	0.48	-0.94	-0.40	0.05
	-1.73,0.28	-2.21,-0.29		-1.82,0.22	-1.70,1.29		-1.57,0.12	-2.58,1.13		-2.23,0.35	-1.25,0.72	
n	147	100		88	49		96	51		94	53	
A lot	-0.75	0.77	0.10	-1.25	0.45	0.87	-1.48	-0.05	0.07	-3.91	1.74	0.55
	-4.45,2.95	-1.66,3.21		-7.23,4.73	-3.73,4.44		-8.42, 5.46	-3.43,3.33		-9.70,1.88	-0.71,4.18	
n	28	43		15	9		12	16		16	12	
	Interaction	*p*=0.42		Interaction	*p*=0.81		Interaction	*p*=0.67		Interaction	*p*=0.11	
Avoided due to cost												
Yes	-0.94	-0.14	0.59	-1.93	0.24	0.13	-1.79	-0.17	0.23	-1.42	-0.18	0.07
	-3.14,1.26	-1.82,1.53		-4.21,0.35	-4.34,4.83		-3.61,0.04	-4.27,3.94		-4.17,1.33	-3.82,3.47	
n	48	64		26	17		27	21		32	16	
No	-0.65	-1.07	0.06	-0.54	-0.29	0.08	-0.56	-0.80	0.57	-1.29	0.14	0.18
	-1.52,0.21	-2.20,0.05		-2.01,0.93	-1.02,0.45		-1.64,0.53	-2.26,0.66		-2.39.-0.18	-0.94,1.21	
n	127	79		77	41		81	46		78	49	
	Interaction	*p*=0.47		Interaction	*p*=0.50		Interaction	*p*=0.42		Interaction	*p*=0.93	

† Within stratum

‡ Crude association for all people is shown in Table 70

4.2.2 Change in mean EQ-5D

4.2.2.1 Association between dental attendance and change in EQ-5D stratified by main covariables

For the cohort of all people, the lack of any difference in EQ-5D change scores between people who attended the dentist and people who did not signified a lack of association of dental attendance with HRQoL (Table 78).

Within strata classified according to baseline OHIP-14 severity, the association was weak, and was not statistically significant for people who had a high baseline OHIP-14 score (p=0.08). However, the stratum specific associations between dental attendance and change in EQ-5D score did not differ to a statistically significant degree (p=0.43 for the interaction). Within the low baseline OHIP-14 severity stratum, people who attended the dentist had a marginally lesser improvement in HRQoL relative to people who did not attend a dentist, whereas dental attendance was associated with greater improvement in HRQoL in the high baseline OHIP-14 stratum.

Among people who reported a treatment need, those who attended a dentist had a marginal deterioration in HRQoL while people who did not attend a dentist, had an improvement in HRQoL. In contrast, dental attendance had the opposite assoiation with HRQoL within the stratum of no treatment needs. However, the interaction was not statistically significant and the mean difference between attendees and non-attendees was not statistically significant in the treatment need stratum. In the no treatment need stratum, the association was not statistically significant (p=0.05).

4.2.2.2 Association between volume, complexity and cost of dental care and change in EQ-5D stratified by main covariables

For the cohort of all people, the difference in OHIP-14 change scores between people who received a high volume, complexity or cost dental care and people who received low volume, complexity or cost dental care signified a beneficial association of high volume, complexity or cost dental care with HRQoL.

Within strata classified according to baseline OHIP-14 severity, people who received high volume dental care had a greater improvement in HRQoL relative to people who received low volume dental care, consistent with the crude analysis. The stratum specific associations between volume of dental care and change in OHIP-14 score differed to a statistically significant degree (p=0.04 for the interaction), though the within-strata associations were not statistically significant.

Within strata classified according to baseline OHIP-14 severity, people who received high complexity dental care had a greater improvement in HRQoL than people who received low complexity dental care. However, the within-stratum associations and the stratum specific associations between complexity of dental care and change in EQ-5D score did not differ to a statistically significant degree (p=0.52 for the interaction). Notable was the within low baseline OHIP-14 severity stratum finding that people who received high cost dental care had a statistically significant lesser improvement in HRQoL relative to people who received low cost dental care (p=0.01), whereas high cost dental care was associated with greater improvement in HRQoL in crude analysis. The stratum specific associations between cost of dental care and change in EQ-5D score was not statistically significant (p=0.08).

Among people who reported a treatment need, those who received high volume, complexity or cost dental care had a statistically significant larger improvement in HRQoL than people who received low volume, complexity or cost dental care, consistent with the crude beneficial association of high volume, complexity or cost dental care with HRQoL. In all three cases, the association was statistically significant. Further, the interaction with dental service cost was statistically significant (p<0.05).

Table 78: Relationship between change of EQ-5Dx100, the volume, complexity and cost of dental services and main covariables

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Main covariables[‡]	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*[†]	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*[†]	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*[†]	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*[†]
All people	-1.8	-1.8	0.50	-1.0	-3.2	0.27	-1.0	-3.0	0.23	-1.0	-3.0	0.01
	-3.8,0.1	-4.1,0.4		-3.8,1.9	-5.6,0.9		-3.4,1.5	-5.7,-0.3		-3.5,1.5	-5.5,-0.4	
n	173	138		103	57		107	66		109	64	
Main covariables												
Baseline OHIP												
Low (0-<5)	-1.7	-2.5	0.43	-1.3	-1.6	0.24	-1.2	-2.4	0.24	-1.9	-1.4	0.01
	-3.6,0.2	-6.0,0.9		-4.0,1.4	-3.8,0.6		-3.9,1.5	-5.2,0.3		-4.9,1.1	-3.4,0.6	
n	86	77		54	30		56	30		50	36	
High (5+)	-2.0	-0.8	0.08	-0.5	-4.8	0.32	-0.7	-3.5	0.28	-0.2	-4.8	0.39
	-05.0,01.0	-4.0,2.4		-5.2,4.2	-8.3,-1.3		-4.0,2.5	-7.9,0.9		-2.9,2.6	-9.3,0.3	
n	87	61		49	27		51	36		59	28	
	Interaction	*p*=0.43		Interaction	*p*=0.04		Interaction	*p*=0.52		Interaction	*p*=0.08	
Treatment need												
Yes	0.2	-5.1	0.53	1.7	-3.2	0.01	3.3	-2.1	0.04	3.1	-3.2	<0.01
	-2.0,2.4	-9.7,-0.5		-1.8,5.3	-6.6,0.2		0.5,6.0	-.5.0,0.8		-0.2,6.4	-6.6,0.1	
n	62	64		36	21		31	31		35	27	
No need	-2.9	0.8	0.05	-2.4	-3.3	0.90	-2.5	-3.9	0.60	-3.0	-2.8	0.42
	-5.5,-0.3	-0.8,2.4		-6.1,1.3	-6.4,-0.1		-5.5,0.6	-7.5,-0.2		-6.4,0.3	-5.9,0.3	
n	111	74		67	36		76	35		74	37	
	Interaction	*P*<0.01		Interaction	*p*=0.22		Interaction	*p*=0.18		Interaction	*P*<0.05	

[†] Within stratum

4.2.2.3 Association between dental attendance and change in EQ-5D stratified by oral diseases

Notable was the within-stratum finding that people with oral disease who visited a dentist had a greater improvement in HRQoL than people who did not, whereas the opposite was true in the no oral disease stratum (Table 79). The within-stratum and the stratum specific associations between dental attendance and change in EQ-5D score did not differ to a statistically significant degree (p=0.54 for the interaction).

4.2.2.4 Association between volume complexity and cost of dental care and change in EQ-5D by stratified oral diseases

Notable was the within-stratum finding that people without oral disease who received high volume, complexity or cost dental care had an improvement in HRQoL than people who received low volume, complexity or cost dental care, consistent with the crude analysis. Further the within-stratum associations were statistically significant (p=0.03 for both). People with oral disease who received a high volume complexity or cost dental care had lesser improvement in HRQoL than people who received a low volume, complexity or cost dental care. The stratum specific associations between volume, complexity and cost dental care and change in EQ-5D score did not differ to a statistically significant degree.

Table 79: Relationship between change of EQ-5Dx100, the volume, complexity and cost of dental services and oral diseases

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Oral diseases‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*†	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*†	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*†	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*†
Yes	-2.1	-0.8	0.70	-2.5	-2.0	0.73	-2.1	-2.0	0.72	-2.6	-1.4	0.79
	-7.1,3.0	-5.1,3.5		-8.5,3.6	-8.6,4.6		-8.5,4.3	-7.4,3.4		-9.7,4.5	-6.7,3.9	
n	43	33		26	14		23	20		27	16	
No disease	-1.7	-2.2	0.56	-0.4	-3.6	0.14	-0.6	-3.4	0.03	-0.4	-3.5	0.03
	-3.3,-0.2	-4.9,0.5		-2.9,2.0	-6.1,1.2		-2.6,1.4	-6.1,-0.7		-2.4,1.5	-6.1,-0.9	
n	130	105		77	43		84	46		82	48	
	Interaction	*p*=0.54		Interaction	*p*=0.40		Interaction	*p*=0.30		Interaction	*p*=0.25	

† Within stratum

‡ Crude association for all people is shown in Table 78

4.2.2.5 Association between dental attendance and change in EQ-5D stratified by sex and age

Within strata classified according to sex, the association was weak (Table 80). The stratum specific associations between dental attendance and change in EQ-5D score did not differ to a statistically significant degree (*p*=0.60 for the interaction). More notable was the opposite association of dental attendance with HRQoL within each sex stratum. Females who visited a dentist had a greater improvement in HRQoL than females who did not visit a dentist, while the opposite was true for males.

In the stratum aged 45 years or older but less than 65 years, those who attended a dentist had a lesser improvement in HRQoL than people who did not attend a dentist. In contrast, dental attendance had the opposite association with HRQoL within the other two age strata. The interaction was not statistically significant (*p*=0.05) and mean differences between attendees and non-attendees were not statistically significant in either stratum.

4.2.2.6 Association between volume, complexity and cost of dental care and change in EQ-5D stratified by sex and age

Within both strata classified according to sex, people who received high volume, complexity or cost dental care had a greater improvement in HRQoL than people who received low volume, complexity or cost dental care, consistent with the crude association. However, the within-stratum and stratum specific associations between dental service volume, complexity and cost and change in EQ-5D score did not differ to a statistically significant degree.

In the two strata of people aged 45 years or older, those who received high volume dental care had a larger improvement in HRQoL than people who received low volume dental care, consistent with the crude beneficial association of high volume dental care with HRQoL. In contrast, dental service volume did not have an association with HRQoL within the stratum of adults aged less than 45 years.

Within all three age strata, those who received high complexity dental care had a greater improvement in HRQoL than people who received lower complexity dental care, consistent with the crude beneficial association of dental service complexity with HRQoL. Notable was the within the three age strata finding that people who received high cost dental care had a greater improvement in HRQoL relative to people who received low cost dental care, consistent with the crude finding. Other than with adults aged less than 45 years and dental service cost, none of the within-stratum associations with age were statistically significant and none of the interactions of age with volume, complexity or cost of dental care were statistically significant.

Table 80: Relationship between change of EQ-5Dx100, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Socio-Demographic Factor[‡] Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*[†]	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*[†]	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*[†]	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	*p*[†]
Sex												
Male	-1.7	-2.6	0.48	-0.6	-3.0	0.31	-0.7	-2.8	0.11	-1.0	-2.3	0.10
	-5.7,2.2	-7.5,2.2		-6.6,5.5	-6.4,0.4		-5.9,4.5	-6.9,1.2		-7.5,5.5	-5.9,1.2	
n	65	49		32	28		36	29		33	32	
Female	-1.9	-1.1	0.16	-1.2	-3.7	0.25	-1.2	-3.2	0.39	-1.0	-4.2	0.10
	-3.1,-0.7	-3.1,0.8		-3.6,1.1	-6.2,-1.3		-3.2,0.8	-5.5,-0.9		-2.9,1.0	-6.8,-1.6	
n	108	89		71	29		71	37		76	32	
	Interaction	*p*=0.60		Interaction	*p*=0.97		Interaction	*p*=0.96		Interaction	*p*=0.61	
Age												
15 - <45 yrs	-2.4	-2.1	0.20	-2.8	-2.6	0.78	-1.4	-4.1	0.17	-2.1	-3.0	0.04
	-5.5,0.7	-6.4,2.2		-7.1,1.5	-7.8,2.7		-4.7,1.8	-9.5,1.2		-5.4,1.2	-8.9,2.9	
n	45	55		28	12		29	16		33	12	
45 - <60 yrs	-1.8	-3.3	0.78	-0.7	-3.4	0.35	-1.4	-2.2	0.47	0.0	-3.8	0.14
	-5.0,1.4	-7.2,0.5		-5.2.3.7	-6.7,-0.1		-5.6,2.8	-5.7,1.3		-4.5,4.5	-7.1,0.5	
n	65	45		35	25		36	29		30	27	
60+ yrs	-0.9	1.4	0.33	1.4	-4.3	0.26	0.1	-2.5	0.49	0.0	-1.9	0.22
	-2.9,1.1	-2.6,5.4		-1.8,4.5	-7.0,-1.6		-2.8,3.1	-5.5,0.5		-2.3,2.4	-5.6,1.9	
n	63	38		40	20		42	21		38	25	
	Interaction	*p*=0.05		Interaction	*p*=0.10		Interaction	*p*=0.58		Interaction	*p*=0.50	

[†] Within stratum

[‡] Crude association for all people is shown in Table 78

4.2.2.7 Association between dental attendance and change in EQ-5D stratified by country of birth and residential location

All but one of the people not born in Australia visited a dentist (Table 81). Thus 95% confidence intervals were not given for the stratum of people born elsewhere than Australia. In the Australian-born stratum those people who visited a dentist had a lesser improvement in HRQoL than those who did not visit a dentist. However, the within-stratum associations and the stratum specific associations between dental attendance and change in EQ-5D score did not differ to a statistically significant degree (*p*=0.40 for the interaction).

Within strata classified according to residential location, there was not much difference in mean EQ-5D change scores between people who visited a dentist and people who did not. The interaction was not statistically significant and mean differences between attendees and non-attendees were not statistically significant in either stratum.

4.2.2.8 Association between volume, complexity and cost of dental care and change in EQ-5D stratified by country of birth and residential location

Within both strata classified according to country of birth, those who received high volume, complexity or cost dental care had a greater improvement in HRQoL than those people who received low volume, complexity or cost dental care, consistent with the crude analysis. Further, the stratum specific associations between dental service volume and cost and change in EQ-5D score differed to a statistically significant degree (*p*<0.01 for both interactions).

Within both strata classified according to residential location, those who received high volume or complexity dental care had a larger improvement in HRQoL than people who received low volume or complexity dental care, consistent with the crude beneficial association of high volume and complexity dental care with HRQoL. Further, the interaction with dental service volume was statistically significant (*p*=0.04). Within strata classified according to residential location, the association was weak.

Table 81: Relationship between change of EQ-5Dx100, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socio-Demographic Factor‡ Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Country of Birth												
Australia	-2.1	-2.7	0.46	-1.9	-2.6	0.48	-1.7	-2.7	0.38	-2.0	-2.2	0.09
	-4.3,0.2	-5.1,-0.2		-5.0,1.2	-5.2,0.0		-4.4,1.1	-5.2,0.4		-4.6,0.6	-5.1,0.7	
n	114	117		84	48		89	55		89	59	
Other	-0.2	-10.5	0.05	4.9	-69.0	0.08	3.6	-5.2	0.09	5.2	-8.3	0.13
	-5.0,4.7	-		0.0,10.0	-134.0,0.0		-5.1,12.3	-11.1,0.8		-1.1,11.5	-15.5,-1.2	
n	29	1		19	9		18	11		20	9	
	Interaction	p=0.40		Interaction	P<0.01		Interaction	p=0.15		Interaction	P<0.01	
Location												
Hobart	-1.4	-0.5	0.30	-1.5	-1.4	0.22	-1.1	-1.8	0.53	-1.2	-1.5	0.06
	-4.6,1.8	-4.5,3.6		-5.8,2.8	-3.6,0.8		-5.4,3.3	-4.1,0.4		-6.2,3.7	-3.7,0.06	
n	86	50		54	30		55	31		52	34	
Other	-2.4	-2.5	0.18	-0.2	-5.6	0.25	-0.9	-4.2	0.12	-0.7	-0.5	0.15
	-5.0,0.3	-5.3,0.3		-4.4,3.9	-9.4,-1.7		-3.1,1.3	-9.2,0.8		-2.8,1.3	-9.9,0.06	
n	87	88		49	27		52	35		57	30	
	Interaction	p=0.75		Interaction	P=0.04		Interaction	p=0.40		Interaction	P=0.20	

† Within stratum

‡ Crude association for all people is shown in Table 78

4.2.2.9 Association between dental attendance and change in EQ-5D stratified by level of education and household income

Only two people who had degree or were a teacher or a nurse did not visit a dentist and so 95% confidence intervals were not given (Table 82). Within the two strata of people with some form of post-secondary education, dental attendance was associated with an improvement in HRQoL while those people who did not attend a dentist suffered deterioration in HRQoL. In the stratum of trade/diploma/certificate the association was statistically significant (p=0.01). Notable was the within without a post-secondary education stratum finding that people who attended the dentist had a lesser improvement in HRQoL relative to people who did not attend a dentist, though the association was not statistically significant. Also notable, the stratum specific associations between dental attendance and change in EQ-5D score differed to a statistically significant degree (p=0.01 for the interaction).

As found in the crude analysis, within the stratum of people with household incomes of $60,000 or more, differences in mean EQ-5D change scores between people who visited a dentist and people who did not were the same. Among people with a household income less than $30,000, those who attended a dentist had a larger improvement in HRQoL than people who did not attend a dentist. In contrast, dental attendance had the opposite, adverse association with HRQoL within the stratum of household income between $30,000 and less than $60,000. The interaction was not statistically significant and mean differences between attendees and non-attendees were not statistically significant in any of the three strata.

4.2.2.10 Association between volume, complexity and cost of dental care and change in EQ-5D stratified by level of education and household income

Within the degree/teacher/nurse and the trade/diploma/certificate strata, the differences in mean EQ-5D change scores between people who received low and high volume, complexity or cost dental care were exaggerated compared to the crude difference and the within-stratum associations were statistically significant other than in the case of the trade/diploma/certificate stratum and dental service volume (p=0.05). Within the no post-secondary education stratum the association with dental service volume, complexity and cost were not statistically significant. The stratum specific associations between low and high dental care volume, complexity and cost and change in EQ-5D score differed to a statistically significant degree.

Within the two strata of household income less than $60,000, those who received high volume, complexity and cost dental care had a larger improvement in HRQoL than people who received low volume, complexity and cost dental care, consistent with the crude beneficial association of high volume dental care with HRQoL. In contrast, high volume and complexity dental care had the opposite association with HRQoL within the stratum of household income of $60,000+. The association was statistically significant for dental service volume and cost within the stratum of between $30,000 and less than $60,000. Within the $60,000+ stratum the association with dental service complexity was not statistically significant (p=0.05). None of the interactions with dental service volume, complexity and cost were statistically significant.

Table 82: Relationship between change of EQ-5Dx100, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socioeconomic factor‡ Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
<u>Level of education</u>												
Deg./Teach/Nurse	-1.6	6.3	0.77	-0.5	-3.3	0.19	-0.4	-2.9	0.03	0.5	-3.9	0.08
	-4.5,1.3	-		-1.8,0.8	-76,0.9		-1.6,0.8	-9.3,3.4		-0.9,1.9	-8.6,0.7	
n	49	2		22	25		28	21		26	23	
Trade/Dip./Cert.	-2.8	2.2	0.01	0.1	-6.3	0.05	-0.5	-5.6	0.04	-0.6	-5.5	<0.01
	-6.6,0.9	-0.8,5.2		-4.2,4.4	-12.0,-0.6		-5.3,4.2	-10.4,-0.9		-5.3,4.1	-11.0,0.0	
n	55	50		35	16		35	20		35	20	
No Post Sec. Edu.	-2.3	-4.1	0.81	-3.8	0.0	0.40	-3.4	-0.6	0.15	-4.2	0.3	0.86
	-5.0,0.3	-7.9,-0.2		-8.0,0.5	-2.3,3.1		-7.5,0.6	-3.5,2.4		-8.0,-0.4	-2.4,3.0	
n	59	63		37	15		35	24		39	20	
	Interaction	p=0.01		Interaction	P<0.01		Interaction	P<0.01		Interaction	P<0.01	
<u>Household income</u>												
Less than \$30,000	-3.2	-2.7	0.25	-2.0	-4.6	0.62	-2.2	-4.4	0.89	-2.0	-5.1	0.47
	-6.9,0.4	-8.0,2.6		-7.8,3.7	-9.3,0.0		-9.2,4.7	-7.4,-1.3		-8.1,4.1	-9.9,-0.2	
n	59	62		36	18		33	26		36	23	
\$30,000-<\$60,000	0.5	-0.5	0.18	2.5	-4.1	0.02	1.4	-0.9	0.28	2.4	-1.8	<0.01
	-1.7,2.7	-2.5,1.6		-0.1,5.1	-9.4,1.2		-2.2,5.0	-5.3,3.4		-0.1,5.6	-5.8,2.1	
n	51	40		31	16		35	16		32	19	
\$60,000+	-1.9	-1.9	0.54	-2.0	-1.1	0.63	-1.6	-2.2	0.05	-2.2	-1.5	0.27
	-4.2,0.4	-5.0,1.2		-5.7,1.8	-3.8,1.5		-5.2,1.9	-5.0,0.7		-5.8,1.5	-4.2,1.1	
n	51	29		30	19		29	22		31	20	
	Interaction	p=0.84		Interaction	p=0.23		Interaction	p=0.76		Interaction	p=0.35	

† Within stratum

‡ Crude association for all people is shown in Table 78

4.2.2.11 Association between dental attendance and change in EQ-5D stratified by occupation and employment status

Within both strata classified according to occupation, those who attended the dentist had a greater improvement in HRQoL relative to people who did not attend a dentist (Table 83). However, the three within-stratum associations and the stratum specific associations between dental attendance and change in EQ-5D score did not differ to a statistically significant degree (p=0.96 for the interaction).

Among people who were employed, those who attended a dentist had a larger improvement in HRQoL than people who did not attend a dentist. In contrast, dental attendance had the opposite association with HRQoL within the stratum of not employed, but in this category there were only five survey participants who did not visit a dentist resulting in a wide 95% confidence interval. The interaction was not statistically significant and mean differences between attendees and non-attendees were not statistically significant in either stratum.

4.2.2.12 Association between volume, complexity and cost of dental care and change in EQ-5D stratified by occupation and employment status

In the occupation stratum of manager/professional/paraprofessional the result was consistent with the crude finding where people who received high volume, complexity or cost dental care have a greater improvement in HRQoL than people who received low volume, complexity or cost dental care. In the case of dental service complexity the within-stratum association was statistically significant. Otherwise the opposite was true. Within the two strata classified according to occupations of trades/clerical worker and blue collar worker/labourer, high volume and complexity dental care was associated with a lesser improvement in HRQoL than low volume and complexity dental care and the within-stratum associations were not statistically significant. The stratum specific associations between low and high dental service volume and complexity and change in EQ-5D score differed to a statistically significant degree.

Notable was the within trades/clerical worker stratum finding that people who received high cost dental care had a statistically significant greater improvement in HRQoL relative to people who received low cost dental care (p<0.01), a trend that was consistent with the crude analysis. The direction of the association was the same within the manager/professional/paraprofessional stratum, but the association was not statistically significant. In contrast, in the blue collar worker/labourer stratum, high cost dental care was associated with a lesser improvement in HRQoL than low cost dental care. However, the stratum specific associations between low and high complexity of dental care and change in EQ-5D score did not differ to a statistically significant degree (p=0.57 for the interaction).

The improvement in HRQoL was similar for employed people who received low and high volume, complexity and cost dental care. For unemployed people, those who received high volume, complexity or cost dental care had an improvement in HRQoL while those who received low volume, complexity or cost dental care suffered deterioration in HRQoL, consistent with the crude beneficial association of high dental service volume, complexity and cost with HRQoL. However, within-stratum associations and the interactions were not statistically significant.

Table 83: Relationship between change of EQ-5Dx100, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Socioeconomic factor‡ Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*†	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*†	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*†	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*†
Occupation												
Manage/Prof/Para.	-1.4	0.8	0.16	-0.5	-3.0	0.45	-0.1	-2.7	0.02	0.6	-3.4	0.16
	-4.6,1.7	-2.3,3.9		-2.0,0.9	-7.8,1.9		-0.9,0.8	-8.6,3.3		-1.0,2.2	-8.6,1.8	
n	45	24		24	19		24	21		26	19	
Trades/Clerical	-1.5	-0.1	0.07	-1.9	-1.7	0.09	-2.2	-0.5	0.44	-1.3	-2.4	<0.01
	-5.3,2.2	-3.6,3.4		-7.3,3.5	-5.4,1.9		-8.2,3.8	-3.4,2.4		-6.2,3.6	-6.8,2.0	
n	36	33		24	9		23	13		27	9	
Blue Col./Lab.	-4.2	-3.1	0.74	-7.3	-2.1	0.74	-4.8	-3.6	0.77	-8.3	-1.4	0.23
	-9.7,1.2	-12.9,6.6		-25.4,10.7	-9.2,5.0		-2.2,12.6	-9.3,2.1		-19.7,3.1	-5.7,2.9	
n	15	12		7	5		8	7		9	6	
	Interaction	*p*=0.96		Interaction	*p*=0.04		Interaction	*p*=0.57		Interaction	*P*<0.01	
Employment status												
Employed	-2.1	-0.4	0.12	-2.5	-2.5	0.37	-2.0	-2.3	0.26	-1.8	-2.6	0.11
	-4.6,0.3	-2.6,1.8		-6.4,1.3	-5.5,0.4		-5.5,1.6	-5.3,0.6		-5.2,1.7	-5.5,0.3	
n	96	69		55	33		55	41		62	34	
Not employed	-1.3	-11.0	0.42	1.6	-5.7	0.21	0.6	-5.0	0.24	0.7	-4.00	0.07
	-3.5,0.9	-29.1,7.2		-1.6,4.9	-10.1,-1.3		-2.1,3.3	-9.1,-0.9		-2.0,3.1	-8.3,0.3	
n	76	5		48	23		51	25		47	29	
	Interaction	*p*=0.19		Interaction	*p*=0.16		Interaction	*p*=0.14		Interaction	*p*=0.30	

† Within stratum

‡ Crude association for all people is shown in Table 78

4.2.2.13 Association between dental attendance and change in EQ-5D stratified by pattern of attendance

Notable was the within regularity of attendance of at least 12 monthly, stratum finding that people who attended the dentist had a lesser improvement in HRQoL relative to people who did not attend a dentist (Table 84). In contrast, among less regular dental attendees, those who attended the dentist had a greater improvement in HRQoL relative to people who did not attend a dentist. However, the within-stratum associations and the stratum specific associations between dental attendance and change in OHIP-14 score did not differ to a statistically significant degree (*p*=0.21 for the interaction).

Among people who usually attended a dentist for a check-up, those who attended a dentist had a statistically significant lesser improvement in HRQoL than people who did not attend a dentist (*p*=0.02). Dental attendance had the opposite, adverse association with HRQoL within the stratum of usually attending for a problem. However, the within stratum association for problem attendees and the interaction were not statistically significant.

4.2.2.14 Association between volume, complexity and cost of dental care and change in EQ-5D stratified by pattern of attendance

Within both strata classified according to regularity of dental attendance, people who received high volume, complexity or cost dental care had an equal or greater improvement in HRQoL relative to people who received low volume, complexity or cost dental care, consistent with the crude analysis. Low and high dental service complexity was associated with the same improvement in HRQoL within the stratum of less regular dental attendees. Within the more regular dental attendees, the association with dental service complexity was statistically significant. However, the stratum specific associations between low and high dental service volume, complexity and cost and change in EQ-5D score did not differ to a statistically significant degree.

Within both strata classified according to usual reason for dental attendance, those who received high volume, complexity or cost dental care had a larger improvement in HRQoL than people who received low volume, complexity or cost dental care, consistent with the crude beneficial association of high volume, complexity and cost dental care with HRQoL. For people who usually visit a dentist for a check-up, the within-stratum associations were statistically significant (p=0.03) but not for people who usually visited a dentist with a problem. Further, none of the interactions were statistically significant.

Table 84: Relationship between change of EQ-5Dx100, the volume, complexity and cost of dental services and pattern of attendance

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Pattern of attendance reported at baseline[‡]	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
Regularity												
≤12 months	-1.2	-4.7	0.24	-0.3	-2.6	0.12	0.0	-2.9	0.01	-0.1	-2.6	0.03
	-3.3,0.9	-12.2,2.8		-3.1,2.4	-5.4,0.1		-2.5,2.5	-6.2,0.6		-2.8,2.6	-5.9,0.7	
n	121	34		73	40		76	45		76	45	
> 12 months	-3.2	-0.6	0.25	-2.2	-4.8	0.64	-3.2	-3.2	0.58	-2.8	-3.8	0.54
	-6.8,0.4	-3.0,1.8		-7.0,2.5	-8.8,-0.9		-8.2,1.8	-6.8,0.4		-7.7,2.0	-8.4,0.8	
n	52	104		30	17		31	21		33	19	
	Interaction	p=0.21		Interaction	p=0.95		Interaction	p=0.37		Interaction	p=0.66	
Usual reason												
Check-up	-2.0	-3.1	0.02	-1.3	-4.0	0.03	-1.3	-3.4	0.02	-0.9	-3.6	0.01
	-4.3,0.2	-8.8,2.5		-4.2,1.6	-6.9,-12.0		-3.6,1.1	-7.0,0.2		-3.3,1.4	-6.7,-0.6	
n	122	42		71	43		81	41		76	46	
Problem	-1.3	-1.1	0.35	-0.2	-1.5	0.58	-0.1	-2.4	0.90	-1.1	-1.6	0.80
	-4.4,1.7	-3.4,1.2		-4.7,4.3	-4.5,1.5		-5.2,2.9	-5.4,0.6		-6.1,4.0	-5.3,2.0	
n	51	95		32	14		26	25		33	18	
	Interaction	p=0.75		Interaction	p=0.33		Interaction	p=0.96		Interaction	p=0.47	

† Within stratum

‡ Crude association for all people is shown in Table 78

4.2.2.15 Association between dental attendance and change in EQ-5D stratified by access to dental care

Notable was the opposite association of dental attendance within the two health care card strata of dental attendance with HRQoL (Table 85). Within the did not hold a health care card stratum, people who attended the dentist had a greater improvement in HRQoL relative to people who did not attend a dentist, while the opposite was true in the did hold a health care card stratum. However, the within-stratum associations and the stratum specific associations between dental attendance and change in OHIP-14 score did not differ to a statistically significant degree (p=0.33 for the interaction).

Among people who reported none, hardly any, or a little difficulty paying a $100 dental bill, those who attended a dentist had a larger improvement in HRQoL than people who did not attend a dentist but the association was not statistically significant (p=0.06). In contrast, dental attendance had the opposite association with HRQoL within the stratum of having a lot of difficulty paying a $100 dental bill and the association was not statistically significant. The interaction was not statistically significant.

Among people who reported avoiding or delaying dental care due to cost, those who attended a dentist had a larger improvement in HRQoL than people who did not attend a dentist but the association was not statistically significant. The opposite association of dental attendance with HRQoL occurred in the stratum of people who reported not avoiding or delaying dental care due to cost, but in this stratum, the association was not statistically significant (p=0.05). However, the stratum specific associations between dental attendance and change in EQ-5D score did not differ to a statistically significant degree (p=0.52 for the interaction).

4.2.2.16 Association between volume, complexity and cost of dental care and change in EQ-5D stratified by access to dental care

Within both strata classified according to eligibility for a health care card, people who received high volume complexity or cost dental care had a greater improvement in HRQoL relative to people who received low volume, complexity or cost dental care, consistent with the crude analysis. However, the stratum specific associations between low and high dental service volume, complexity and change in EQ-5D score did not differ to a statistically significant degree. The only within-stratum association that was statistically significant was with people not holding a health care card and cost of dental care (p=0.04).

Within the stratum of people who reported none, hardly any, or little difficulty paying a $100 dental bill, people who received high volume, complexity or cost dental care had a greater improvement in HRQoL relative to people who received low volume, complexity or cost dental care, consistent with the crude analysis. This association was statistically significant for dental service cost (p=0.02), but was not statistically significant in the case of dental service complexity (p=0.05). Within the stratum of people who had a lot of difficulty paying a $100 dental bill, people who received high complexity or cost dental care had lesser improvement in HRQoL relative to people who received low complexity or cost dental care, in contrast with the crude analysis. None of the interactions for were statistically significant.

Within both strata classified according to avoiding or delaying dental care due to cost, people who received high volume, complexity or cost dental care had a greater improvement in HRQoL relative to people who received low volume, complexity or cost dental care, consistent with the crude analysis. The within-stratum association was statistically significant for people who had not avoided or delayed dental care due to cost for volume and complexity of dental care (both p=0.03). However, the stratum specific associations between low and high dental service volume, complexity and cost and change in EQ-5D score did not differ to a statistically significant degree.

Table 85: Relationship between change of EQ-5Dx100, the volume, complexity and cost of dental services and access to dental care

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
	Visited a	Did not visit		Low	High		Low	High		Low	High	
	dentist	a dentist		1-6 items	7+ items		1-1.25	>1.25		\$1-\$499	\$500+	
Access to	Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean	
dental care[‡]	95%CIs	95%CIs	$p^{\dagger}$	95%CIs	95%CIs	$p^{\dagger}$	95%CIs	95%CIs	$p^{\dagger}$	95%CIs	95%CIs	$p^{\dagger}$
<u>Health care card</u>												
Yes	-1.6	-3.8	0.41	0.0	-5.3	0.40	-0.6	-4.3		-0.9	-3.1	
	-4.6,1.3	-9.0,1.4		-4.7,4.7	-8.7,-1.7		-4.6,3.5	-8.4,-0.3	0.45	-5.4,3.6	-7.8,1.7	0.22
n	69	59		44	19		47	22		45	24	
No	-1.9	-0.6	0.14	-1.4	-2.7	0.16	-1.2	-2.7	0.09	-1.0	-0.29	0.04
	-4.1,0.3	-2.3,1.0		-4.1,1.4	-5.6,1.0		-4.0,1.6	-5.7,0.3		-3.9,1.8	-5.7,0.2	
n	104	79		59	38		60	44		64	40	
	Interaction	*p*=0.33		Interaction	*p*=0.29		Interaction	*p*=0.45		Interaction	*p*=0.93	
<u>Diff. pay \$100 bill</u>												
None - a little	-1.6	-0.1	0.06	-0.6	-3.1	0.15	-0.5	-3.2	0.05	-0.6	-3.0	0.02
	-4.1,0.9	-1.9,1.8		-3.8,2.5	-5.6,-0.6		-3.2,2.2	-6.4,0.1		-3.5,2.3	-6.2,0.1	
n	147	98		89	49		96	51		93	54	
A lot	-3.2	-6.7	0.44	-2.4	-4.3	0.43	-4.2	-2.3	0.63	-3.8	-2.8	0.60
	-8.0,1.5	-12.4,-1.1		-9.8,4.9	-10.9,2.4		-13.5,5.0	-6.0,1.4		-13.6,6.0	-7.2,1.6	
n	26	40		14	8		11	15		16	10	
	Interaction	*p*=0.19		Interaction	*p*=0.74		Interaction	*p*=0.33		Interaction	*p*=0.50	
<u>Avoided due to cost</u>												
Yes	-3.8	-2.3	0.66	-0.5	-5.4	0.81	-0.10	-6.3	0.42	-1.4	-7.5	0.61
	-7.6,0.0	-5.1,0.6		-6.5,5.5	-9.9,-0.9		-6.1, 4.0	-10.8,-1.7		-5.9,2.9	-13.0,-1.9	
n	48	61		26	17		27	21		30	16	
No	-1.1	-1.6	0.05	-1.1	-2.3	0.03	-1.0	-1.3	0.28	-0.8	-1.5	0.03
	-2.9,0.7	-5.5,2.4		-3.6,1.4	-4.6,0.0		-3.1,1.1	-3.8,0.9		-3.0,1.4	-3.5,0.6	
n	125	77		77	40		80	45		77	48	
	Interaction	*p*=0.52		Interaction	*p*=0.78		Interaction	*p*=0.13		Interaction	*p*=0.09	

[†] Within stratum

[‡] Crude association for all people is shown in Table 78

4.2.3 Global oral health transition statements

4.2.3.1 Association between dental attendance and global oral health transition score stratified by main covariables

For the cohort of all people, the difference in global oral health transition scores between people who attended the dentist (mean = -0.79) and people who did not (mean = 2.44) and the statistical significance of the association (*p*=0.02) signified a beneficial association of dental attendance with oral HRQoL (Table 86).

The crude favourable association with oral HRQoL is repeated within all strata – in fact, the within-stratum magnitude of difference between visit and non-visit groups tends to be greater than the crude magnitude of difference between visit and non-visit groups, even though within stratum associations with oral HRQoL sometimes are not statistically significant. This suggests the crude finding, although significant, is underestimated due to confounding by baseline OHIP and treatment need.

4.2.3.2 Association between volume, complexity and cost of dental care and global oral health transition score stratified by main covariables

The crude associations with oral HRQoL differed according to explanatory variable. The association of more care with oral HRQoL was favourable when amount of care was indexed as volume or cost; but association of more care with oral HRQoL was adverse when amount of care was indexed as complexity.

Within low baseline OHIP-14 severity stratum, people who received high volume dental care had a deterioration in oral HRQoL while those who received low volume dental care had an improvement in oral HRQoL, the opposite to the crude association. With complexity of dental care it was the within high baseline OHIP-14 severity stratum finding that was opposite to the crude result where people who received high complexity dental care had an improvement in oral HRQoL while those who received low complexity dental care had a deterioration in oral HRQoL. With cost of dental care, within both the strata classified according to baseline OHIP-14 severity, the association was similar to the crude association. None of the baseline OHIP-14 severity within-stratum associations were statistically significant and only the stratum specific associations between dental service volume and global oral transition score differed to a statistically significant degree (p<0.01 for the interaction).

Among people who reported a treatment need, the association was inflated for volume and cost of dental care compared to the crude analysis and in both cases the association was statistically significant. However, among people who reported a treatment need, the association was reduced for complexity of dental care compared to the crude analysis. None of the other within-stratum associations or the interactions was statistically significant.

Table 86: Relationship between mean global oral health statement x 10, the volume, complexity and cost of dental services and main covariables

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Main covariables‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*†	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*†	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*†	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*†
All people	-0.79	2.44	0.02	-0.34	-1.84	0.11	-1.24	-0.18	0.62	1.06	-3.23	0.13
	-2.76,1.72	0.41,4.47		-2.86,2.18	-5.40,1.72		-3.56,1.09	-3.09,2.73		-0.23,2.35	-7.47,1.01	
n	176	144		104	58		109	67		110	66	
Main covariables												
Baseline OHIP												
Low (0-<5)	-1.25	2.02	0.29	-2.60	1.03	0.14	-2.55	0.93	0.92	0.35	-2.76	0.06
	-4.43,1.94	-1.34,5.37		-6.29,1.09	-3.45,5.52		-6.16,1.05	-4.10,5.96		-0.67,0.74	-10.01,4.49	
n	87	78		54	30		57	30		51	36	
High (5+)	-0.34	3.02	0.01	2.52	-4.50	0.23	0.29	-1.08	0.88	2.00	-3.74	0.71
	-2.80,2.11	1.62,4.42		-0.54,5.59	-9.01,0.01		-2.56,3.13	-5.18,3.01		-0.83,4.84	-8.08,0.59	
n	89	66		50	28		52	37		59	30	
	Interaction	*p*=0.89		Interaction	*P*<0.01		Interaction	*p*=0.29		Interaction	*p*=0.40	
Treatment need												
Yes	0.16	5.21	0.12	2.09	-2.88	<0.01	0.12	0.20	0.48	2.65	-2.67	0.01
	-3.19,3.51	1.93,8.50		-1.26,5.44	-12.40,6.64		-3.15,3.38	-4.84,5.24		-0.82,6.11	-9.32,3.97	
n	63	66		37	21		31	32		35	28	
No need	-1.32	0.23	0.12	-1.67	-1.33	0.56	-1.70	-0.54	0.56	0.27	-3.57	0.990
	-3.60,0.96	-0.61,1.07		-5.08,1.74	-4.56,1.89		-4.62,1.22	-4.36,3.27		-0.83,1.37	-8.63,1.50	
n	113	78		67	67		78	35		75	38	
	Interaction	*p*=0.14		Interaction	*p*=0.30		Interaction	*p*=0.79		Interaction	*p*=0.70	

† Within stratum

4.2.3.3 Association between dental attendance and global oral health transition score stratified by oral diseases

Notable was the within oral disease stratum finding that people who attended the dentist had a statistically significant greater improvement in oral HRQoL relative to people who did not attend a dentist (*p*<0.01), consistent with the crude analysis (Table 87). Within the no oral disease stratum, people who attended the dentist had a lesser deterioration in oral HRQoL relative to people who did not attend a dentist. Further, the stratum specific associations between dental attendance and global oral health transition score differed to a statistically significant degree (*p*=0.02 for the interaction).

4.2.3.4 Association between volume, complexity and cost of dental care and global oral health transition score stratified by oral diseases

Among people with an oral disease, those who received high volume or high cost dental care had a statistically significant larger improvement in oral HRQoL than people who received low volume or cost dental care (*p*<0.01), consistent with the crude beneficial association of high volume and high cost dental care with oral HRQoL. Within both the oral disease strata, people who received high complexity dental care had a greater improvement or a lesser deterioration in oral HRQoL relative to people who received low complexity dental care, in the same direction to the crude analysis. However, the within-stratum associations and the stratum specific associations between dental service complexity and global oral health transition score did not differ to a statistically significant degree (*p*=0.77 for the interaction). Other than among people with an oral disease and volume or cost dental care, the within-stratum associations were not statistically significant. The stratum specific associations between dental service volume, complexity or cost of dental care and global oral health transition score did not differ to a statistically significant degree.

Table 87: Relationship between mean global oral health statement x 10, the volume, complexity and cost of dental services and oral disease

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Oral disease[‡]	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean (95%CIs)	*p*[†]	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*[†]	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*[†]	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*[†]
Yes	-4.53	3.28	<0.01	-3.66	-6.97	<0.01	-5.62	-3.28	0.68	-0.17	-9.66	<0.01
	-9.34,0.29	1.36,5.20		-12.75,5.43	-13.48,-0.45		-13.52,2.29	-8.34,1.78		-4.74,4.40	17.39,-1.94	
n	44	35		26	15		24	20		27	17	
No disease	0.53	2.15	0.18	0.82	-0.07	0.20	0.15	1.10	0.91	1.47	-0.75	0.59
	-1.12,2.18	-0.20,4.50		-0.50,2.13	-3.85,3.71		-1.13,1.43	-2.07,4.27		0.35,2.60	-4.69,3.20	
n	132	109		78	43		85	47		83	49	
	Interaction	*p*=0.02		Interaction	*p*=0.59		Interaction	*p*=0.77		Interaction	*p*=0.19	

[†] Within stratum

[‡] Crude association for all people is shown in Table 86

4.2.3.5 Association between dental attendance and global oral health transition score stratified by sex and age

Similar to the crude analysis, in both strata classified according to sex, people who attended the dentist had a greater improvement or a lesser deterioration in oral HRQoL relative to people who did not attend a dentist (Table 88). For males the association was statistically significant (p<0.01), but for females it was not statistically significant (p=0.08). However, the stratum specific associations between dental attendance and global oral health transition score did not differ to a statistically significant degree (p=0.16 for the interaction).

Similar to the crude analysis, in all three strata classified according to age, people who attended the dentist had an improvement in oral HRQoL while people who did not attend a dentist had deterioration in oral HRQoL. Furthermore, among people aged between 45 and less than 60 years, the association was statistically significant (p=0.02). However, the interaction was not statistically significant.

4.2.3.6 Association between volume, complexity and cost of dental care and global oral health transition score stratified by sex and age

Notable was the within male stratum finding that those who received high volume dental care had a lesser improvement in oral HRQoL relative to people who received low volume dental care, whereas high volume dental care was associated with greater improvement in oral HRQoL in the crude analysis. This association in males was not statistically significant (p=0.06). With females, the association was in the same direction as in the crude analysis, but was not statistically significant. With complexity of dental care it was the female stratum that was opposite to crude analysis. Females who received high complexity dental care had a lesser deterioration in oral HRQoL relative to females who received low complexity dental care, while with males, the association was amplified and in the same direction as the crude analysis. Within both strata classified according to sex, those who received high cost dental care had a greater improvement in oral HRQoL than those who received low cost dental care, similar to the crude analysis. However, the within-stratum and the stratum specific associations between dental service volume, complexity or cost and global oral health transition score did not differ to a statistically significant degree.

In contrast to the crude analysis, among adults aged less than 45 years, those who received high volume dental care had a deterioration in oral HRQoL while people who received low volume dental care had an improvement in oral HRQoL. Dental service volume had the opposite association with oral HRQoL within the other two age strata. The interaction was statistically significant (p=0.03) but the mean differences between those who received high and low volume dental care were not statistically significant in any of the three strata.

People aged between 45 and less than 60 years who received high complexity dental care had a greater improvement in oral HRQoL relative to those who received low complexity dental care, whereas high complexity dental care was associated with lesser improvement in oral HRQoL in crude analysis. In the other two age strata, those who received high complexity dental care had a deterioration in oral HRQoL, while those who received low complexity dental care had an improvement in oral HRQoL. The interaction was statistically significant ($p<0.05$), but mean differences between those who received low and high complexity dental care were not statistically significant in either stratum.

Within all three strata classified according to age, those who received high cost dental care had an improvement in oral HRQoL while those who received low cost dental care suffered deterioration in oral HRQoL, similar to the crude analysis. However, the within-stratum and the stratum specific associations between dental service cost and global oral health transition score did not differ to a statistically significant degree ($p=0.33$ for the interaction).

Table 88: Relationship between mean global oral health statement x 10, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Socio-Demographic Factor‡ Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*†	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*†	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*†	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*†
Sex												
Male	-2.00	2.93	<0.01	-2.73	-1.61	0.06	-3.45	-0.41	0.32	-0.13	-3.49	0.32
	-5.52,1.52	-0.84,6.60		-8.47,3.01	-6.17,2.16		-8.52,1.63	-4.69,3.87		-2.80,2.54	-9.15,2.18	
n	66	59		32	29		37	29		33	33	
Female	0.52	2.02	0.08	1.39	-2.36	0.33	0.72	0.16	0.52	1.88	-2.69	0.64
	-0.93,1.98	0.98,3.07		0.09,2.68	-7.43,2.71		-0.35,1.79	-4.07,4.39		0.52,3.25	-6.90,1.52	
n	110	94		72	29		72	38		77	33	
	Interaction	*p*=0.16		Interaction	*p*=0.22		Interaction	*p*=0.36		Interaction	*p*=0.70	
Age												
15 - <45 yrs	-0.38	2.91	0.10	-0.90	0.33	0.21	-1.96	2.31	0.79	0.92	-2.65	0.70
	-4.51,3.75	-0.61,6.43		-6.56,4.76	-6.85,7.52		-6.67,2.75	-3.92,8.55		-1.16,3.00	-15.19,9.88	
n	45	56		28	12		29	16		33	12	
45 - <60 yrs	-1.80	3.17	0.02	0.73	-4.94	0.15	-0.32	-3.20	0.59	1.08	-4.94	0.46
	-4.30,0.71	1.71,3.18		-2.33,3.79	-8.33,1.55		-2.95,2.30	-7.10,0.69		-1.69,3.85	-8.25,-1.63	
n	65	48		35	25		36	29		38	27	
60+ yrs	-0.29	2.52	0.21	-0.50	-0.57	0.97	-0.90	0.70	0.91	1.31	-1.96	0.39
	-1.96,1.38	0.48,4.55		-2.66,1.67	-5.05,3.91		-3.24,1.43	-1.71,3.11		-0.75,3.38	-5.44,1.52	
n	66	40		41	21		44	22		39	27	
	Interaction	*p*=0.81		Interaction	*p*=0.03		Interaction	*P*<0.05		Interaction	*p*=0.33	

† Within stratum
‡ Crude association for all people is shown in Table 86

4.2.3.7 Association between dental attendance and global oral health transition score stratified by country of birth and residential location

Only one of the survey participants from a country other than Australia did not visit a dentist (Table 89) and hence 95% confidence interval results were not given for this category. Within both strata classified according to country of birth, people who attended the dentist had a greater improvement in oral HRQoL than people who did not attend a dentist. As in the crude analysis, in both strata the association was statistically significant. However, the stratum specific associations between dental attendance and global oral health transition score did not differ to a statistically significant degree (p=0.59 for the interaction).

Within both strata classified according to residential location, those who attended a dentist had a larger improvement or a lesser deterioration in oral HRQoL than people who did not attend a dentist, consistent with the crude beneficial association of dental visits with oral HRQoL. Further, for Tasmanians who reside outside of Hobart the association was statistically significant (p=0.01) but for Hobart residents it was not statistically significant (p=0.08). The interaction was not statistically significant.

4.2.3.8 Association between volume, complexity and cost of dental care and global oral health transition score stratified by country of birth and residential location

In both countries of birth strata, volume and cost of dental care had results consistent with the crude analysis. Notable was the not born in Australia stratum finding that people who received high complexity dental care had an improvement in oral HRQoL while people who received low complexity dental care suffered deterioration in oral HRQoL, whereas high complexity dental care was associated with a lesser improvement in oral HRQoL in the crude analysis. The relationship was reversed for people born in Australia. None of the within-stratum associations were statistically significant but the stratum specific associations between dental service complexity and global oral health transition score differed to a statistically significant degree (p=0.02 for the interaction).

Within both strata classified according to residential location, volume and cost of dental care gave similar results to the crude analysis. Among people who live in Hobart, those who received high complexity dental care had a lesser improvement in oral HRQoL than people who received low complexity dental care, consistent with the crude association. High dental care complexity was associated with a lesser deterioration in oral HRQoL within the stratum of living in Tasmania outside of Hobart. However, the within-stratum associations and the stratum specific associations between dental service volume, complexity or cost and global oral health transition score did not differ to a statistically significant degree.

Table 89: Relationship between mean global oral health statement x 10, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Socio-Demographic Factor[‡] Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Country of Birth												
Australia	-0.56	2.48	0.01	-0.43	-1.11	0.11	-1.46	0.71	0.83	1.20	-2.80	0.42
	-2.56,1.65	0.73,4.89		-3.33,2.46	-4.95,2.72		-4.12,1.20	-2.29,3.12		-0.17,2.57	-7.40,1.80	
n	147	123		85	49		91	56		90	57	
Other	-2.35	0.00	0.03	0.26	-5.96	0.18	0.26	-5.76	0.20	0.25	-6.30	0.05
	-6.20,1.49	-		-2.32,2.85	-14.72,2.80		-2.40,2.93	-13.16,1.64		-2.22,2.71	-15.86,3.27	
n	29	1		19	9		18	11		20	9	
	Interaction	p=0.59		Interaction	p=0.16		Interaction	p=0.02		Interaction	p=0.55	
Location												
Hobart	-1.70	1.02	0.08	-1.58	-1.93	0.36	-2.48	-0.51	0.89	0.43	-4.09	0.42
	-5.04,1.64	-0.66,2.70		-5.84,2.69	-7.38,3.52		-6.44,1.47	-5.77,4.74		-1.36,2.22	-11.06,2.88	
n	88	52		55	31		56	32		52	36	
Other	0.26	3.11	0.01	1.39	-1.73	0.09	0.34	0.17	0.99	1.70	-2.00	0.52
	-2.22,2.74	0.21,6.01		-1.14,3.92	-2.96,3.50		-2.29,2.97	-3.28,3.62		-0.47,3.87	-7.07,3.07	
n	88	92		49	27		53	35		58	30	
	Interaction	p=0.96		Interaction	p=0.49		Interaction	p=0.53		Interaction	p=0.83	

[†] Within stratum
[‡] Crude association for all people is shown in Table 86

4.2.3.9 Association between dental attendance and global oral health transition score stratified by level of education and household income

Only two people who had a degree or were a teacher or a nurse did not visit a dentist and so 95% confidence intervals were not given in that category (Table 90). Within all three strata classified according to level of education, people who attended the dentist had a greater improvement in oral HRQoL relative to people who did not attend a dentist, similar to the crude analysis.

Within all three strata classified according to household income, people who attended the dentist had either a greater improvement or lesser deterioration in oral HRQoL relative to people who did not attend a dentist, similar to the crude analysis. Further, within the stratum of income between \$30,000 and less than \$60,000, the association was statistically significant (p=0.01).

4.2.3.10 Association between volume, complexity and cost of dental care and global oral health transition score stratified by level of education and household income

For people with a post-secondary education, mean scores of global oral health transition were lower for people receiving a high volume, high complexity or high cost of dental services than for people receiving low levels of dental services, signifying a beneficial association of dental care with oral HRQoL in this stratum. These associations were statistically significant for subjects in the Trade/Diploma/Certificate category for volume and cost, but not for complexity of dental service. Of the people without a post-secondary school education, higher volume or complexity of dental service was associated with a small harmful association with oral HRQoL, while the opposite was true for cost of dental service. However, these associations were not statistically significant. Education was a statistically significant modifier of the associations of both volume and complexity of care with oral HRQoL.

Within all three strata classified according to household income, those who received high volume or high cost dental care had a larger improvement in oral HRQoL than people who received low volume or low cost dental care, consistent with the crude beneficial association of high volume and high cost dental care with oral HRQoL. The beneficial treatment associations observed for volume and cost of dental care were somewhat more pronounced in the mid-income stratum than in other income strata, although there was no significant effect modification. In contrast with the crude detrimental association of high complexity dental care with oral HRQoL, within the $60,000+ household income stratum, those who received high complexity dental care had a larger improvement in oral HRQoL than people who received low complexity dental care. The association was reversed in the other two household income strata. The slightly harmful treatment association of complexity with oral HRQoL is somewhat more pronounced in low- and mid-income than in high income, but there was no significant effect modification.

Table 90: Relationship between mean global oral health statement x 10, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
	Visited a dentist	Did not visit a dentist		Low 1-6 items	High 7+ items		Low 1-1.25	High >1.25		Low $1-$499	High $500+	
Socioeconomic factor[‡] Table A	Mean 95%CIs	Mean 95%CIs	*p*[†]	Mean 95%CIs	Mean 95%CIs	*p*[†]	Mean 95%CIs	Mean 95%CIs	*p*[†]	Mean 95%CIs	Mean 95%CIs	*p*[†]
Level of education												
Deg./Teach/Nurse	-1.43	0.00	0.98	-0.22	-2.58	0.56	-0.14	-2.50	0.69	-0.18	-2.78	0.76
	-3.84,0.98	-		-1.16,0.72	-7.53,2.38		-1.99,1.16	-7.88,2.87		-0.98,0.61	-8.59,3.03	
n	49	2		22	25		28	21		26	23	
Trade/Dip./Cert.	-1.05	0.49	<0.01	1.76	-5.21	<0.01	-0.14	-2.23	0.38	2.13	-4.79	<0.01
	-3.66,1.57	-0.48,1.46		-1.65,1.57	-7.37,-3.06		-3.39,3.11	-6.08,1.62		-1.27,5.53	-7.29,-2.28	
n	57	51		35	17		37	20		36	21	
No Post Sec. Edu.	-0.08	3.89	0.02	-1.87	3.20	0.26	-2.74	4.08	0.72	1.54	-2.37	0.27
	-4.43,4.27	0.56,7.21		-7.53,3.79	-4.91,11.31		8.30,2.83	0.70,7.46		-0.13,3.22	-13.69,8.94	
n	60	67		38	15		35	25		39	21	
	Interaction	*p*=0.41		Interaction	*p*<0.01		Interaction	*p*<0.01		Interaction	*p*=0.68	
Household income												
Less than $30,000	1.84	4.63	0.12	3.00	-0.48	0.64	0.91	2.94	0.53	3.97	-1.13	0.88
	-0.88,4.56	1.11,8.15		-0.73,6.74	-6.76,5.79		-2.07,3.89	-1.64,7.53		0.14,7.80	-5.72,3.46	
n	61	66		37	19		34	27		36	25	
$30,000-<$60,000	-2.19	0.90	0.01	-2.39	-3.10	0.02	-3.38	-0.32	0.65	1.49	-6.78	0.08
	-6.15,2.36	-0.47,2.27		-9.08,4.29	-6.41,0.21		-10.02,3.27	-3.87,3.24		-1.39,4.36	-14.63,1.07	
n	51	42		31	16		35	16		32	19	
$60,000+	-1.23	1.86	0.18	-0.77	-1.84	0.62	-0.75	-1.79	0.66	-0.74	-1.81	0.51
	-4.36,1.91	-0.22,3.95		-2.22,0.68	-9.07,5.40		-2.23,0.74	-8.78.5.20		-2.09,0.62	-9.07,5.43	
n	51	29		30	19		29	22		31	20	
	Interaction	*p*=0.98		Interaction	*p*=0.61		Interaction	*p*=0.58		Interaction	*p*=0.21	

[†] Within stratum

[‡] Crude association for all people is shown in Table 86

4.2.3.11 Association between dental attendance and global oral health transition score stratified by occupation and employment status

For all three occupational groupings, there was a small beneficial association of dental attendance with oral HRQoL which did not vary markedly between strata, and there was not a statistically significant interaction between global oral health transition statement, occupation and dental attendance (Table 91).

There was a significant beneficial association of dental attendance with oral HRQoL for both employed and unemployed and they tended to be of a greater magnitude than the crude association of dental attendance with oral HRQoL, but employment was not a significant modifier of the association of dental attendance with global oral health transition statement, employment status and visiting a dentist.

4.2.3.12 Association between volume, cost and complexity of dental care and global oral health transition score stratified by occupation and employment status

The beneficial association of high-volume dental services with global oral health was greater for trade/clerical workers than for management/professional workers, while high-volume services had a harmful association with oral HRQoL for the small number of blue collar workers. This was a statistically significant modifying effect of occupation on the relationship between volume and oral HRQoL. Greater complexity of care had a more beneficial association with oral HRQoL for management/professional workers than for trade/clerical workers, and again, it had a harmful association for blue collar workers in what was another statistically significant interaction. In contrast, high cost dental care was beneficially associated with oral HRQoL in all strata of occupation, and there was no significant effect modification.

The associations of volume, complexity and cost of care with oral HRQoL were not significantly modified by employment status, although it again was notable that greater complexity was associated with poorer oral HRQoL in the unemployed stratum, just as greater complexity was associated with poorer oral HRQoL in the lowest-status category of employment.

Table 91: Relationship between mean global oral health statement x 10, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socioeconomic factor[‡] Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
<u>Occupation</u>												
Manage/Prof/Para.	-1.85	0.52	0.50	0.50	-3.99	0.69	0.08	-3.56	0.80	0.44	-4.02	0.45
	-4.29,0.58	-1.75,2.80		-0.10,1.97	9.05,1.07		-1.01,1.17	-8.49,1.39		-0.86,1.74	-9.69,1.64	
n	45	24		24	19		24	21		26	19	
Trades/Clerical	0.18	2.18	0.01	1.51	-3.69	0.07	-0.70	1.58	0.81	0.55	-1.31	0.40
	-3.13,3.49	-0.16,4.51		-2.25,5.27	-10.31,2.92		-4.24,2.84	-4.94,7.99		-3.25,4.36	-6.45,3.83	
	36	33		24	9		23	13		27	9	
Blue Col./Lab.	-0.50	2.11	0.57	-6.19	6.20	0.57	-6.01	5.84	0.09	2.30	-2.49	0.02
	-13.28,12.28	-0.82,5.04		-31.89,19.51	2.71,9.68		-31.11,26.09	2.97,8.30		-4.81,9.42	-32.25,27.26	
n	15	15		7	5		8	7		9	6	
	Interaction	p=0.91		Interaction	p<0.01		Interaction	p<0.01		Interaction	p=0.90	
<u>Employment status</u>												
Employed	-0.89	1.65	0.04	-0.45	-1.63	0.21	-1.62	-0.05	0.63	0.80	-3.13	0.53
	-3.70,1.93	0.39,2.91		-4.44,3.55	-6.53,3.26		-5.27,2.03	-4.24,4.14		-1.04,2.65	-9.32,3.05	
n	96	72		55	33		55	41		62	34	
Not employed	-0.27	3.20	<0.01	-0.16	-1.38	0.20	-0.14	-0.54	0.09	1.57	-2.81	0.06
	-1.71,1.17	-3.25,9.65		-2.07,1.74	-5.03,2.27		-2.17,1.90	-2.98,1.91		-0.14,3.27	-6.38,0.76	
n	79	6		49	24		53	26		48	31	
	Interaction	p=0.55		Interaction	p=0.92		Interaction	p=0.57		Interaction	p=0.90	

† Within stratum

‡ Crude association for all people is shown in Table 86

4.2.3.13 Association between dental attendance and global oral health transition score stratified by pattern of attendance

Within strata classified according to regularity of dental attendance, people who attended the dentist had either greater improvement or lesser deterioration in oral HRQoL relative to people who did not attend a dentist, consistent with the crude analysis (Table 92). Further, within the stratum of visiting a dentist less regularly than 12 monthly, the association was statistically significant (p=0.01). However, the stratum specific associations between dental attendance and global oral health transition score did not differ to a statistically significant degree (p=0.13 for the interaction).

The tendency was for problem-based dental attendees to experience a greater beneficial association of attendance, volume or cost with oral HRQoL than people who went for a check-up. However, usual reason for attendance did not significantly modify the association of dental care with oral HRQoL.

4.2.3.14 Association between volume, complexity and cost of dental care and global oral health transition score by pattern of attendance

Favourable associations of dental care with oral HRQoL was more pronounced for people whose last dental visit was more than a year ago compared to people who attended in the preceding 12 months. This was noted for all four measures of dental care. However, the apparent difference in treatment association between recent- and non-recent dental attendees was statistically significant only for cost of care. In fact, the mean improvement of -11.3 for high-cost care people in the stratum that last visited more than 12 months ago was the largest mean improvement in oral HRQoL observed in any of these tables.

Within both strata classified according to usual reason for dental visit, those who received high volume or high cost dental care had a larger improvement in oral HRQoL than people who received low volume or low cost dental care, consistent with the crude beneficial association of high volume dental care. However, within both strata classified according to the usual reason for dental visit, those who received high complexity dental care had lesser improvement in oral HRQoL than people who received low complexity dental care, in contrast with the crude beneficial association of high complexity dental care. However, none of the interactions were statistically significant and mean differences between low and high complexity dental care were not statistically significant in any stratum.

Table 92: Relationship between mean global oral health statement x 10, the volume, complexity and cost of dental services and pattern of attendance

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Pattern of attendance reported at baseline‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*†	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*†	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*†	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	*p*†
<u>Regularity</u>												
≤12 months	0.66	2.21	0.34	0.58	0.70	0.20	0.03	1.52	0.51	1.19	0.01	0.40
	-1.06,2.39	-3.15,7.58		-0.70,1.86	-2.83,4.23		-1.23,1.30	-1.27,4.32		0.22,2.17	-3.77,3.79	
n	122	36		73	41		77	45		76	46	
> 12 months	-4.05	2.54	0.01	-2.16	-8.69	0.23	-3.98	-4.15	0.50	0.79	-11.35	0.50
	-8.29,0.19	1.51,3.57		-9.23,4.90	-14.94,-2.45		-10.57,2.60	-10.08,1.78		-2.70,4.28	-17.66,-5.05	
n	54	108		31	17		32	22		34	20	
	Interaction	*p*=0.13		Interaction	*p*=0.13		Interaction	*p*=0.71		Interaction	*P*<0.01	
<u>Usual reason</u>												
Check-up	-0.11	2.46	0.23	0.11	-0.68	0.29	-0.18	0.00	0.99	0.70	-1.26	0.99
	-1.46,1.24	-3.08,8.00		-1.07,1.28	-3.26,1.90		-1.39,1.04	-1.99,2.00		-0.24,1.63	-4.25,1.72	
n	122	45		71	43		81	41		76	46	
Problem	-2.27	2.38	0.03	-1.35	-4.24	0.21	-4.24	-0.46	0.99	1.95	-6.86	0.38
	-7.55,3.01	1.42,3.33		-9.49,6.78	-16.36,7.88		-12.11,3.63	-7.19,6.27		-2.03,5.92	-18.37,4.65	
n	54	98		33	15		28	26		34	20	
	Interaction	*p*=0.57		Interaction	*p*=0.71		Interaction	*p*=0.47		Interaction	*p*=0.25	

† Within stratum

‡ Crude association for all people is shown in Table 86

4.2.3.15 Association between dental attendance and global oral health transition score stratified by access to dental care

Within strata classified according to eligibility for a health care card, to difficulty paying a $100 dental bill, and to avoiding or delaying dental care due to cost, people who attended the dentist had either greater improvement or lesser deterioration in oral HRQoL relative to people who did not attend a dentist, consistent with the crude analysis (Table 93). Within the holding a health care card stratum, both strata of difficulty paying a $100 dental bill, and the not avoiding or delaying dental care due to cost stratum, the associations were statistically significant.

4.2.3.16 Association between volume, complexity and cost of dental care and global oral health transition score stratified by access to dental care

People with a health care card tended to have a more favourable association of dental care (i.e. attendance, volume and cost) with oral HRQoL than people who did not have a health care card. Again, greater complexity tended to have a negative association with the global oral health transition statement, although this adverse treatment association was not statistically significant within strata of health care card eligibility. The apparent modifying effect of health care card eligibility on relationship between dental care and oral HRQoL was statistically significant only when dental care was measured as cost.

Except for people who had a lot of difficulty paying a $100 dental bill stratum and complexity of dental care, those people who received high volume, complexity or cost dental care had a greater improvement in oral HRQoL than people who received low volume, complexity or cost of dental care.

For the volume, complexity and cost of dental care, the people who avoided or delayed care due to cost received a greater beneficial association of high values of dental care on oral HRQoL than people who did not avoid or delay due to cost. This was statistically significant when dental care was measured as volume of service.

Table 93: Relationship between mean global oral health statement x 10, the volume, complexity and cost of dental services and access to dental care

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Access to dental care‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
Health care card												
Yes	0.21	4.45	<0.01	1.86	-4.46	<0.01	-0.15	1.18	0.94	3.59	-5.72	0.03
	-2.13,2.56	1.00,7.90		-1.56,5.28	-7.56,-1.37		-2.79,2.48	-4.70,7.05		0.76,6.42	-8.86,-2.57	
n	72	62		45	20		49	23		46	26	
No	-1.20	1.20	0.12	-1.36	-1.16	0.50	-1.84	-0.50	0.97	-0.15	-2.43	
	-3.83,1.42	0.20,2.21		-4.63,1.91	-5.57,3.25		-5.10,1.42	-4.63,3.63		-1.61,1.31	-7.79,2.92	0.70
n	104	82		59	38		60	44		64	40	
	Interaction	*p*=0.44		Interaction	*p*=0.05		Interaction	*p*=0.99		Interaction	*p*=0.02	
Diff. pay \$100 bill												
None- a little	-0.45	1.82	0.03	0.02	-1.32	0.19	-0.10	-0.97	0.11	0.33	-1.58	0.28
	-2.34,1.44	0.31,2.05		-1.32,1.37	-4.86,2.21		-1.63,1.43	-4.61,2.67		-0.86,1.53	-5.29,2.14	
n	148	101		89	49		97	51		94	54	
A lot	-2.55	5.82	0.03	-1.90	-6.13	0.10	-8.21	2.96	0.20	6.00	-9.30	0.68
	-11.07,5.97	0.54,11.10		-14.72,10.92	-20.38,18.12		-18.60,2.16	-5.60,11.51		-0.49,12.49	-19.46,0.86	
n	28	43		15	9		12	16		16	12	
	Interaction	*p*=0.18		Interaction	*p*=0.65		Interaction	*p*=0.06		Interaction	*p*=0.02	
Avoided due to cost												
Yes	0.82	2.09	0.10	5.78	-5.82	0.16	2.82	-1.01	0.71	4.42	-4.92	0.18
	-2.89,4.52	0.72,3.46		2.27,9.28	-13.04,1.41		-0.08,5.72	-7.78,5.76		0.26,8,59	-13.02,3.18	
n	48	64		26	17		27	21		32	16	
No	-1.39	2.68	0.02	-2.31	-0.17	0.47	-2.38	0.24	0.92	-0.32	-2.69	0.74
	-3.79,1.02	-0.43,5.79		-5.10,0.48	-4.16,3.82		-5.04,0.28	-3.24,3.79		-1.06,0.43	-7.85,2.46	
n	128	80		78	41		82	46		78	50	
	Interaction	*p*=0.30		Interaction	*P*<0.01		Interaction	*p*=0.10		Interaction	*p*=0.14	

† Within stratum

‡ Crude association for all people is shown in Table 86

4.2.4 Global general health transition statements

4.2.4.1 Association between dental attendance and global general health transition score stratified by main covariables

The crude finding was for favourable associations with HRQoL of: dental attendance (p<0.01, where the net difference was 1.4 - 0.7 = 0.7 benefit); higher volume (p<0.01); and higher cost (p=0.03) (Table 94). There was a weak beneficial association of complexity (p=0.84). There was no statistically significant modification of these associations by baseline OHIP score or perceived treatment needs. Furthermore, the magnitude of treatment associations with oral HRQoL within strata were mostly similar to the magnitude of the crude associations, suggesting little confounding of the crude associations either by baseline OHIP score or perceived treatment need.

Within strata classified according to baseline OHIP-14 severity, people who attended the dentist had either greater improvement or lesser deterioration in HRQoL relative to people who did not attend a dentist, and in both strata the relationship was statistically significant consistent with the crude analysis. The stratum specific associations between dental attendance and global general health transition score did not differ to a statistically significant degree (p=0.38 for the interaction).

For people with a treatment need, visiting a dentist had a greater adverse influence on their global general health transition statements than not visiting a dentist, though this relationship was not statistically significant. People without a treatment need who visited a dentist had a improvement and those who didn’t visit a deterioration in their HRQoL, and the relationship was statistically significant. There was a statistically significant interaction between dental attendance and global general health transition score.

4.2.4.2 Association between volume, complexity and cost of dental care and global general health transition score stratified by main covariables

The association of more care with HRQoL was favourable when amount of care was indexed as volume, complexity or cost. The association was not statistically significant for complexity of dental care but was for volume and cost of dental service.

Within both strata of baseline OHIP-14 severity, the association of more care with oral HRQoL was favourable for two of the measures of dental care in cases. The exception was with people with a low baseline OHIP-14 severity and complexity of dental care, where more care was associated with a lesser improvement in HRQoL. However, only with people with a high baseline OHIP-14 severity and volume of dental care was the within stratum association statistically significant. There were not any statistically significant interactions between the global general health transition statement, baseline OHIP severity and volume, complexity or cost of dental services.

Survey participants with a treatment need had a lesser deterioration of general health if they received more rather than less care, whether it was measured by volume, complexity or cost of dental service, though the relationships were not statistically significant. People without a treatment need had a greater improvement in general health if they received high rather than a low volume, complexity or cost of dental service. In the case of volume of dental services the relationship was statistically significant, but not in the case of complexity and cost of dental services. There were not any statistically significant interactions between the global general health transition statement, treatment need and either volume, complexity or cost of dental services.

Table 94 Relationship between (global general health statement x 10), the volume, complexity and cost of dental services and main covariables

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Main covariables‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean (95%CIs)	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
All people	0.75	1.40	<0.01	0.70	-1.17	<0.01	0.39	-0.37	0.84	0.99	-1.23	0.03
	-0.86,1.01	0.22,2.58		-0.45,1.86	-2.93,0.60		-0.88,1.66	-1.88,1.14		-0.35,2.33	-2.74,0.49	
n	176	144		104	58		109	67		110	66	
Main covariables												
<u>Baseline OHIP</u>												
Low (0-<5)	-1.15	1.14	0.03	-0.95	-1.96	0.31	-1.41	-0.72	0.30	-0.77	-1.59	0.84
	-2.65,0.35	-0.94,3.22		-2.45,0.56	-4.51,0.59		-3.22,0.40	-2.84,1.41		-3.04,1.49	-3.84,0.65	
n	87	78		54	30		57	30		51	36	
High (5+)	1.30	1.77	0.03	2.80	-0.43	0.01	2.48	-0.08	0.26	2.61	-0.60	0.16
	-0.31,2.91	0.25,3.28		0.05,5.55	-2.99,2.12		0.12,4.83	-1.92,1.75		0.48,4.74	-2.71,1.50	
n	89	66		50	28		54	37		59	30	
	Interaction	*p*=0.38		Interaction	*p*=0.53		Interaction	*p*=0.11		Interaction	*p*=0.20	
<u>Treatment need</u>												
Yes	1.74	1.03	0.75	2.00	1.44	0.59	3.02	0.82	0.55	3.04	0.27	0.70
	0.35,3.14	-0.91,2.97		-0.30,4.31	-0.90,3.78		0.26,5.79	-0.65,2.28		1.28,4.80	-1.90,2.45	
n	63	66		37	21		31	32		35	28	
No need	-0.84	1.70	<0.01	-0.01	-2.45	<0.01	-0.51	-1.51	0.61	-0.03	-1.99	0.21
	-2.14,0.45	0.55,2.85		-1.25,1.23	-4.68,-0.22		-2.01,0.98	-3.96,0.95		-1.74,1.69	-3.95,-0.03	
n	113	78		67	37		78	35		75	38	
	Interaction	*p*=0.02		Interaction	*p*=0.27		Interaction	*p*=0.58		Interaction	*p*=0.66	

† Within stratum

4.2.4.3 Association between dental attendance and global general health transition score stratified by oral diseases

In both strata of oral disease, dental attendance was associated with a favourable general health compared to not visiting a dentist (Table 95). For people with an oral disease, this relationship was not statistically significant (*p*=0.07) and was statistically significant for people without an oral disease (*p*<0.01). There was not a statistically significant interaction between the global general health transition statement, dental disease and dental attendance.

4.2.4.4 Association between volume, complexity and cost of dental care and global general health transition score stratified by oral diseases

The association of more care with HRQoL was favourable except in the case of people with an oral disease and complexity of dental care. However, the only within-stratum association that was statistically significant was with people without an oral disease and volume of dental care. There was not a statistically significant interaction between the global general health transition statement, oral diseases and either volume, complexity, or cost of dental services.

Table 95: Relationship between global general health statement x 10, the volume, complexity and cost of dental services and oral disease

	Some or no dental services			Among those survey participants who visited a dentist								
				Volume of dental services			Complexity of dental services			Cost for dental services		
Oral disease[‡]	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Yes	-1.18	1.65	0.07	-1.22	-2.14	0.50	-1.29	-1.06	0.80	-0.59	-1.89	0.33
	-3.32,0.95	-0.87,4.17		-4.57,2.12	-5.62,1.35		-4.77,2.19	-3.60,1.48		-4.14,2.96	-4.63,0.86	
n	44	35		26	15		24	20		27	17	
No disease	0.52	1.32	<0.01	1.37	-0.83	<0.01	0.93	-0.08	0.57	1.52	-0.83	0.22
	-0.92,1.97	0.19,2.49		-0.45,3.20	-2.78,1.11		-1.23,3.09	-1.65,1.49		-0.63,3.67	-2.60,0.93	
n	132	109		78	43		85	47		83	49	
	Interaction	p=0.32		Interaction	p=0.78		Interaction	p=0.63		Interaction	p=0.69	

† Within stratum

‡ Crude association for all people is shown in Table 94

4.2.4.5 Association between dental attendance and global general health transition score stratified by sex and age

For females, dental attendance had a favourable HRQoL (Table 96), and the association was either statistically significant (p=0.01) but for males the realtioship was not statistically significant (p=0.06). There was not a statistically signification interaction between the global general health transition statement, sex and dentist visiting (p=0.63).

More care had a favourable association with HRQoL for people aged 45 years or older and an unfavourable association with HRQoL for younger adults. However, the within-stratum association was only statistically significant for people aged between 45 and under 60 years. There was not a statistically significant interaction between the global general health transition statement, age and visiting a dentist.

4.2.4.6 Association between volume, complexity and cost of dental care and global general health transition score stratified by sex and age

For both sexes, dental attendance had a favourable association with HRQoL. However, other than in the case of males and volume, the relationships were not statistically significant. There were not any statistically significant interactions between sex with volume, complexity and cost of dental service.

For both sexes, with volume and cost of dental care, more care was associated with a favourable association with HRQoL. However, the relationships were not statistically significant. Although none of the relationships between age and complexity of dental care were statistically significant, a similar result was found for those aged between 45 and 60 years, otherwise high complexity dental care had an unfavourable association with HRQoL. There were not any statistically significant interactions between the global general health transition statement, age with volume, complexity or cost of dental care.

Table 96: Relationship between global general health statement x 10, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socio-Demographic Factor[‡] Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Sex												
Male	0.35	1.39	0.06	1.54	-1.16	0.02	0.79	-0.14	0.88	1.88	-0.88	0.88
	-1.11,1.80	-0.66,3.45		-0.93,4.00	-3.92,1.60		-1.46,3.04	-2.70,2.42		-1.01,4.78	-3.06,1.31	
n	66	50		32	29		37	29		33	33	
Female	-0.22	1.41	0.01	0.10	-1.19	0.06	0.04	-0.70	0.63	0.38	-1.64	0.40
	-1.31,0.86	0.32,2.51		-1.25,1.45	-3.43,1.06		-1.47,1.56	-2.39,0.98		-0.84,1.59	-3.65,0.37	
n	110	94		72	29		72	38		77	33	
	Interaction	*p*=0.63		Interaction	*p*=0.52		Interaction	*p*=0.94		Interaction	*p*=0.74	
Age												
15 - <45 yrs	0.98	0.70	0.11	0.54	-1.01	0.10	-0.15	0.52	0.87	0.21	-0.09	0.31
	-1.57,1.77	-1.31,2.71		-2.05,3.13	-4.13,2.11		-2.95,2.65	-1.85,2.89		-2.56,2.97	-2.50,2.32	
n	45	56		28	12		29	16		33	12	
45 - <60 yrs	-0.48	1.71	0.01	0.69	-1.80	0.06	1.14	-2.02	0.50	1.26	-2.38	0.36
	-2.99,2.03	0.45,2.98		-3.01,4.39	-5.45,1.85		-2.55,4.84	-4.95,0.91		-2.15,4.68	-5.49,0.73	
n	65	48		35	25		36	29		38	27	
60+ yrs	0.67	2.60	0.10	0.93	-0.37	0.07	0.57	0.83	0.84	2.21	-0.92	0.09
	-0.54,1.88	-0.17,5.37		-0.75,2.61	-3.09,2.35		-1.43,2.58	-0.67,2.34		0.48,3.93	-2.92,1.07	
n	66	40		41	21		44	22		39	27	
	Interaction	*p*=0.50		Interaction	*p*=0.89		Interaction	*p*=0.18		Interaction	*p*=0.22	

[†] Within stratum
[‡] Crude association for all people is shown in Table 94

4.2.4.7 Association between dental attendance and global general health transition score stratified by country of birth and residential location

Only one of the survey participants from a country other than Australia did not visit a dentist (Table 97) and hence 95% confidence interval results were not given for this category. Dental attendance had a statistically significant association with HRQoL for people born in Australia. There was not a statistically significant interaction between the global general health transition statement, country of birth and dentist visiting.

There was a statistically significant association of dental attendance with HRQoL for Hobart residents. For those Tasmanians who lived outside of Hobart, dental attendance was associated with unfavourable association with HRQoL, although the association was not statistically significant. There was a statistically significant interaction between the global general health transition statement, residential location and dentist attendance.

4.2.4.8 Association between volume, complexity and cost of dental care and global general health transition score stratified by country of birth and residential location

No matter whether they were born in Australia or not, more care was associated with a favourable association with HRQoL. The relationship was statistically significant only in the case of people born in Australia and volume of dental services. There were not any statistically significant interactions between the global general health transition statement, country of birth with volume, complexity or cost of dental care.

More care was associated with a favourable association with HRQoL in both strata of residential location. The relationship was statistically significant only in the case of Hobart residents and volume of dental services. There were not any statistically significant interactions between the global general health transition statement, whether the subject lived in Hobart or elsewhere in Tasmania with volume, complexity or cost of dental care.

Table 97: Relationship between global general health statement x 10, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Socio-Demographic Factor‡ Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*†	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*†	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*†	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*†
<u>Country of Birth</u>												
Australia	-0.27	1.27	<0.01	0.32	-1.61	0.01	-0.38	-0.59	0.94	0.64	-1.44	0.28
	-1.33,0.79	0.04,2.50		-1.01,1.66	-3.72,0.50		-1.51,1.43	-2.20,1.02		-0.95,2.24	-3.20,0.32	
n	147	123		85	49		91	56		90	57	
Other	2.32	0	0.20	3.11	1.32	0.16	3.30	1.03	0.38	3.10	1.13	0.09
	-0.17,4.81	-		-0.01,6.24	-4.73,7.36		-0.72,7.33	-4.50,6.57		-0.12,6.32	-5.50,7.76	
n	29	1		19	9		18	11		20	9	
	Interaction	*p*=0.39		Interaction	*p*=0.91		Interaction	*p*=0.62		Interaction	*p*=0.97	
<u>Location</u>												
Hobart	-1.22	2.42	<0.01	-0.28	-2.69	<0.01	-0.94	-1.63	0.47	-0.29	-2.26	0.04
	-2.84,0.40	0.98,3.85		-1.94,1.39	-5.90,0.51		-2.90,1.01	-4.10,0.83		-2.65,2.07	-5.00,0.49	
n	88	52		55	31		56	32		52	36	
Other	1.58	0.93	0.81	2.08	0.84	0.73	2.08	0.96	0.81	2.28	0.48	0.62
	0.69,2.49	-0.81,2.67		0.26,3.89	-1.24,2.91		0.81,3.35	-1.00,2.92		1.23,3.44	-1.57,2.53	
n	88	92		49	27		53	35		58	30	
	Interaction	*P*<0.01		Interaction	*p*=0.54		Interaction	*p*=0.82		Interaction	*p*=0.94	

† Within stratum

‡ Crude association for all people is shown in Table 94

4.2.4.9 Association between dental attendance and global general health transition score stratified by level of education and household income

Only two people who had degree or were a teacher or a nurse did not visit a dentist and so 95% confidence intervals were not given (Table 98). No matter the level of education, dental attendance had a favourable influence on HRQoL, and the association was statistically significant in both the Degree/Teacher/Nurse and Trade/Diploma/Certificate strata. There was not a statistically significant interaction between the global general health transition statement, level of education and dental attendance.

For all three strata of income, dental attendance was associated with a favourable influence on HRQoL, but only in the case of people with an income of $60,000 or more, was this relationship statistically significant. There was not a statistically significant interaction between the global general health transition statement, household income and dental attendance.

4.2.3.10 Association between volume, complexity and cost of dental care stratified by level of education and household income

For people in the Trade/Diploma/Certificate category, receiving more care was associated with favourable HRQoL, and the within-strata association approached statistical significance with volume and people in the Trade/Diploma/Certificate category (p=0.05). People in the degree/teacher/nurse category had an improvement in HRQoL no matter what level of dental service they received. Those who had a high volume and high cost of dental service had a favourable association with HRQoL, while the opposite was true for complexity of dental service. All the people without a post-secondary school education had deterioration in HRQoL with more dental care when measured by volume or complexity having an unfavourable association with HRQoL, while the opposite was true for cost of dental service. There were not any statistically significant interactions between the global general health transition statement, level of education and level of dental care.

More care was associated with favourable HRQoL in all income strata and all measures of dental care but one. The exception was for people with an income between \$30,000 and under \$60,000 and complexity of dental care. Only for the stratum of income of \$60,000 or more and volume of dental care was this relationship statistically significant. None of the within strata associations between income and complexity of dental care were statistically significant. There was a statistically significant interaction between the global general health transition statement, household income with cost of dental care received, but not with volume or complexity of dental care received, although in the case of complexity of dental care it was close (p=0.05).

Table 98: Relationship between global general health statement x 10, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socioeconomic factor[‡] Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
<u>Level of education</u>												
Deg./Teach/Nurse	-1.37	0	0.04	-1.11	-1.72	0.14	-1.71	-1.00	0.42	-1.35	-1.40	0.17
	-2.96,0.22	-		-2.62,0.39	-4.10,0.66		-4.41,0.96	-2.88,0.88		-4.07,1.37	-3.41,0.63	
n	49	2		22	25		28	21		26	23	
Trade/Dip./Cert.	0.59	1.25	0.04	1.93	-1.79	0.05	1.53	-0.63	0.89	3.06	-2.31	0.30
	-2.09,3.28	-0.87,3.37		-1.30,5.16	-6.51,2.93		-2.00,5.07	-5.29,4.03		-0.10,6.22	-6.19,1.57	
n	57	51		35	17		37	20		36	21	
No Post Sec. Edu.	0.24	1.71	0.68	0.05	0.27	0.82	0.13	0.41	0.53	0.33	0.11	0.93
	-1.54,2.02	-0.05,3.46		-2.60,2.69	-3.31,3.84		-2.56,2.81	-1.86,2.68		-2.48,3.14	-1.97,2.18	
n	60	67		38	15		35	25		39	21	
	Interaction	*p*=0.79		Interaction	*p*=0.19		Interaction	*p*=0.60		Interaction	*p*=0.06	
<u>Household income</u>												
Less than \$30,000	-2.67	3.44	0.16	3.91	0.00	0.14	4.10	0.97	0.53	4.65	-0.11	0.84
	0.03,5.30	1.73,5.15		0.27,7.55	-3.83,3.84		-0.19,8.39	-1.19,3.13		1.06,8.24	-3.10,2.89	
n	61	66		37	19		34	27		36	25	
\$30,000-<\$60,000	-0.24	0.22	0.13	-0.21	-0.38	0.22	-0.65	0.41	0.19	0.32	-0.94	0.35
	-1.70,1.22	-1.68,1.73		-2.33,1.90	-2.62,1.85		-3.05,1.75	-0.57,1.37		-1.86,2.50	-2.80,0.92	
n	51	42		31	16		35	16		32	19	
\$60,000+	-1.48	0.77	<0.01	-1.03	-2.48	<0.01	-1.38	-1.60	0.67	-1.04	-2.00	0.07
	-3.74,0.58	-1.03,2.57		-3.59,1.54	-6.32,1.36		-4.10,1.34	-5.07,1.88		-3.79,1.70	-5.60,1.58	
n	51	29		30	19		29	22		31	20	
	Interaction	*p*=0.62		Interaction	*p*=0.13		Interaction	*p*=0.05		Interaction	*p*=0.04	

† Within stratum

‡ Crude association for all people is shown in Table 94

4.2.4.11 Association between dental attendance and global general health transition score stratified by occupation and employment status

For the two occupational groupings of managers/professionals/paraprofessionals and trades/clerical workers, dental attendance was associated with favourable HRQoL (Table 99). The opposite was true for people in the blue collar worker/labourer category. The within-stratum association was statistically significant for all three occupational groups but there was a statistically significant interaction between the global general health transition statement, occupation and dental attendance.

In both strata of employment, dental attendance was associated with a favourable HRQoL, and in the employed strata the association was statistically significant. There was not a statistically significant interaction between the global general health transition statement, employment status and dental attendance.

4.2.4.12 Association between volume, complexity and cost of dental care and global general health transition score stratified by occupation and employment status

In all strata of occupation, more care was associated with a favourable HRQoL other than in the case of the managers/professionals/paraprofessional stratum and volume of dental care. With volume of dental care, for two of the three occupation strata, this within-stratum relationship was statistically significant, but it was not statistically significant in the trade/clerical stratum (p=0.07). There were not any statistically significant interactions between the global general health transition statement, occupation with volume, complexity, or cost of dental service delivered.

For both strata of employment, in all strata but one, high level dental care was associated with favourable HRQoL. The exception was the unemployed stratum and complexity of dental care. However, only in the employed stratum when dental care was measured by volume of dental care was the within-stratum association statistically significant (p<0.01). There were not any statistically interactions between the global general health transition statement, employment status and volume, complexity or cost of dental care.

Table 99: Relationship between global general health statement x 10, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socioeconomic factor[‡] Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
Occupation												
Manage/Prof/Para.	-1.08	0.78	<0.01	1.01	2.71	0.01	0.15	-2.18	0.30	0.33	-2.42	0.03
	-2.96,0.80	-0.88,2.45		-1.38	3.40		-3.31,3.61	4.74,.39		-3.04,3.70	-4.86,0.03	
n	45	24		24	19		24	21		26	19	
Trades/Clerical	-2.03	1.25	<0.01	-1.61	-3.83	0.07	-2.08	-1.96	0.40	-1.41	-4.50	0.51
	-4.54,0.48	-1.14,3.65		-4.95,1.72	-10.14,2.47		-5.85,1.69	-5.15,1.24		-4.34,1.52	-11.06,2.06	
	36	33		28	9		23	13		27	9	
Blue Col./Lab.	3.76	-1.91	0.03	4.53	2.99	0.03	4.00	3.48	0.31	6.23	2.00	0.17
	-0.77,8.29	-4.15,0.33		-8.42,17.49	-1.49,7.48		-10.76,18.75	0.18,6.79		-0.38,12.83	-0.79,4.79	
n	15	15		7	5		8	7		9	6	
	Interaction	*P*<0.01		Interaction	*p*=0.58		Interaction	*p*=0.80		Interaction	*p*=0.81	
Employment status												
Employed	-0.27	0.41	<0.01	0.61	-1.76	<0.01	0.21	-0.83	0.87	0.53	-1.35	0.19
	-1.54,0.99	-0.88,1.70		-0.92,2.15	-4.04,0.51		-1.60,2.02	-2.65,1.00		-1.19,2.25	-3.42,0.72	
n	96	72		55	33		55	41		62	34	
Unemployed	0.78	2.00	0.27	0.85	0.30	0.48	0.70	0.92	0.87	1.89	-0.77	0.81
	-0.50,2.05	-3.60,7.60		-1.16,2.87	-2.63,3.24		-1.04,2.44	-1.23,3.08		-0.01,3.79	-3.23,1.69	
n	79	6		49	24		53	26		48	31	
	Interaction	*p*=0.38		Interaction	*p*=0.42		Interaction	*p*=0.51		Interaction	*p*=0.69	

[†] Within stratum

[‡] Crude association for all people is shown in Table 94

4.2.4.13 Association between dental attendance and global general health transition score stratified by pattern of attendance

Dental attendance had a favourable association with HRQoL for people who usually visited a dentist at least every 12 months and the within-stratum association was statistically significant (Table 100). In contrast to the crude analysis, dental attendance was associated with an unfavourable HRQoL for people who usually visit a dentist less regularly than every 12 months. There was a statistically significant interaction between the global general health transition statement, regularity of visiting a dentist and dental attendance.

Dental attendance had a favourable association with HRQoL for people who usually visited a dentist for a check-up and the within-stratum association was statistically significant (Table 100). In contrast to crude analysis, dental attendance was associated with an unfavourable HRQoL for problem attendees. There was not a statistically significant interaction between the global general health transition statement, dental attendance and the usual reason for visiting a dentist (p=0.05).

4.2.4.14 Association between volume, complexity and cost of dental care and global general health transition score stratified by pattern of attendance

With both strata of regularity of dental attendance, higher levels of care was associated with a favourable HRQoL, but only in the case of the more regular attendees and volume of dental care was the association statistically significant (p=0.01). There were not any statistically significant interactions between the global general health transition statement, regularity of visiting a dentist with volume, complexity or cost of dental care.

With both strata of usual reason for dental attendance, higher levels of care was associated with a favourable HRQoL, but only in the stratum of the usually visiting for a check-up and volume of dental care was the association statistically significant (p=0.03). There were not any statistically significant interactions between the global general health transition statement, usual reason for dental attendance with volume, complexity or cost of dental care.

Table 100: Relationship between global general health statement x 10, the volume, complexity and cost of dental services and pattern of attendance

	Some or no dental services			Among those survey participants who visited a dentist								
				Volume of dental services			Complexity of dental services			Cost for dental services		
Pattern of attendance reported at baseline[‡]	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Regularity												
≤12 months	-0.64	2.40	0.01	-0.04	-1.83	0.01	-0.56	-0.74	0.59	0.11	-1.55	0.09
	-1.61,0.64	0.59,4.23		-1.56,1.48	-3.70,0.05		-1.91,0.79	-2.43,0.95		-1.52,1.73	-3.40,0.30	
n	122	36		73	41		77	45		76	46	
> 12 months	1.66	0.97	0.20	2.17	0.61	0.14	2.45	0.51	0.89	2.81	-0.06	0.86
	-0.56,3.88	-0.26,2.20		-1.37,5.71	-2.88,4.10		-1.21,6.11	-2.12,3.13		-0.59,6.21	-2.81,2.69	
n	54	108		31	17		32	22		34	20	
	Interaction	p=0.02		Interaction	p=0.88		Interaction	p=0.48		Interaction	p=0.64	
Usual reason												
Check-up	-0.64	2.84	<0.01	0.12	-1.95	0.03	-0.30	-1.23	0.30	0.08	-1.68	0.30
	-1.74,0.45	-0.33,6.01		-1.45,1.68	-3.73,-0.18		-1.85,1.24	-3.09,0.62		-1.50,1.66	-3.53,0.16	
n	122	45		71	43		81	41		76	46	
Problem	1.63	0.50	0.30	2.03	0.45	0.08	2.36	0.96	0.95	3.21	-0.09	0.77
	-0.46,3.71	-0.64,1.64		-1.72,5.78	-2.83,3.73		-1.57,2.69	-1.06,2.97		-0.60,7.02	-2.53,2.34	
n	54	98		33	15		28	26		34	20	
	Interaction	p=0.05		Interaction	p=0.95		Interaction	p=0.85		Interaction	p=0.58	

[†] Within stratum

[‡] Crude association for all people is shown in Table 94

4.2.4.15 Association between dental attendance and global general health transition score stratified by access to dental care

In both strata of eligibility for a health care card, dental attendance had a favourable influence on HRQoL (Table 101). The within-stratum associations were statistically significant (p=0.02) for people not eligible for a health care card but was not statistically significant for people eligible for a health care card (p=0.09). There was not a statistically significant interaction between the global general health transition statement, dental attendance and eligibility for a health care card.

In both strata of difficulty paying a $100 dental bill, dental attendance had a favourable influence on HRQoL. For people who had none or a little difficulty paying a $100 dental bill, the within-stratum association was statistically significant (p=0.01). There was not a statistically significant interaction between the global general health transition statement, dental attendance and difficulty in paying a $100 dental bill.

In contrast to the crude association, dental attendance had an unfavourable association with HRQoL for people who avoided or delayed dental treatment due to cost, though this relationship was not statistically significant. For people who did not avoid or delay dental treatment due to cost, dental attendance had a statistically significant association with HRQoL. There was a statistically significant interaction between the global general health transition statement, dental attendance and avoiding and delaying treatment due to cost.

4.2.4.16 Association between volume, complexity and cost of dental care and global general health transition score stratified by access to dental care

In both strata of eligibility for a health care card, higher levels of care was associated with favourable HRQoL, though only in the stratum of not holding a health care card and dental service volume, was the relationship statistically significant. There were not any significant interactions between eligibility for a health care card with volume, complexity or cost of dental care received.

In both strata of difficulty in paying $100 dental bill, higher levels of care was associated with favourable HRQoL. In the stratum of having none to a little difficulty in paying a $100 dental bill and dental service volume and cost, the relationship was statistically significant ($p<0.01$ and $p=0.03$ respectively). There were not any significant interactions between eligibility for a health care card with volume, complexity or cost of dental care received.

In both strata of avoiding or delaying dental care due to cost, higher levels of care was associated with favourable HRQoL, though only in the stratum of not avoiding or delaying dental care due to cost and dental service volume, was the relationship statistically significant. There were not any significant interactions between avoiding or delaying dental care due to cost with volume, complexity or cost of dental care received.

Table 101: Relationship between global general health statement x 10, the volume, complexity and cost of dental services and access to dental care

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Access to dental care‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Health care card												
Yes	1.42	2.88	0.09	2.29	-0.54	0.15	1.63	0.88	0.67	3.11	-1.56	0.53
	-0.73,3.57	1.25,4.50		-1.07,6.66	-4.29,3.21		-1.17,4.43	-11.98,3.73		0.14,6.09	-4.88,1.76	
n	72	62		45	20		49	23		46	26	
No	-0.47	0.49	0.02	-0.03	-1.33	0.02	-0.30	-0.66	0.99	-0.03	-0.99	0.27
	-1.63,0.69	-0.55,1.53		-1.73,1.66	-3.40,0.74		-2.19,1.59	-2.39,1.07		-1.90,1.85	-2.79,0.81	
n	104	82		59	38		60	44		64	40	
	Interaction	p=0.77		Interaction	p=0.67		Interaction	p=0.88		Interaction	p=0.18	
Diff. pay $100 bill												
None- a little	-0.27	0.25	0.01	0.26	-1.25	<0.01	0.09	-0.82	0.43	0.49	-1.38	0.03
	-1.42,0.87	-0.79,1.28		-1.16,1.68	-3.25,0.74		-1.49,1.67	-2.73,1.09		-1.05,2.02	-3.40,0.65	
n	148	101		89	49		97	51		94	54	
A lot	1.83	4.51	0.48	2.60	-0.44	0.78	3.22	1.42	0.82	4.39	-0.19	0.48
	-0.25,3.92	1.43,7.59		-0.44,5.63	-4.60,3.71		2.79,3.66	-0.32,3.16		0.76,8.03	-2.04,1.66	
n	28	43		15	9		12	16		16	12	
	Interaction	p=0.32		Interaction	p=0.60		Interaction	p=0.98		Interaction	p=0.24	
Avoided due to cost												
Yes	3.16	1.17	0.20	4.10	2.09	0.12	4.67	1.79	0.81	4.20	1.51	0.73
	0.65,5.68	-0.42,2.76		-0.24,8.40	-1.18,5.37		0.58,8.75	-0.24,3.82		0.63,7.77	-1.40,4.43	
n	48	64		26	17		27	21		32	16	
No	-1.06	1.56	0.01	-0.38	-2.54	0.01	-0.81	-1.46	0.46	-0.32	-1.96	0.10
	-2.20,0.09	-0.22,3.34		-1.72,0.96	-4.84,-0.24		-2.15,0.52	-3.63,0.71		-1.78,1.13	-3.97,0.05	
n	128	80		78	41		82	46		78	50	
	Interaction	p=0.02		Interaction	p=0.86		Interaction	p=0.38		Interaction	p=0.70	

† Within stratum
‡ Crude association for all people is shown in Table 94

4.2.5 Follow-up OHIP-14 severity

4.2.5.1 Association between dental attendance and follow-up OHIP-14 severity stratified by main covariables

Crude analysis indicated that dental attendance was associated with an unfavourable mean follow-up OHIP-14 score, but the relationship was not statistically significant (Table 102).

Dental attendance had a favourable association with oral HRQoL for people with a high baseline OHIP-14 severity, but an unfavourable influence on oral HRQoL for people with a high baseline OHIP-14 severity. However, the within-stratum associations and interaction were not statistically significant.

Dental attendance had a favourable association with oral HRQoL for people with a treatment need, but an unfavourable influence on oral HRQoL for people without a treatment need. The within-stratum associations and interaction were not statistically significant.

4.2.5.2 Association between volume, complexity and cost of dental care and follow-up OHIP-14 severity stratified by main covariables

Crude analysis indicated that higher levels of care had an unfavourable association with oral HRQoL compared to lower levels of care, though there were not any statistically significant associations for volume, complexity or cost of dental service.

People with a high baseline OHIP-14 severity who received higher levels of care had a favourable oral HRQoL compared to people who received lower levels of care, and for dental service complexity the association was statistically significant, but in the case of volume the association was not statistically significant. People with a low baseline OHIP-14 severity, high volume or complexity dental care had a favourable association, and high cost an unfavourable association, with oral HRQoL. In the cases of volume and cost, the associations were not statistically significant (p=0.06). There were not any statistically significant interactions between follow-up OHIP-14 severity, baseline OHIP-14 severity with volume, complexity or cost of dental care.

Higher levels of care had a favourable association with oral HRQoL for people without treatment need, and this relationship was statistically significant in the case of dental service complexity (p=0.04). High cost and high volume dental care had a favourable association, while high complexity had an unfavourable association with oral HRQoL for people with a treatment, though none of the within-stratum associations were statistically significant. There were not any statistically significant interactions between follow-up OHIP-14 severity, treatment need with volume, complexity or cost of dental care.

Table 102: Relationship between follow-up OHIP-14 severity, the volume, complexity and cost of dental services and main covariables

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
	Visited a dentist	Did not visit a dentist		Low 1-6 items	High 7+ items		Low 1-1.25	High >1.25		Low \$1-\$499	High \$500+	
Main covariables‡	Mean 95%CIs	Mean 95%CIs	$p^{\dagger}$	Mean 95%CIs	Mean 95%CIs	$p^{\dagger}$	Mean 95%CIs	Mean 95%CIs	$p^{\dagger}$	Mean 95%CIs	Mean 95%CIs	$p^{\dagger}$
All people	6.12	5.74	0.75	5.73	6.22	0.38	5.30	7.24	0.22	5.94	6.35	0.62
	4.69,7.54	4.25,7.18		4.03,7.43	3.65,8.79		3.63,6.98	5.25,9.23		4.21,7.66	4.42,8.27	
n	176	144		104	58		109	67		110	66	
Main covariables												
Baseline OHIP												
Low (0-<5)	2.75	2.45	0.40	2.81	2.76	0.06	2.83	2.61	0.36	2.28	3.30	0.06
	1.74,3.76	1.53,3.37		1.28,4.34	1.44,4.07		1.39,4.27	1.20,4.02		1.34,3.23	1.53,5.06	
n	87	78		54	30		57	30		51	36	
High (5+)	9.48	10.20	0.39	9.44	9.43	0.84	8.17	11.01	<0.01	9.28	9.76	0.80
	7.37,11.59	7.34,13.05		6.51,12.38	5.59,13.27		5.42,10.91	8.43,13.59		6.85,11.71	6.63,12.90	
n	89	66		50	28		52	37		59	30	
	Interaction	p=0.59		Interaction	p=0.98		Interaction	p=0.09		Interaction	p=0.74	
Treatment need												
Yes	8.06	8.60	0.17	8.54	7.31	0.72	7.48	8.48	0.31	9.46	6.46	0.50
	5.67,10.46	5.65,11.54		5.22,11.86	2.84,11.79		2.36,12.61	5.23,11.73		5.88,13.04	4.07,8.85	
n	63	66		37	21		31	32		35	28	
No need	5.05	3.42	0.12	4.19	5.69	0.55	4.56	6.06	0.04	4.18	6.28	0.18
	3.65,6.45	2.26,4.59		2.76,5.63	2.96,8.41		3.14,5.97	3.19,8.92		2.88,5.49	3.77,8.79	
n	113	78		67	37		78	35		75	38	
	Interaction	p=0.30		Interaction	p=0.36		Interaction	p=0.90		Interaction	p=0.05	

† Within stratum

4.2.5.3 Association between dental attendance and follow-up OHIP-14 severity stratified by oral diseases

Dental attendance had an unfavourable association with oral HRQoL for people with an oral disease, while it had no association for people without an oral disease (Table 103). The relationships were not statistically significant, nor was there a significant interaction between follow-up OHIP-14 severity, oral disease and dental attendance.

4.2.5.4 Association between volume, complexity and cost of dental care and follow-up OHIP-14 severity stratified by oral diseases

Higher levels of care had a favourable association with oral HRQoL for people with an oral disease but an unfavourable association with oral HRQoL for people without an oral disease, though the within-stratum associations were not statistically significant. There were not any statistically significant interactions between follow-up OHIP-14 severity, oral diseases with volume, complexity, of cost of dental services.

Table 103: Relationship between follow-up OHIP-14 severity, the volume, complexity and cost of dental services and oral disease

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Oral disease[‡]	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	$p^{\dagger}$
Yes	8.21	6.74	0.89	8.81	7.90	0.54	8.74	7.61	0.89	8.85	7.46	0.52
	5.20,11.22	4.01,9.46		3.77,13.85	3.26,12.53		3.58,13.90	4.99,10.23		3.70,14.00	4.99,9.93	
n	44	35		26	15		24	20		27	17	
No disease	5.37	5.37	0.75	4.66	5.64	0.57	4.22	7.09	<0.01	4.97	5.92	0.29
	4.11,6.63	4.16,6.58		3.20,6.11	2.86,8.43		3.09,5.35	4.56,9.63		3.62,6.31	3.48,8.36	
n	132	1.09		78	43		85	47		83	49	
	Interaction	p=0.41		Interaction	p=0.77		Interaction	p=0.17		Interaction	p=0.44	

† Within stratum

‡ Crude association for all people is shown in Table 102

4.2.5.5 Association between dental attendance and follow-up OHIP-14 severity stratified by sex and age

For both sexes, dental attendance had an unfavourable association with oral HRQoL, though the within-stratum relationships were not statistically significant. There was not a statistically significant interaction between follow-up OHIP-14 severity, sex and dental attendance (Table 104).

Dental attendance had a favourable association with oral HRQoL for people aged 60 years or older, but an unfavourable association for younger adults. The relationships were not statistically significant nor was there a statistically significant interaction between follow-up OHIP-14 severity, age and dental attendance.

4.2.5.6 Association between volume, complexity and cost of dental care and follow-up OHIP-14 severity stratified by sex and age

In both sexes, other than with males and complexity of dental care, higher levels of care had an unfavourable association with oral HRQoL, and in the case of females and complexity of dental care, the relationship was statistically significant (p<0.01). There were not any statistically significant interactions between follow-up OHIP-14 severity, sex and any of the three main explanatory variables, though in the case of complexity of care it came close (p-=0.05).

For people aged between 45 and 60 years, higher levels of care had an unfavourable association with oral HRQoL, and with dental service complexity the association was statistically significant (p=0.01). For adults younger than 45 years or 65 years and older, high volume dental care had a marginally favourable association with oral HRQoL. High cost dental care had little influence on oral HRQoL for adults younger than 45 years, an unfavourable influence for people aged between 45 and 60 years, and a favourable influence for people 65 years and older, though none of the within stratum associations were statistically significant. There was a statistically significant interaction between follow-up OHIP-14 severity, age with volume, but not between follow-up OHIP-14 severity, age with complexity or cost of dental care.

Table 104: Relationship between follow-up OHIP-14 severity, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Socio-Demographic Factor‡ Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
<u>Sex</u>												
Male	5.52	5.12	0.68	4.94	5.79	0.81	5.62	5.40	0.95	5.32	5.68	0.93
	3.89,7.14	3.28,6.96		2.79,7.09	3.35,8.22		3.17,8.08	3.63,7.17		2.80,7.84	4.17,7.18	
n	66	50		32	29		37	29		33	33	
Female	6.77	6.22	0.81	6.30	7.18	0.92	5.02	9.95	<0.01	3.67	7.72	0.42
	5.07,8.46	4.35,8.10		4.07,8.53	2.59,11.78		2.92,7.13	6.81,13.09		4.23,8.50	4.13,11.30	
n	110	94		72	29		72	38		77	33	
	Interaction	*p*=0.92		Interaction	*p*=0.99		Interaction	*p*=0.05		Interaction	*p*=0.70	
<u>Age</u>												
15 - <45 yrs	6.06	4.66	0.63	6.08	5.59	0.66	5.69	6.69	0.08	6.06	6.07	0.96
	3.75,8.38	3.09,6.24		2.83,9.32	0.49,10.69		2.84,8.55	1.46,11.93		3.11,9.01	1.28,10.87	
n	45	56		28	12		29	16		33	12	
45 - <60 yrs	6.70	6.59	0.40	5.63	7.45	0.41	4.49	8.79	0.01	5.98	7.48	0.39
	5.10,8.30	4.86,8.32		3.37,7.88	4.75,10.15		2.40,6.59	5.69,11.89		3.92,8.03	4.90,10.07	
n	65	48		35	25		36	29		38	27	
60+ yrs	5.53	6.82	0.11	5.36	5.28	0.39	5.42	5.69	0.56	5.66	5.39	0.77
	3.15,7.90	2.71,10.94		2.56,8.15	1.98,8.58		1.85,9.00	2.84,8.54		2.50,8.82	2.96,7.81	
n	66	40		41	21		44	22		39	27	
	Interaction	*p*=0.19		Interaction	*P*<0.01		Interaction	*p*=0.07		Interaction	*p*=0.47	

† Within stratum

‡ Crude association for all people is shown in Table 102

4.2.5.7 Association between dental attendance and follow-up OHIP-14 severity stratified by country of birth and residential location

Only one of the survey participants from a country other than Australia did not visit a dentist (Table 105) and hence 95% confidence interval results were not given for this category. For people born in Australia, dental attendance had a small unfavourable association with oral HRQoL, but this result was not statistically significant. There was not a statistically significant interaction between follow-up OHIP-14 severity, country of birth and dental attendance.

Dental attendance had a favourable association with oral HRQoL for Hobart residents but an unfavourable association with oral HRQoL for Tasmanians who lived outside Hobart. Neither of these two within strata associations was statistically significant. The interaction between follow-up OHIP-14 severity, residential location in Tasmania and dental attendance was not statistically significant (p=0.07).

4.2.5.8 Association between dental care and follow-up OHIP-14 severity stratified by sex and age

For people born in Australia, higher levels of care had an unfavourable association with oral HRQoL, though this relationship was only statistically significant in the case of complexity of dental services. A similar, though not statistically significant, association was true for people born outside Australia for complexity of dental care. High volume or cost of dental care had a favourable association with oral HRQoL for people born outside Australia. There were not any statistically significant interactions between follow-up OHIP-14 severity and volume, complexity or cost of dental care with country of birth.

Higher levels of care had an unfavourable association with oral HRQoL for Hobart residents. The same was true for people who resided outside Hobart for complexity and cost of dental care but not for volume of dental services. This relationship was statistically significant only with people residing in Hobart and complexity of dental services. There were not any statistically significant interactions between follow-up OHIP-14 severity, volume, complexity or cost of dental care with residential location.

Table 105: Relationship between follow-up OHIP-14 severity, the volume, complexity and cost of dental services and sociodemographic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socio-Demographic Factor[‡] Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
Country of Birth												
Australia	6.10	5.50	0.59	5.46	6.48	0.56	5.25	7.29	p<0.01	5.82	6.46	0.39
	4.65,7.54	3.56,7.34		3.61,7.30	3.53,9.43		3.61,6.88	4.99.5.59		3.93,7.71	4.32,8.60	
n	147	123		85	49		91	56		90	57	
Other	6.24	0	0.01	7.47	4.78	0.16	5.71	6.93	0.99	6.68	5.57	0.52
	3.29,9.19	-		2.62,12.32	1.77,7.78		0.49,10.93	3.60,10.26		1.73,11.63	3.33,7.81	
n	29	1		19	9		18	11		20	9	
	Interaction	p=0.59		Interaction	p=0.34		Interaction	p=0.80		Interaction	p=0.57	
Location												
Hobart	5.06	6.91	0.88	4.46	5.98	0.15	4.39	6.07	0.04	4.74	5.41	0.11
	3.16,6.95	2.88,10.95		1.97,6.96	2.56,9.40		1.97,6.81	3.18,8.96		1.91,7.56	3.29,7.53	
n	88	52		55	31		56	32		52	36	
Other	7.35	5.16	0.86	7.51	6.54	0.19	6.46	8.48	0.06	7.15	7.68	0.34
	5.15,9.56	4.06,6.25		4.84,10.17	2.07,11.02		4.01,8.91	5.65,11.30		5.03,9.27	3.95,11.40	
n	88	92		49	27		53	35		58	30	
	Interaction	p=0.07		Interaction	p=0.34		Interaction	p=0.87		Interaction	p=0.95	

[†] Within stratum
[‡] Crude association for all people is shown in Table 102

4.2.5.9 Association between dental attendance and follow-up OHIP-14 severity stratified by level of education and household income

Only two people who had degree or were a teacher or a nurse did not visit a dentist and so 95% confidence intervals were not given (Table 106). Dental attendance had a favourable association with oral HRQoL for people without a post-secondary education, but this association was not statistically significant (p=0.06). The opposite, though also not statistically significant association was true for people in the Trade/Diploma/Certificate category. There was not a statistically significant interaction between follow-up OHIP-14 severity, level of education and dental attendance.

Only in the highest household income category ($60,000+) did dental attendance have a favourable association with oral HRQoL, but none of the within-stratum associations were statistically significant. Nor was there a statistically significant interaction between follow-up OHIP-14 severity, household income and dental attendance.

4.2.5.10 Association between volume complexity and cost of dental care and follow-up OHIP-14 severity stratified by level of education and household income

For people in the Degree/Teacher/Nurse category, higher levels of care had a statistically significant unfavourable association with oral HRQoL, while for people without a postsecondary education, higher levels of care had a favourable association with oral HRQoL. For dental service volume this association was not statistical significant (p=0.05), and for cost it was statistically significant (p=0.03). For people in the Trade/Diploma/Certificate category, low volume and complexity, and high cost of dental care had a favourable association with oral HRQoL, though these relationships were not statistically significant. However, there were statistically significant interactions between follow-up OHIP-14 severity, level of education and all three of volume, complexity and cost of dental care.

For high household income earners ($60,000+), higher levels of care had an unfavourable association with oral HRQoL, but the associations were not statistically significant for dental service complexity and cost (p=0.05 & 0.08 respectively). On the other hand, for low household income earners (less than $30,000), higher levels of care had a favourable association with oral HRQoL, though the association was negligible in the case of dental service severity, and there was not a statistically significant relationship between any of the three measures of dental service. For people with an income between $30,000 and under $60,000, high dental service volume or high cost had a favourable association with oral HRQoL, but the relationships were not statistically significant. The opposite trend occurred with complexity of dental care for this income category and in this case the relationship was statistically significant. There were statistically significant interactions between follow-up OHIP-14 severity, household income with volume and cost of dental care received, but not with complexity of dental care received.

Table 106: Relationship between follow-up OHIP-14 severity, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Socioeconomic factor[‡] Table A	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
Level of education												
Deg./Teach/Nurse	4.87	7.09	0.04	2.21	6.86	0.01	1.81	8.09	<0.01	2.12	7.83	0.02
	2.29,7.46	-		0.72,3.70	2.82,10.89		0.59,3.04	3.74,12.43		0.50,3.74	3.40,12.27	
n	49	2		22	25		28	21		26	23	
Trade/Dip./Cert.	6.99	4.79	0.90	6.70	7.78	0.64	6.07	8.19	0.16	7.34	6.58	0.21
	5.12,8.86	2.89,6.68		3.86,9.53	3.84,11.71		4.72,7.14	4.15,12.23		4.22,10.46	4.41,8.74	
n	57	51		35	17		37	20		36	21	
No Post Sec. Edu.	6.19	6.44	0.06	6.63	3.27	0.05	6.66	5.44	0.92	7.28	4.65	0.03
	3.78,8.60	4.02,8.86		3.74,9.73	-0.84,7.39		3.71,9.62	1.19,9.69		4.19,10.38	1.23,8.06	
N	60	67		38	15		35	25		39	21	
	Interaction	p=0.25		Interaction	p<0.01		Interaction	p<0.01		Interaction	p<0.01	
Household income												
Less than \$30,000	8.34	6.67	0.83	8.13	7.59	0.99	8.34	8.33	0.48	9.21	7.11	0.50
	5.72,10.96	5.14,8.20		4.93,11.33	3.26,11.92		3.95,12.74	5.82,10.83		5.87,12.55	4.37,9.85	
N	61	66		37	19		34	27		36	25	
\$30,000-<\$60,000	8.11	5.34	0.48	8.32	7.96	0.74	6.53	10.62	0.04	9.18	6.78	0.66
	5.80,10.42	2.42,8.26		4.67,11.97	4.00,11.92		3.07,9.98	5.42,15.83		5.14,13.21	4.07,9.49	
N	51	42		31	16		35	16		32	19	
\$60,000+	4.05	4.27	0.27	2.87	5.62	0.18	3.03	5.23	0.05	2.40	6.05	0.08
	2.22,5.89	1.07,7.48		1.59,4.16	1.54,9.30		1.14,4.92	1.88,8.59		1.32,3.44	1.92,10.18	
N	51	29		30	19		29	22		31	20	
	Interaction	p=0.25		Interaction	p=0.04		Interaction	p=0.16		Interaction	p<0.01	

† Within stratum

‡ Crude association for all people is shown in Table 102

4.2.5.11 Association between dental attendance and follow-up OHIP-14 severity stratified by occupation and employment status

For people in the blue collar worker/labourer category, dental attendance had a favourable association with oral HRQoL (Table 107). The opposite was true for people in the other two occupation categories. There was not a statistically significant association between any of the three occupational groups with dental attendance. There was a statistically significant interaction between follow-up OHIP-14 severity, occupation and dental attendance.

For employed people, dental attendance had an unfavourable association with oral HRQoL, while for unemployed people it had a favourable association with oral HRQoL. In neither case was the association statistically significant. Nor was there a statistically significant interaction between employment status and visiting a dentist.

4.2.5.12 Association between volume, complexity and cost of dental care and follow-up OHIP-14 severity stratified by occupation and employment status

Higher levels of care had a favourable association with oral HRQoL for blue collar workers and labourers, but these relationships were not statistically significant. In contrast, higher levels of care had an unfavourable association with oral HRQoL for people in either of the managers, professionals, and paraprofessionals or trades and clerical workers categories. In these two categories, other than for complexity of dental care, the within-stratum associations were not statistically significant. There were statistically significant interactions between occupation with all three dental service measures of volume, complexity and cost.

For employed people, higher levels of care had an unfavourable association with oral HRQoL, but only in the case of complexity of dental care was this association statistically significant. On the other hand, for unemployed people high dental care had a favourable association with oral HRQoL, though none of the within strata associations were significant. There were not any interactions between employment status and any of the three measures of dental service delivered.

Table 107: Relationship between follow-up OHIP-14 severity, the volume, complexity and cost of dental services and socioeconomic factors

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Socioeconomic factor[‡] Table B	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*[†]	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*[†]	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*[†]	Low $1-$499 Mean 95%CIs	High $500+ Mean 95%CIs	*p*[†]
Occupation												
Manage/Prof/Para.	5.69	3.82	0.06	4.01	6.94	0.18	3.58	7.56	<0.01	3.74	7.53	0.10
	3.05,8.33	2.11,5.53		1.76,6.26	2.69,11.18		0.90,6.25	3.74,11.38		180,5.67	3.21,11.86	
n	45	24		24	19		24	21		26	19	
Trades/Clerical	5.86	5.08	0.55	5.14	8.62	0.51	3.25	10.01	<0.01	5.79	6.11	0.88
	3.66,8.05	1.46,8.71		2.11,8.16	2.18,15.05		1.69,4.81	4.18,15.84		3.05,8.54	0.91,11.31	
	36	33		24	9		23	13		27	9	
Blue Col./Lab.	6.48	10.03	0.34	7.24	4.39	0.34	7.49	5.31	0.99	7.72	5.59	0.69
	3.02,9.93	3.49,16.57		0.45,14.47	1.72,7.07		4.63,10.34	1.67,8.95		1.40,14.03	-1.80,12.98	
n	15	15		7	5		8	7		9	6	
	Interaction	*p*=0.02		Interaction	*p*=0.01		Interaction	*p*<0.01		Interaction	*p*=0.02	
Employment status												
Employed	5.92	5.79	0.28	5.16	6.69	0.21	4.36	7.70	<0.01	5.33	6.71	0.12
	4.52,7.33	4.00,7.57		3.50,6.81	3.58,9.80		2.90,5.82	5.10,10.30		3.80,6.87	4.20,9.22	
n	96	72		55	33		55	41		62	34	
Not employed	6.50	10.95	0.09	6.68	5.00	0.11	6.77	5.96	0.25	7.12	5.64	0.21
	4.07,8.93	3.33,18.57		3.40,9.96	2.29,7.70		3.10,10.43	3.56,8.37		3.39,10.86	3.72,7.55	
n	79	6		49	24		53	26		48	31	
	Interaction	*p*=0.69		Interaction	*p*=0.07		Interaction	*p*=0.16		Interaction	*p*=0.19	

[†] Within stratum

[‡] Crude association for all people is shown in Table 102

4.2.5.13 Association between dental attendance and follow-up OHIP-14 severity stratified by pattern of attendance

In both strata of regularity of visiting a dentist, dental attendance had an unfavourable association with oral HRQoL, though the associations were not statistically significant (Table 108). There was not a statistically significant interaction between follow-up OHIP-14 severity, regularity of visiting a dentist and dental attendance.

In both strata of usual reason for visiting a dentist, dental attendance had an unfavourable associatiobn with oral HRQoL, but the associations were not statistically significant. There was not a statistically significant interaction between dental attendance and the usual reason for visiting a dentist.

4.2.5.14 Association between volume, complexity and cost of dental care and follow-up OHIP-14 severity stratified by pattern of attendance

For more regular dental visitors, higher levels of care had an unfavourable association with HRQoL. However, only with complexity of dental care was this association statistically significant. For less regular visitors, high dental service volume and complexity but not cost, had an unfavourable association with oral HRQoL, but the associations were not statistically significant. There were not any statistically significant interactions between follow-up OHIP-14 severity and regularity of visiting a dentist with volume, complexity or cost of dental care.

For people who usually visit a dentist for a check-up, higher levels of care had an unfavourable association with oral HRQoL. The same occurred for people who usually visit a dentist for a problem and complexity of dental services. However, the opposite was true for people who usually visit a dentist for a problem with volume and cost of dental services. Only for people who usually attend a dentist for a check-up and complexity of dental care was this association statistically significant. There were not any statistically significant interactions between follow-up OHIP-14 severity, the usual reason for visiting a dentist with volume, complexity or cost of dental care.

Table 108: Relationship between follow-up OHIP-14 severity, the volume, complexity and cost of dental services and pattern of attendance

				Among those survey participants who visited a dentist								
	Some or no dental services			Volume of dental services			Complexity of dental services			Cost for dental services		
Pattern of attendance reported at baseline‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	$p^{\dagger}$	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	$p^{\dagger}$	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	$p^{\dagger}$	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	$p^{\dagger}$
Regularity												
≤12 months	4.83	3.41	0.12	4.43	4.91	0.42	4.03	5.92	0.01	4.34	5.44	0.12
	3.68,5.98	2.10,4.71		3.05,5.81	2.84,6.98		2.56,5.49	4.13,7.71		2.86,5.82	3.64,7.23	
n	122	36		73	41		77	45		76	46	
> 12 months	8.99	6.72	0.68	8.29	9.76	0.92	8.07	10.33	0.54	9.22	8.64	0.36
	5.54,12.43	4.46,8.99		4.38,12.21	4.06,16.46		3.76,12.38	6.18,14.47		4.58,13.86	3.92,13.35	
n	54	108		31	17		32	22		34	20	
	Interaction	*p*=0.71		Interaction	*p*=0.71		Interaction	*p*=0.89		Interaction	*p*=0.60	
Usual reason												
Check-up	4.49	3.11	0.06	3.67	5.01	0.35	3.83	5.60	0.02	3.90	5.32	0.10
	3.42,5.56	2.06,4.16		2.47,4.87	2.96,7.06		2.60,5.06	3.95,7.26		2.63,5.18	3.51,7.13	
n	122	45		71	43		81	41		76	46	
Problem	9.62	7.15	0.24	10.42	8.72	0.73	9.48	9.75	0.49	10.88	8.25	0.55
	6.27,12.98	4.88,9.41		6.56,12.27	2.05,15.38		4.61,14.35	5.15,14.35		6.25,15.52	3.64,12.86	
n	54	98		33	15		28	26		34	20	
	Interaction	*p*=0.63		Interaction	*p*=0.43		Interaction	*p*=0.60		Interaction	*p*=0.19	

† Within stratum

‡ Crude association for all people is shown in Table 102

4.2.5.15 Association between dental attendance and follow-up OHIP-14 severity stratified by access to dental care

For both strata of health care card eligibility, dental attendance had an unfavourable association with oral HRQoL (Table 109), but the associations were not statistically significant. There was not a statistically significant interaction between follow-up OHIP-14 severity and dental attendance and holding a health care card.

In both strata of difficulty paying a $100 dental bill, dental attendance had an unfavourable association with oral HRQoL, but the associations were not statistically significant There was not a statistically significant interaction between follow-up OHIP-14 severity and dental attendance and difficulty in paying a $100 dental bill.

In both strata of whether people avoided or delayed dental treatment due to cost, dental attendance had an unfavourable association with oral HRQoL, though the associations was not statistically significant. There was not a statistically significant interaction between follow-up OHIP-14 severity and dental attendance and avoiding and delaying treatment due to cost.

4.2.5.16 Association between volume, complexity and cost of dental care and follow-up OHIP-14 severity stratified by access to dental care

For people who held a health care card, higher levels of care had a favourable association with oral HRQoL, but the associations were not statistically significant. On the other hand, for people who did not hold a health care card, higher levels of care had a favourable association with oral HRQoL. There was a statistically significant association for people who did not hold a health care card with complexity of dental care (p<0.01) but was not statistically significant relationship with cost of dental care (p=0.07). There were statistically significant interactions between holding a health care card with volume or cost, but not with complexity of dental service delivered.

Only in the case of people who a lot of difficulty in paying a $100 dental bill, and then with cost of dental care, higher levels of care have a favourable association with oral HRQoL, and none of the within strata associations were statistically significant. There was a statistically significant interaction between difficulty in paying a $100 dental bill with complexity but not with volume or cost of dental service delivered.

For people who avoided or delayed dental care due to cost, higher levels of care had an unfavourable association with oral HRQoL, and with dental service complexity the within-stratum association was statistically significant (p<0.01). For people who did not avoid or delay dental care due to cost, high volume care had a favourable association with oral HRQoL, while high complexity or cost dental care had an unfavourable association with oral HRQoL, but there were not any within-stratum statistically significant associations. There were also not any statistically significant interactions between avoiding or delaying dental care due to cost with volume, complexity or cost of dental care received.

Table 109: Relationship between follow-up OHIP-14 severity, the volume, complexity and cost of dental services and access to dental care

				Among those survey participants who visited a dentist								
	Some or no dental services			**Volume of dental services**			**Complexity of dental services**			**Cost for dental services**		
Access to dental care‡	Visited a dentist Mean 95%CIs	Did not visit a dentist Mean 95%CIs	*p*†	Low 1-6 items Mean 95%CIs	High 7+ items Mean 95%CIs	*p*†	Low 1-1.25 Mean 95%CIs	High >1.25 Mean 95%CIs	*p*†	Low \$1-\$499 Mean 95%CIs	High \$500+ Mean 95%CIs	*p*†
Health care card												
Yes	7.85	6.93	0.05	7.69	5.94	0.13	7.89	7.76	0.54	9.33	5.26	0.18
	5.28,10.42	4.89,8,97		4.41,10.97	2.52,9.37		4.14,11.64	4.22,11.29		5.81,12.85	2.78,7.74	
n	72	62		45	20		49	23		46	26	
No	5.41	4.97	0.10	4.83	6.30	0.16	3.86	7.12	<0.01	4.31	6.69	0.07
	4.04,6.78	3.48,4.67		3.24,6.42	3.58,9.01		2.39,5.33	4.85,9.39		2.82,5.80	4.61,8.77	
n	104	82		59	38		60	44		64	40	
	Interaction	*p*=0.76		Interaction	*P*<0.01		Interaction	*p*=0.31		Interaction	*P*<0.01	
Diff. pay \$100 dental bill												
None, hardly any, a little	5.13	3.95	0.06	4.78	5.22	0.35	4.97	5.37	0.09	5.12	5.16	0.14
	3.82,6.45	2.86,5.04		2.97,6.59	2.97,7.46		3.16,6.79	3.48,7.26		3.17,7.06	3.41,6.90	
n	148	101		89	49		97	51		94	54	
A lot	11.06	10.46	0.58	9.80	14.50	0.54	7.34	14.68	0.14	11.50	10.72	0.13
	6.62,15.51	6.24,16.68		4.98,14.63	1.71,27.28		3.29,11.40	8.41,20.95		4.52,18.47	4.22,17.23	
n	28	43		15	9		12	16		16	12	
	Interaction	*p*=0.85		Interaction	*p*=0.45		Interaction	*p*=0.04		Interaction	*p*=0.86	
Avoided due to cost												
Yes	10.74	8.95	0.21	10.38	11.62	0.20	8.97	12.35	<0.01	10.32	14.21	0.41
	7.01,14.46	5.99,11.91		5.62,15.15	4.17,19.06		3.73,14.71	7.34,17.36		6.24,14.39	4.10,18.72	
n	48	64		26	17		27	21		32	16	
No	4.42	3.52	0.42	4.23	3.95	0.59	4.27	4.66	0.62	4.14	4.76	0.83
	3.32,5.52	2.16,4.88		2.79,5.67	2.16,5.74		2.97,5.57	2.90,4.62		2.74,5.75	3.01,6.50	
n	128	80		78	41		82	46		78	50	
	Interaction	*p*=0.71		Interaction	*p*=0.54		Interaction	*p*=0.33		Interaction	*p*=0.89	

† Within stratum

‡ Crude association for all people is shown in Table 102

4.2.6 Summary of stratified analysis

4.2.6.1 Potential effect modification

Effect modification was determined by the statistical significance of the interaction as defined as a *p* value less than 0.05 and is summarised in Table 110.

There were not any statistically significant interactions between sex, employment status and usual reason for dental attendance with any of the five measures of HRQoL. The survey participant variables with the most interactions with HRQoL were education and occupation. The outcome variable with the least number of statistically significant interactions was change in OHIP-14 severity, while the outcome variables with most interactions were the global oral health transition statement and follow-up OHIP-14 severity.

Table 110: Summary of predictor dental care variables* that had statistically significant interactions with survey participant variables in stratified analysis

	Outcome variable †				
Survey participant variables	Δ†OHIP-14	ΔEQ-5D	SROH‡	SRGH‡	Follow-up OHIP-14
Baseline OHIP	V	V	V	–	–
Perceived treatment need	–	A, $	–	A	–
Oral disease	–	–	A	–	–
Sex	–	–	–	–	–
Age	–	–	V, C	–	V
Country of birth	–	V, $	C	–	–
Residential location	A	V	–	A	–
Education	–	A, V, C, $	V, C	–	V, C, $
Household income	–	–		$	V, $
Occupation	$	V, $	V, C	A	A, V, C, $
Employment status	–	–	–	–	–
Regularity of dental attendance	–	–	$	A	–
Reason for dental attendance	–	–	–	–	–
Health care card	–	–	$	–	V, $
Difficulty paying $100 dental bill	–	–	$	–	C
Avoided dental care due to cost	–	–	V	A	–

† Δ = Change in
* A = Dental attendance (yes *vs.* no); V = Volume of dental services (1-6 items *vs.* 7+ items); C = complexity of dental services (1-1.25 *vs.* >1.25); $ = cost of dental services ($1-499 *vs.* $500 or more)
‡ SROH = Self-reported oral health, SRGH = Self-reported general health

4.2.6.2 Evidence of confounding

For associations where there was no evidence of effect modification, evidence of confounding as defined by whether the within stratum associations differ from the crude association was summarised in Table 111.

Across all five outcome measures, evidence of confounding was more common for baseline OHIP-14 severity, sex, country of birth, and difficulty paying a $100 dental bill. Age, residential location, education, reason for attendance, and avoiding or delaying dental care due to cost did not show evidence of confounding. More survey participants variables showed confounding when HRQoL was measured by change measures than the global statements or follow-up OHIP-14 severity.

Table 111: Summary of the evidence of confounding without effect modification

	Outcome variable †				
Survey participant variables	ΔOHIP-14	ΔEQ-5D	SROH‡	SRGH‡	Follow-up OHIP-14
Baseline OHIP	C, $	A, $	C	V, C	–
Perceived treatment need	A	–	–	C	$
Oral disease	C	A, C	–	–	A, V, C
Sex	–	A	V	V	C, $
Age	–	–	–	–	–
Country of birth	V, $	C	V	–	V
Residential location	–	–	–	–	–
Education	–	–	–	–	–
Household income	V	–	–	C	–
Occupation	A	C	–	V	–
Employment status	–	A	–	–	A, V, C, $
Regularity of dental attendance	V	A	A	–	–
Reason for dental attendance	–	–	–	–	–
Health care card	A, C	A	V	–	–
Difficulty paying $100 dental fee	A	A, C	V	A	–
Avoided dental care due to cost	–	–	–	–	C

† Δ = Change in

* A = Dental attendance (yes *vs.* no); V = Volume of dental services (1-6 items *vs.* 7+ items); C = complexity of dental services (1-1.25 *vs.* >1.25); $ = cost of dental services ($1-499 *vs.* $500 or more)

‡ SROH = Self-reported oral health, SRGH = Self-reported general health

4.3 Multivariate analyses

As described in the methods, four models were created with increasing levels of complexity to adjust for confounding and to illustrate effect modification.

4.3.1 Change in mean OHIP-14 severity

4.3.1.1 Visiting a dentist

In Model 1 there was no meaningful relationship between visiting a dentist and change in mean OHIP-14 severity (Table 112). That is, the parameter estimate (-0.04) was very close to zero, and was statistically non-significant (p=0.94). After adjustment for first order terms in Model 2, dental visits were associated with an increase in OHIP-14 severity (parameter estimate=0.60), although the association was not statistically significant (p=0.23).

In contrast, there was a statistically significant association of dental visits with change in mean OHIP-14 severity in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need. Model 4 expanded on that result by showing the association of dental visits with change in mean OHIP-14 severity was somewhat greater in Hobart, the reference location, where the estimated association of visits was 1.23 (p=0.01) than in other locations where the estimated association of visits was 1.23-0.45=0.78. However, this difference in association of visits between Hobart and other places was not statistically significant based on the interaction between residential location and visiting (p=0.54).

Additional observations in Table 112 were that difficulty in paying a $100 dental bill was associated with a statistically significant increase in OHIP-14 severity scores in the Model 3 that adjusted for baseline OHIP-14 severity and treatment need. The statistically significant association of difficulty paying a $100 dental bill persisted in Model 4. Baseline OHIP-14 severity itself had a strong influence on change in mean OHIP-14 severity. In Model 3, the change in mean OHIP-14 severity was 3.9 units lower for people who had a high baseline OHIP-14 severity compared to people who had a low baseline OHIP-14 severity. This signified that people who had a high baseline OHIP score were more likely to experience an improvement in oral HRQoL than people who had a low baseline OHIP score. Consistent with the model building strategy, other variables were included in Table 112, whether or not they were statistically significant.

The largest difference in R^2 occurred between Models 2 and 3, suggesting most of the explained variability in OHIP-14 severity came about due to the addition of baseline OHIP-14 severity and treatment need into the model. Based on its statistical significance and effect size, it was OHIP-14 severity that contributed most to the increase in R^2.

Table 112: Regression analysis for change in mean OHIP-14 severity and visiting a dentist

Parameter	Model 1 Crude model: Visit Estimate	se	*p* value	Model 2 Crude model plus first order terms Estimate	se	*p* value	Model 3 Model 2 plus baseline OHIP severity and treatment need Estimate	se	*p* value	Model 4 Model 3 plus interaction terms Estimate	se	*p* value
Intercept	-0.69	0.36	0.07	-1.03	0.69	0.15	0.63	0.72	0.38	0.24	0.99	0.81
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	-3.89	0.47	<0.01	-3.84	0.47	<0.01
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-1.19	0.48	0.69	-0.15	0.50	0.75
Location (Hobart=0, Other=1)	–	–	–	–	–	–	–	–	–	0.52	0.64	0.42
Interaction term: location x visit	–	–	–	–	–	–	–	–	–	-0.45	0.72	0.54
Income ($30,000-$59,999, ref: $29,999)	–	–	–	-1.06	0.77	0.18	-0.70	0.77	0.37	-0.68	0.79	0.39
Income ($60,000+, ref: $29,999)	–	–	–	0.63	0.71	0.38	-0.15	0.64	0.81	-0.14	0.65	0.82
Diff. in paying $100 bill (No=0, Yes=1)	–	–	–	1.66	0.96	0.10	2.35	0.75	<0.01	2.34	0.75	<0.01
Visit a dentist (No=0, Yes=1)	-0.04	0.53	0.94	0.60	0.49	0.23	0.93	0.34	0.01	1.23	0.46	0.01
	R^2<0.01, Model p=0.94			R^2=0.02, Model p=0.24			R^2=0.17, Model p<0.01			R^2=0.17, Model p<0.01		

4.3.1.2 Volume of dental services

In Model 1 there was a positive relationship between the volume of dental services and increase in mean OHIP-14 severity, though it was not statistically significant (Table 113). After adjustment for the many (11) first order terms (Model 2), high dental service volume was associated with an increase in OHIP-14 severity but the association was not statistically significant (p=0.09). This association of volume with change in OHIP-14 severity remained statistically non-significant (p=0.13) in Model 3, that additionally controlled for baseline OHIP-14 severity and treatment need. Model 4 expanded on that result by showing the increase of OHIP-14 severity was greater for people with a high baseline OHIP-14 severity (association with high volume=0.24+2.70=2.94) compared to a subject with a low baseline OHIP-14 severity (association with low volume=0.24). In other words, among people with low baseline OHIP-14 severity, greater volume of dental services was associated with very little change in OHIP-14 severity whereas among people with high baseline OHIP-14 severity, volume of dental services was associated with a large increase in OHIP-14 severity. This difference in associations of dental service volume with change in OHIP-14 severity was not statistically significant (p=0.07).

As with dental visits, the largest difference in R^2 occurred between Models 2 and 3, suggesting most of the explained variability in OHIP-14 severity came about due to the addition of baseline OHIP-14 severity and treatment need into the model.

4.3.1.3 Complexity of dental services

In Model 1 there was a positive relationship between complexity of dental care and increase in mean OHIP-14 severity, though it was not statistically significant (*p*=0.77, Table 114). After adjustment for the usual reason for visiting a dentist (Model 2), the association with change in OHIP-14 severity was still not statistically significant. The relationship was only slightly stronger in Model 3 compared to Model 2 but it was not statistically significant. There were not any statistically significant interactions between change in mean OHIP-14 severity and complexity of dental care and hence no Model 4. An increased baseline OHIP-14 severity was associated with a decrease in OHIP-14 severity.

There was a non-significant association of dental treatment complexity with change in OHIP-14 severity in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need. The usual reason for visiting a dentist was included in Table 114 but was not statistically significant.

Again the greatest difference in R^2 occurred between Models 2 and 3, suggesting most of the explained variability in OHIP-14 severity came about due to the addition of baseline OHIP-14 severity and treatment need into the model.

Table 113: Regression analysis for change in mean OHIP-14 severity and volume of dental service of those who visited a dentist

Parameter	Model 1 Crude model: Volume Estimate	se	*p* value	Model 2 Crude model plus first order terms Estimate	se	*p* value	Model 3 Model 2 plus baseline OHIP severity and treatment need Estimate	se	*p* value	Model 4 Model 3 plus interaction terms Estimate	se	*p* value
Intercept	-1.09	0.52	<0.05	-2.62	1.88	0.18	-1.06	2.30	0.65	-0.43	2.24	0.85
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	-3.76	0.68	<0.01	-4.83	0.86	<0.01
Interaction term: base severity x volume	–	–	–	–	–	–	–	–	–	2.70	1.44	0.07
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	0.74	0.68	0.29	0.53	0.59	0.38
Sex (ref: Male=0, Female=1)	–	–	–	1.71	0.82	<0.05	1.11	0.79	0.17	1.27	0.79	0.12
Age (Age=15-44, ref: Age 60+)	–	–	–	-0.69	1.10	0.54	-0.84	1.20	0.49	-0.85	1.19	0.48
Age (Age=45-59, ref: Age 60+)	–	–	–	-1.16	1.41	0.42	-0.37	1.33	0.79	-0.28	1.29	0.83
Country of birth (Australia=0, Other=1)	–	–	–	-1.66	0.82	0.05	-1.46	0.76	0.07	-1.52	0.77	0.06
Location (Hobart=0, Other=1)	–	–	–	-1.28	0.92	0.18	-0.30	0.79	0.71	-0.19	0.79	0.81
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	0.64	0.71	0.38	0.20	0.62	0.75	0.46	0.63	0.47
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	0.76	0.72	0.30	1.66	0.89	0.08	1.35	0.85	0.12
Employ status (Yes=0, No=1)	–	–	–	1.28	1.28	0.33	0.76	1.39	0.59	0.68	1.40	0.63
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	0.71	0.79	0.38	1.46	0.82	0.09	1.38	0.77	0.08
Health care card (Yes=0, 1=No)	–	–	–	1.06	1.60	0.51	0.12	1.77	0.95	-0.16	1.78	0.93
Diff. in paying $100 bill (No=0, Yes=1)	–	–	–	-0.29	2.13	0.89	0.43	1.85	0.82	0.44	1.81	0.81
Dental service volume (Lo=0, Hi=1)	0.96	0.80	0.25	1.52	0.86	0.09	1.43	0.93	0.13	0.24	0.89	0.79
	R^2<0.01, Model *p*=0.25			R^2=0.09, Model *p*=0.06			R^2=0.21, Model *p*<0.01			R^2=0.22, Model *p*<0.01		

Table 114: Regression analysis for change in mean OHIP-14 severity and complexity of dental service of those who visited a dentist

Parameter	Model 1 Crude model: Complexity Estimate	se	*p* value	Model 2 Crude model plus first order variables Estimate	se	*p* value	Model 3 Model 2 plus baseline OHIP severity and treatment need Estimate	se	*p* value
Intercept	-0.83	0.46	0.08	-1.02	0.36	<0.01	-0.26	0.63	0.69
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	-3.57	0.55	<0.01
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	0.90	0.59	0.15
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	0.70	0.93	0.46	1.60	0.97	0.11
Dental service complexity (Lo=0, Hi=1)	0.24	0.83	0.77	0.15	0.85	0.86	0.54	0.78	0.49
	R^2<0.01, Model *p*=0.77			R^2<0.01, Model *p*=0.66			R^2=0.15, Model *p*<0.01		

4.3.1.4 Cost of dental services

In Model 1 there was a statistically significant relationship (p<0.05) between greater cost of dental care and increase in mean OHIP-14 severity (Table 115). After adjustment for first order terms in Model 2, dental cost was associated with a greater increase in OHIP-14 severity than in Model 1, and the association continued to be statistically significant (p=0.02).

There was an association between dental cost and an increase in mean OHIP-14 severity in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need, but the relationship was not quite statistically significant (p=0.05). There were not any statistically significant interactions between change in OHIP-14 severity, cost of dental care with any of the variables and hence there are only three models.

The greater difference in R^2 occurred between Model 2 and 4 than between Model 1 and 2, though not by a lot (0.07 to 0.10). This suggested the explained variability in OHIP-14 severity was shared between the addition of first order terms, baseline OHIP-14 severity and treatment need into the model.

Table 115: Regression analysis for change in mean OHIP-14 severity and cost of dental services of those who visited a dentist

Parameter	Model 1 Crude model: Cost Estimate	se	*p* value	Model 2 Crude model plus first order variables Estimate	se	*p* value	Model 4 Model 2 plus baseline OHIP severity and treatment need Estimate	se	*p* value
Intercept	-1.32	0.48	0.01	0.78	1.06	0.47	1.70	1.77	0.16
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	-2.99	0.62	<0.01
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	0.87	0.69	0.21
Age (Age=15-44, ref: Age 60+)	–	–	–	-1.32	0.91	0.16	-1.57	0.77	0.05
Age (Age=45-59, ref: Age 60+)	–	–	–	-1.02	1.15	0.38	-0.24	1.02	0.81
Country of birth (Australia=0, Other=0)	–	–	–	-0.97	0.93	0.30	-0.43	0.81	0.60
Income ($30,000-$59,999, ref: $29,999)	–	–	–	-1.23	1.58	0.45	-0.50	1.48	0.74
Income ($60,000+, ref: $29,999)	–	–	–	-0.12	1.35	0.93	-1.41	1.15	0.23
Dental service cost (Lo=0, Hi=1)	1.39	0.66	<0.05	1.83	0.75	0.02	1.57	0.77	0.05
	R^2=0.02, Model p<0.05			R^2=0.09, Model p<0.01			R^2=0.19, Model p<0.01		

4.3.1.5 Regression to the mean

It is acknowledged that the use of variables was subject to residual confounding due to regression to the mean. This is where high baseline scores influence overall change after treatment. For the analyses for change in OHIP-14 severity, a more precise adjustment for regression to the mean was done through the use of residuals as the dependent variable. The results for the influence of regression to the mean on the association between the main explanatory variables and change in OHIP-14 severity are shown in Table 116. The result for dental visits was not remarkably different from that found in Model 3 in Table 112 in the multivariate analysis section of the results. The estimate for change in OHIP-14 severity was -0.35 where this decrease was qualified as residual change in OHIP-14 severity. Similar results were found with dental service volume, complexity and cost. The estimate for change in OHIP-14 severity was both relatively small and statistically insignificant.

Table 116: Influence of regression to the mean on the association between the main explanatory variables and change in OHIP-14 severity

Main explanatory variable	Model 3 in multivariate analysis	Residual
Visit a dentist (No=0, Yes=1)	0.93 (*p*=0.01)	-0.35 (*p*=0.20)
Dental service volume (Lo=0, Hi=1)	1.43 (*p*=0.13)	0.09 (*p*=0.74)
Dental service complexity (Lo=0, Hi=1)	0.54 (*p*=0.49)	-0.10 (*p*=0.72)
Dental service cost (Lo=0, Hi=1)	1.57 (*p*=0.05)	0.31 (*p*=0.27)

4.3.2 Change in mean EQ-5D

4.3.2.1 Visiting a dentist

In Model 1 there was no relationship between visiting a dentist and change in mean EQ-5D (Table 117). That is, the parameter estimate was very close to zero (<0.01), and was not statistically significant (*p*=0.99). After adjustment for first order terms in Model 2, dental visiting was associated with a small decrease in EQ-5D, although the relationship was not statistically significant (*p*=0.72). The non-significant association of dental visiting with change in mean EQ-5D persisted in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need.

Model 4 expanded on that result with the addition of two interaction terms, showing that the association of dental visits with change in mean EQ-5D varied according to education and according to perceived treatment need. For example, in the reference group with no post-secondary education and no treatment need, the association of dental attendance with change in mean EQ-5D was equal to the parameter estimate of +4.57, representing an adverse association of dental visits with HRQoL. In contrast, for people with no post-secondary education who did have perceived treatment needs, the association of attendance with HRQoL was 4.57 – 6.72 = -2.15, representing a favourable association of dental visits with HRQoL. When other combinations of education and perceived treatment need were considered, the most favourable association of dental visits with HRQoL was estimated for Trade/Diploma/Certificate holders who had perceived treatment needs (estimated association of attendance = -8.96) while the most adverse association of dental visits on HRQoL was estimated for Degree/Teaching/Nursing group with no treatment needs (estimated association of attendance = 5.97) and the association between dental visits and change in EQ-5D was reversed so that there was an increase in EQ-5D. This change was influenced by the introduction of the treatment need interaction term and the level of education into the model. Other than the interaction term for treatment need and education level, none of the variables included in Table 117 were statistically significant.

Only a relatively modest increase in R^2 occurred from Model 1 through to 4, suggesting that none of the included variables were associated with change in EQ-5D.

Table 117: Regression analysis for change in mean EQ-5D and visiting a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Visit			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	-1.84	1.11	0.11	-2.06	2.50	0.42	-3.14	3.24	0.34	-6.40	3.42	0.07
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	0.46	1.69	0.79	0.84	1.63	0.61
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	1.48	1.83	0.42	4.80	2.62	0.08
Interaction term: treatment need x visit	–	–	–	–	–	–	–	–	–	-6.72	2.95	0.03
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	-2.61	1.88	0.18	-2.60	1.86	0.18	-2.41	2.75	0.39
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	2.93	1.54	0.07	2.68	1.50	0.09	5.71	2.57	0.04
Interaction term: educ (Deg/Tea/Nur) x visit	–	–	–	–	–	–	–	–	–	1.40	3.42	0.68
Interaction term: educ (Tra/Dip/Cert) x visit	–	–	–	–	–	–	–	–	–	-6.81	3.07	0.04
Occupation (Unemployed, ref: Blue col)	–	–	–	-0.72	2.09	0.73	-0.85	2.03	0.68	0.14	1.78	0.94
Occupation (Man/prof/para, ref: Blue col)	–	–	–	0.84	2.06	0.69	0.66	2.10	0.76	1.34	1.89	0.48
Occupation (Trade/clerical, ref: Blue col)	–	–	–	2.13	1.81	0.25	2.03	1.76	0.26	1.34	1.59	0.41
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	2.40	1.38	0.63	2.69	1.31	0.05	2.00	1.11	0.08
Visit a dentist (No=0, Yes=1)	<0.01	1.50	0.99	-0.54	1.50	0.72	-0.66	1.49	0.66	4.57	3.49	0.50
	R^2<0.01, Model *p*=0.99			R^2=0.05, Model *p*=0.26			R^2=0.06, Model *p*=0.31			R^2=0.11, Model *p*=0.41		

4.3.2.2 Volume of dental services

In Model 1 there was an association between the volume of dental services and a decrease in mean EQ-5D, but the association was not statistically significant (*p*=0.08) (Table 118). After adjustment for three first order terms, dental service volume was associated with a smaller decrease in EQ-5D, though it was not statistically significant.

There was a similar, but not statistically significant association, between dental service volume and decrease in mean EQ-5D in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need as was found in Model 2.

There were several interaction terms. The interaction terms related to the level of education was chosen to include in Model 4. The other interaction terms relating to occupation, residential location and country of birth were all considered to be related to education. Though not shown here, when the interactions other than education were included in the model, they were not statistically significant. Their removal from the model did not greatly reduce R^2 (0.28 to 0.20).

Model 4 resulted in a small negative and not statistically significant relationship between the volume of dental services and increase in mean EQ-5D. However, the regression model was statistically significant (*p*=0.02).

The level of education, household income, and avoiding or delaying dental care due to cost, were individually statistically significant in their association with change in EQ-5D. However, one of the education interaction terms was statistically significant. The greatest increase in R^2 occurred between Models 3 and 4, suggesting most of the explained variability in EQ-5D came about due to the addition of the education interaction terms into the model.

Table 118: Regression analysis for change in mean EQ-5D and volume of dental service of those who visited a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Volume			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus education interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	-1.01	1.66	0.39	-1.24	2.18	0.57	-0.96	2.23	0.67	-2.75	2.12	0.21
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	1.28	1.23	0.31	3.24	1.70	0.07
Interact baseline severity/volume	–	–	–	–	–	–	–	–	–	-1.31	2.33	0.58
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-2.85	2.03	0.17	-1.74	1.95	0.38
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	–	–	–	–	–	–	-4.44	1.92	0.03
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	–	–	–	–	–	–	3.76	2.41	0.13
Interaction term: educ (Deg/Tea/Nur) x vol	–	–	–	–	–	–	–	–	–	4.45	2.64	0.10
Interaction term: educ (Tra/Dip/Cert) x vol	–	–	–	–	–	–	–	–	–	-10.0	4.39	0.03
Income ($30,000-$59,999, ref: $29,999)	–	–	–	-3.72	2.07	0.08	-3.67	2.02	0.08	-5.76	2.07	0.01
Income ($60,000+, ref: $29,999)	–	–	–	1.40	1.56	0.38	1.87	1.52	0.23	3.62	1.88	0.07
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	1.44	2.09	0.50	0.86	2.06	0.68	2.64	1.94	0.19
Avoid treat due to cost (Yes=0, No=1)	–	–	–	2.47	1.75	0.17	3.49	1.62	0.04	5.56	1.87	<0.01
Dental service volume (Lo=0, Hi=1)	-2.23	1.21	0.08	-1.62	1.23	0.20	-1.63	1.23	0.20	-0.34	1.73	0.85
	R^2=0.01, Model *p*=0.08			R^2=0.05, Model *p*=0.05			R^2=0.07, Model *p*=0.06			R^2=0.20, Model *p*=0.02		

4.3.2.3 Complexity of dental services

In Model 1 there was a relationship between complexity of dental care and decrease in mean EQ-5D, though it was not statistically significant (Table 119). After adjustment for the first order terms in Model 2, complexity of dental care was associated with a greater decrease in EQ-5D but the association was still not statistically significant.

There was a greater decrease in EQ-5D in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need. However it was again not statistically significant.

Model 4 expanded on that result by showing the association between dental service complexity and decrease in EQ-5D lessened with the inclusion of the two educational interaction terms into the model. However, the association was not statistically significant. There were not any variables included in Model 4 that were statistically significant.

There was little difference in R^2 between Models 1 to 4, and R^2 was always under 0.11, suggesting they did not explain much variability in EQ-5D. However, the models from 2 to 4 were statistically significant.

Table 119: Regression analysis for change in mean EQ-5D and complexity of dental service of those who visited a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Complexity			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	-0.98	1.19	0.42	-1.12	3.94	0.78	1.05	3.45	0.76	1.68	2.41	0.63
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	-0.53	1.60	0.74	-0.04	1.57	0.98
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-2.88	1.90	0.14	-2.60	1.90	0.18
Oral disease (No=0, Yes=1)	–	–	–	-0.44	2.21	0.84	-0.63	2.27	0.78	0.44	2.19	0.84
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	-1.74	2.15	0.42	-1.52	2.11	0.48	-3.60	2.23	0.12
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	-0.27	1.57	0.86	-0.75	1.66	0.65	1.40	2.29	0.55
Interaction term: educ (Deg/Tea/Nur) x com	–	–	–	–	–	–	–	–	–	4.92	3.52	0.17
Interaction term: educ (Tra/Dip/Cert) x com	–	–	–	–	–	–	–	–	–	-5.38	4.02	0.19
Occupation (Unemployed, ref: Blue col)	–	–	–	0.64	2.32	0.78	0.38	2.28	0.87	0.13	2.40	0.96
Occupation (Man/prof/para,., ref: Blue col)	–	–	–	0.44	2.76	0.88	0.95	2.73	0.73	0.79	2.76	0.78
Occupation (Trade/clerical, ref: Blue col)	–	–	–	2.18	1.53	0.17	2.04	1.47	0.18	2.03	1.51	0.19
Reg. of visit (≤12 mths=0, >12mths=1)	–	–	–	-4.76	2.07	0.03	-4.24	1.98	0.04	-3.73	2.00	0.07
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	4.52	2.24	0.05	3.57	2.40	0.15	3.08	2.47	0.22
Dental service complexity (Lo=0, Hi=1)	-2.02	1.52	0.20	-2.12	1.76	0.24	-2.51	1.60	0.13	-2.07	2.42	0.11
	R^2=0.01, Model p=0.20			R^2=0.06 Model p=0.04			R^2=0.08 Model p<0.01			R^2=0.10, Model p=0.01		

4.3.2.4 Cost of dental services

In Model 1 there was a positive, though not statistically significant relationship, (p<0.20) between cost of dental care and an increase in mean EQ-5D (Table 120). After adjustment for first order terms, dental cost was associated with a decrease in EQ-5D and the association was closer to being statistically significant (p=0.09).

Compared to Model 2, there was a greater decrease in EQ-5D in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need, and the relationship between the cost of dental care and decrease in EQ-5D was statistically significant (p<0.05).

Due to the number of interactions, the level of education interaction term was chosen to also represent occupation, and country of birth interaction terms. Although not shown, the inclusion of the occupation, and country of birth interaction terms into the model did not greatly reduce R^2 (0.37 to 0.34) and the model p value stayed less than 0.01. The treatment need interaction term was included in Model 4.

Model 4 showed that the dental service cost was associated with a somewhat greater and statistically significant (p<0.01) decrease of EQ-5D. Consistent with the model building strategy, many variables were included in Table 120. The level of education, treatment need, occupation and avoiding dental care due to cost were statistically significant. However, both the education interaction terms and the treatment need interaction term were statistically significant.

The greatest increase in R^2 occurred between Models 3 and 4 (0.34-0.14=0.20), suggesting most of the explained variability in EQ-5D came about due to the addition of the education interaction terms into the model.

Table 120: Regression analysis for change in mean EQ-5D and cost of dental service of those who visited a dentist

Parameter	Model 1 Crude model: Cost			Model 2 Crude model plus first order terms			Model 3 Model 2 plus baseline OHIP severity and treatment need			Model 4 Model 3 plus interaction terms		
	Estimate	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	-0.99	1.23	0.43	-5.23	4.64	0.27	-5.00	4.41	0.27	-3.90	3.04	0.21
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	0.49	1.38	0.72	2.21	1.62	0.19
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-3.38	2.15	0.13	-6.95	2.72	0.02
Interaction term: treatment need x cost	–	–	–	–	–	–	–	–	–	8.23	3.13	0.02
Oral disease (No=0, Yes=1)	–	–	–	-0.62	2.28	0.79	-0.91	2.21	0.68	-2.29	1.85	0.23
Age (Age=15-44, ref: Age 60+)	–	–	–	1.54	2.83	0.59	0.93	2.79	0.74	2.05	2.68	0.45
Age (Age=45-59, ref: Age 60+)	–	–	–	-1.25	2.71	0.65	-0.68	2.70	0.80	-2.28	2.21	0.31
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	–	–	–	–	–	–	-5.19	2.18	0.03
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	–	–	–	–	–	–	4.83	2.19	0.04
Interaction term: educ (Deg/Tea/Nur) x cost	–	–	–	–	–	–	–	–	–	9.51	3.52	0.01
Interaction term: educ (Tra/Dip/Cert) x cost	–	–	–	–	–	–	–	–	–	-12.44	3.95	<0.01
Income ($30,000-$59,999, ref: $29,999)	–	–	–	-4.12	2.31	0.09	-3.45	2.26	0.14	-3.58	2.07	0.10
Income ($60,000+, ref: $29,999)	–	–	–	0.07	2.36	0.98	-0.41	2.27	0.86	1.70	2.04	0.41
Occupation (Unemployed, ref: Blue col)	–	–	–	2.81	1.62	0.10	3.02	1.45	<0.05	2.81	1.79	0.13
Occupation (Man/prof/para,., ref: Blue col)	–	–	–	4.30	2.74	0.13	4.85	2.75	0.09	5.11	2.35	0.04
Occupation (Trade/clerical, ref: Blue col)	–	–	–	1.51	1.80	0.41	1.44	1.52	0.35	3.43	1.66	0.05
Reg. of visit (≤12 mths=0, >12mths=1)	–	–	–	-3.22	2.13	0.14	-2.31	1.89	0.23	-1.17	1.64	0.48
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	4.74	2.56	0.08	3.69	2.40	0.14	3.32	2.09	0.12
Health care card (Yes=0, 1=No)	–	–	–	2.30	2.11	0.29	2.89	2.08	0.18	2.78	1.56	0.09
Avoid treat due to cost (Yes=0, No=1)	–	–	–	2.96	1.80	0.11	4.22	1.73	0.03	5.83	1.72	<0.01
Diff. in paying $100 bill (No=0, Yes=1)	–	–	–	0.81	2.67	0.76	0.98	2.68	0.72	0.07	1.81	0.97
Dental service cost (Lo=0, Hi=1)	1.97	1.51	0.20	-2.98	1.66	0.09	-3.50	1.67	<0.05	-9.74	3.33	<0.01
	R^2=0.01, Model p=0.20			R^2=0.11, Model p<0.01			R^2=0.14, Model p<0.01			R^2=0.34, Model p<0.01		

4.3.3 Global oral health transition statement

4.3.3.1 Visiting a dentist

In Model 1 there was a relationship between visiting a dentist and a negative global oral health transition statement (Table 121), and the relationship was statistically significant (p=0.02). After adjustment for (16) first order terms in Model 2, there was a statistically significant association (p=0.03) between dental visiting and global oral health transition statement.

There was a larger negative parameter estimate for the association of visiting a dentist with the global oral health transition statement in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need. The association was again statistically significant. Model 4 expanded on that result by showing the association of the global oral health transition statement with dental visiting was somewhat greater with a further increase in the negative parameter estimate associated with visiting a dentist and the global oral health transition statement.

Additional observations in Table 121 were that age, level of education and regular dental visiting had statistically significant associations with the global oral health transition statement. Consistent with the model building strategy, other variables were included in Table 121 but were not statistically significant.

The greatest difference in R^2 occurred between Models 1 and 2, suggesting most of the explained variability in the global oral health transition statement came about due to the addition of several first order terms into the model.

Table 121: Regression analysis for global oral health transition statement and visiting a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Visit			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	2.44	0.99	0.02	3.91	2.76	0.17	5.71	3.05	0.07	8.90	3.33	0.01
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	1.03	1.10	0.35	1.04	1.13	0.37
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-3.15	1.15	0.01	-3.07	1.15	0.01
Oral disease (No=0, Yes=)	–	–	–	-2.40	1.45	0.11	-3.02	1.34	0.03	0.57	1.32	0.67
Interaction term: oral disease x visit	–	–	–	–	–	–	–	–	–	6.47	1.75	<0.01
Sex (ref: Male=0, Female=1)				0.43	0.80	0.60	0.32	0.76	0.67	-0.23	0.75	0.76
Age (Age=15-44, ref: Age 60+)	–	–	–	-2.91	1.52	0.07	-2.70	1.31	<0.05	-2.96	1.39	0.04
Age (Age=45-59, ref: Age 60+)	–	–	–	1.53	1.47	0.31	1.11	1.36	0.42	1.08	1.29	0.41
Country of birth (Australia=0, Other=1)	–	–	–	-0.59	0.97	0.55	-1.15	0.86	0.19	-1.08	0.73	0.15
Location (Hobart=0, Other=1)	–	–	–	2.40	1.14	<0.05	1.85	1.07	0.10	1.62	1.08	0.15
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	3.02	1.43	0.04	2.80	1.39	0.05	2.87	1.33	0.04
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	-3.27	0.98	<0.01	-2.90	0.79	<0.01	-3.17	0.71	<0.01
Income ($30,000-$59,999, ref: $29,999)	–	–	–	3.02	1.63	0.07	1.83	1.56	0.25	1.99	1.57	0.22
Income ($60,000+, ref: $29,999)	–	–	–	-1.86	2.19	0.40	-0.91	2.06	0.66	-1.59	2.01	0.44
Employment status (Yes=0, No=1)	–	–	–	-0.39	1.20	0.75	-0.21	1.23	0.86	-0.89	1.15	0.44
Reg. of visit (≤12 mths=0, >12mths=1)	–	–	–	-4.33	1.55	<0.01	-3.78	1.28	<0.01	-3.46	1.17	<0.01
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	-0.26	1.98	0.89	-1.18	1.80	0.52	-1.15	1.65	0.49
Health care card (Yes=0, 1=No)	–	–	–	-2.74	1.84	0.15	-3.18	1.81	0.09	-3.30	1.84	0.08
Diff. in paying $100 bill (No=0, Yes=1)	–	–	–	-0.97	2.49	0.70	-1.12	2.28	0.63	-0.75	2.31	0.75
Avoid treat due to cost (Yes=0, No=1)	–	–	–	-2.37	1.63	0.16	-1.14	1.22	0.36	-0.81	1.14	0.48
Visit a dentist (No=0, Yes=1)	-3.23	1.35	0.02	-2.95	1.30	0.03	-3.26	1.27	0.01	-7.90	1.90	<0.01
	R^2=0.05, Model *p*=0.02			R^2=0.25, Model *p*<0.01			R^2=0.30, Model *p*<0.01			R^2=0.33, Model *p*<0.01		

4.3.3.2 Volume of dental services

In Model 1 there was a negative relationship between the volume of dental services and the negative global oral health transition statement, although the association was not statistically significant (p=0.40) (Table 122).

Residential location did not have either a within stratum or interaction p value under 0.05 but was added to Model 2 because bivariate analysis showed it was a confounder defined as being associated with both the explanatory and outcome variables. After adjustment for the first order terms and the confounder, there still was a negative association between dental service volume with the global oral health transition statement, and it was again not statistically significant.

As in Model 2, there was a similar and not statistically significant negative association between dental service volume with the global oral health transition statement in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need. Of the interaction terms, the level of education and baseline OHIP-14 severity were included in Model 4. The level of education was considered to be related to both occupation and avoiding or delaying dental care due to cost.

Inclusion of the interaction terms resulted in a smaller negative association between the global oral health transition statement and dental service volume; a relationship that was not statistically significant. None of the variables were statistically significant, but both the education interaction terms were statistically significant.

The greatest change in R^2 occurred between Models 1 and 2, and Models 3 and 4, suggesting most of the explained variability in the global oral health transition statement came about due to the addition of first order terms and the interaction terms into the model.

Table 122: Regression analysis for global oral health transition statement and volume of dental service of those who visited a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Volume			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	-0.18	1.10	0.87	-7.62	3.57	0.04	-5.69	3.29	0.10	-0.79	2.05	0.70
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	1.07	1.72	0.54	4.75	1.91	0.02
Interaction term: base OHIP sev x volume	–	–	–	–	–	–	–	–	–	-6.11	4.23	0.16
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-1.86	1.93	0.34	-0.37	1.51	0.81
Oral disease (No=0, Yes=1)	–	–	–	-5.44	2.34	0.03	-6.06	2.30	0.01	-4.15	2.09	0.06
Location (Hobart=0, Other=1)	–	–	–	1.71	1.96	0.39	1.04	1.93	0.59	0.27	1.78	0.88
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	2.50	2.30	0.29	2.43	2.19	0.28	-0.95	1.92	0.63
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	-2.33	2.08	0.27	-2.04	1.89	0.29	2.10	2.11	0.33
Interaction term: educ (Deg/Tea/Nur) x vol	–	–	–	–	–	–	–	–	–	8.75	3.39	0.02
Interaction term: educ (Tra/Dip/Cert) x vol	–	–	–	–	–	–	–	–	–	-10.95	2.57	<0.01
Income ($30,000-$59,999, ref: $29,999)	–	–	–	3.70	2.48	0.15	2.39	2.22	0.29	1.13	2.49	0.65
Income ($60,000+, ref: $29,999)	–	–	–	-2.21	2.91	0.46	-0.85	2.89	0.77	0.49	3.17	0.88
Health care card (Yes=0, 1=No)	–	–	–	0.49	2.68	0.86	-0.79	2.44	0.75	-1.30	2.46	0.60
Dental service volume (Lo=0, Hi=1)	-1.67	1.93	0.40	-1.37	1.84	0.46	-1.68	1.78	0.36	-1.04	2.45	0.68
	R^2=0.01, Model p=0.40			R^2=0.14, Model p=0.02			R^2=0.17, Model p=0.06			R^2=0.28, Model p<0.01		

4.3.3.3 Complexity of dental services

In Model 1 there was a positive relationship between complexity of dental care and the global oral health transition statement, though it was not statistically significant (Table 123). There were not any first order terms for the association between the global oral health transition statement and complexity of dental service and hence there were only three models.

There was reduction in the parameter estimate for the association of complexity of dental care with the global oral health transition statement score in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need. However it was again not statistically significant.

There were many interaction terms. The level of education was chosen as the most representative interaction term and was used to expand on the Model 3 result. Model 4 showed a negative parameter estimate for the association of complexity of dental care with the global oral health transition statement score, but the relationship was not statistically significant (p=0.26). Both the education interaction terms were statistically significant in Model 4.

The greatest difference in R^2 occurred between Models 3 and 4 suggesting most of the explained variability in global oral health transition statement came about due to the addition of the education interaction terms into the model. However, the model was not statistically significant (p=0.20).

Table 123: Regression analysis for global oral health transition statement and complexity of dental service of those who visited a dentist

	Model 1			Model 3			Model 4		
	Crude model: Complexity			Model 1 plus baseline OHIP severity and treatment need			Model 3 plus the education interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	-1.24	1.13	0.28	0.22	1.70	0.90	-0.19	1.56	0.90
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	0.24	1.82	0.90	1.33	1.80	0.47
Treatment need (No=0, Yes=1)	–	–	–	-1.76	1.54	0.26	-0.61	1.49	0.69
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	–	–	–	-2.72	2.92	0.36
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	–	–	–	3.28	2.89	0.27
Interaction term: educ (Deg/Tea/Nur) x complexity	–	–	–	–	–	–	9.52	4.07	0.03
Interaction term: educ (Tra/Dip/Cert) x complexity	–	–	–	–	–	–	-10.01	4.23	0.03
Dental service complexity (Lo=0, Hi=1)	1.06	1.68	0.53	0.37	1.58	0.82	-2.74	2.39	0.26
	$R^2<0.01$, Model $p=0.53$			$R^2=0.01$, Model $p=0.73$			$R^2=0.10$ Model $p<0.20$		

4.3.3.4 Cost of dental services

In Model 1 there was a statistically significant negative relationship (p=0.04) between cost of dental care and the global oral health transition statement (Table 124). After adjustment for first order terms, the relationship between dental cost and the global oral health transition statement showed little change.

There was little change from Model 2 in the parameter estimate for the association of complexity with dental care on the global oral health transition statement score in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need. The relationship was statistically significant.

The variables of eligibility for a health care card and difficulty paying a $100 dental bill were expected to be strongly linked. Difficulty paying a $100 dental bill was included in Model 4 because it had the larger effect size and the interaction term had lower *p* values. Model 4 showed an increase in the parameter estimate of the association between dental service cost and the higher global oral health transition statement score indicating a lesser improvement in oral HRQoL than in Model 3.

Additional observations in Table 124 were that there was a statistically significant association between the presence of oral disease and regular dental visiting with the global oral health transition statement. Difficulty paying a $100 dental bill was not statistically significant (p=0.06). The associated interaction term was statistically significant (p<0.01). Consistent with the model building strategy, other variables were included in Table 124 but were not statistically significant.

The greatest increase in R^2 occurred between Models 1 and 2 suggesting most of the explained variability in the global oral health transition statement score came about due to the addition into the model of the first order terms.

Table 124: Regression analysis for global oral health transition statement and cost of dental service of those who visited a dentist

	Model 1 Crude model: Cost			Model 2 Crude model plus first order terms			Model 3 Model 2 plus baseline OHIP severity and treatment need			Model 4 Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	1.06	0.63	0.10	-1.49	2.63	0.58	-0.86	2.78	0.76	-0.74	2.39	0.76
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	1.00	1.61	0.54	0.18	1.27	0.89
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-2.57	1.80	0.17	-1.86	1.61	0.26
Oral disease (No=0, Yes=1)	–	–	–	-4.22	1.72	0.02	-4.78	1.63	<0.01	-4.03	1.24	<0.01
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	1.83	1.89	0.34	1.94	2.03	0.35	1.31	1.78	0.47
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	-1.21	1.79	0.50	-1.24	1.66	0.46	-0.47	1.44	0.75
Occupation (Unemployed, ref: Blue col)	–	–	–	0.08	2.79	0.98	0.76	2.49	0.76	0.76	2.23	0.73
Occupation (Man/prof/para,., ref: Blue col)	–	–	–	-0.64	2.72	0.81	-0.24	2.39	0.92	-0.62	1.96	0.75
Occupation (Trade/clerical, ref: Blue col)	–	–	–	0.50	2.87	0.86	0.48	2.62	0.86	-0.13	2.22	0.95
Reg. of visit (≤12 mths=0, >12mths=1)	–	–	–	-4.45	1.92	0.03	-5.01	1.83	0.01	-5.04	1.48	<0.01
Diff. in paying $100 bill (No=0, Yes=1)	–	–	–	–	–	–	–	–	–	6.84	3.45	0.06
Interaction term: diff. paying $100 bill/cost	–	–	–	–	–	–	–	–	–	-13.41	4.41	<0.01
Dental service cost (Lo=0, Hi=1)	-4.29	2.02	0.04	-4.27	1.58	0.01	-4.08	1.49	0.01	-1.93	1.29	0.15
	R^2=0.07, Model p=0.04			R^2-0.22, Model p<0.01			R^2=0.27, Model p=0.03			R^2=0.36, Model p=0.01		

4.3.4 Global general health transition statement

4.3.4.1 Visiting a dentist

In Model 1 there was a negative relationship between dentist visiting and the global general health transition statement signifying a favourable association of dental visits with self-reported general health (SRGH), but the relationship was not statistically significant (*p*=0.06, Table 125). After adjustment for first order terms, dental visiting was associated with a slightly lower negative parameter estimate in the relationship to the global general health transition statement, but the association was not statistically significant (*p*=0.13). There was a similar negative parameter estimate for the relationship between dental visiting and the global general health transition statement as in Model 2 and Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need.

Model 4 expanded on that result with the introduction into the model of the interaction term for residential location. Residential location was used as a proxy for occupation, the other statistically significant interaction term other than treatment need from the stratified analysis. Tasmanians residing outside Hobart were more likely than Hobart rdesidents to be unemployed, or a blue collar worker or labourer (ABS, 2006), to have less regular dental visiting patterns, and to avoid or delay dental care due to cost (Slade et al. 2007). As a main explanatory variable, the treatment need interaction term was retained in the model. The parameter estimate for the relationship between dental visiting and the global general health transition statement score in Model 4 was negative but close to zero, and not statistically significant (*p*=0.82).

The greatest increase in R^2 occurred between Models 1 and 2 suggesting most of the explained variability in the global general health transition statement came about due to the introduction of the cost of dental care into the model. Based on its statistical significance, it was avoiding or delaying dental care due to cost that contributed most to the increase in R^2. Neither treatment need nor residential location variables were statistically significant, while their interaction terms were statistically significant (*p*=0.02), indicating that treatment need and residential location had only a small or no contribution to the increase in R^2.

Table 125: Regression analysis for global general health transition statement and visiting a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Visit			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	1.40	0.57	0.02	1.61	2.63	0.54	2.03	2.06	0.49	3.51	2.64	0.20
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	0.32	1.08	0.77	-0.06	1.13	0.96
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-0.29	0.91	0.75	1.87	1.30	0.16
Interaction term: treatment need x visited	–	–	–	–	–	–	–	–	–	-4.30	1.66	0.02
Oral disease (No=0, Yes=1)	–	–	–	-1.17	1.12	0.30	-1.36	1.13	0.24	-1.22	1.00	0.23
Sex (ref: Male=0, Female=1)	–	–	–	-0.94	0.69	0.18	-1.06	0.73	0.16	-1.29	0.72	0.09
Age (Age=15-44, ref: Age 60+)	–	–	–	0.39	1.08	0.72	0.34	1.10	0.76	-0.19	1.07	0.86
Age (Age=45-59, ref: Age 60+)	–	–	–	-0.10	1.13	0.93	-0.06	1.21	0.24	0.68	1.17	0.57
Location (Hobart=0, Other=1)	–	–	–	0.42	0.75	0.58	0.27	0.76	0.72	-1.37	1.67	0.25
Interaction term: location x visited	–	–	–	–	–	–	–	–	–	3.10	1.24	0.02
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	1.32	1.38	0.35	1.37	1.39	0.33	1.43	1.39	0.31
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	-0.39	1.27	0.76	-0.20	1.29	0.87	-0.33	1.19	0.78
Income ($30,000-$59,999, ref: $29,999)	–	–	–	2.46	1.24	0.06	1.99	1.21	0.11	2.20	1.07	0.05
Income ($60,000+, ref: $29,999)	–	–	–	-1.63	1.70	0.34	-1.28	1.61	0.44	-1.59	1.42	0.27
Occupation (Unemployed, ref: Blue col)	–	–	–	-1.00	1.46	0.50	-0.88	1.50	0.56	-0.66	1.50	0.66
Occupation (Man/prof/para,., ref: Blue col)	–	–	–	-1.57	1.18	0.19	-1.56	1.20	0.21	-1.20	1.12	0.29
Occupation (Trade/clerical, ref: Blue col)	–	–	–	-1.22	1.66	0.47	-1.32	1.61	0.42	-1.49	1.46	0.32
Reg. of visit (≤12 mths=0, >12mths=1)	–	–	–	-0.28	0.88	0.75	-0.14	0.89	0.87	0.14	0.82	0.87
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	-1.19	1.38	0.40	-1.47	1.33	0.28	-1.83	1.42	0.21
Health care card (Yes=0, 1=No)	–	–	–	-0.15	1.73	0.93	-0.55	1.74	0.75	-0.77	1.73	0.66
Diff. in paying $100 bill (No=0, Yes=1)	–	–	–	1.46	1.47	0.33	1.38	1.51	0.37	1.44	1.67	0.40
Avoid treat due to cost (Yes=0, No=1)	–	–	–	-2.43	0.78	<0.01	-2.20	0.82	0.01	-2.15	0.74	<0.01
Visit a dentist (No=0, Yes=1)	-1.33	0.67	0.06	-1.28	0.81	0.13	-1.25	0.76	0.09	-0.38	1.65	0.82
	R^2=0.01, Model p=0.06			R^2=0.12, Model p<0.01			R^2=0.13, Model p<0.01			R^2=0.17, Model p<0.01		

4.3.4.2 Volume of dental services

In Model 1 the relationship between the volume of dental services and a negative global general health statement was not statistically significant (*p*=0.05) (Table 126).

After adjustment for the first order terms, dental service volume was associated with a greater negative parameter estimate in the relation to the global general health transition statement, and the relationship was statistically significant.

Compared to Model 2, there was a greater statistically significant negative association between dental service volume and the global oral health transition statement in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need, and again in Model 4 that included the interaction terms. The statistically significant variables in Model 4 were oral disease, sex, income, occupation and financial hardship.

The greatest increase in R^2 from 0.02 to 0.36 occurred between Models 1 and 2, suggesting most of the explained variability in the global general health transition statement score came about due to the addition of numerous first order terms into the model.

Table 126: Regression analysis for global general health transition statement and volume of dental service of those who visited a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Volume			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	0.81	0.49	0.11	4.43	1.94	0.03	5.76	1.99	<0.01	5.75	1.96	<0.01
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	0.03	1.26	0.98	0.09	1.26	0.94
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-1.81	1.07	0.10	-1.83	1.10	0.11
Oral disease (No=0, Yes=1)	–	–	–	3.08	1.44	0.04	3.36	1.34	0.02	3.33	1.38	0.02
Sex (ref: Male=0, Female=1)	–	–	–	-2.63	0.97	0.01	-2.81	0.99	<0.01	-2.78	0.99	0.01
Country of birth (Australia=0, Other=1)	–	–	–	1.50	0.89	0.11	1.18	0.87	0.19	1.10	0.91	0.24
Location (Hobart=0, Other=1)	–	–	–	1.94	0.71	0.01	1.69	0.71	0.02	1.38	0.76	0.08
Interaction term: location x visited	–	–	–	–	–	–	–	–	–	0.90	1.87	0.63
Income ($30,000-$59,999, ref: $29,999)	–	–	–	3.15	1.42	0.04	2.74	1.33	0.05	2.79	1.30	0.04
Income ($60,000+, ref: $29,999)	–	–	–	-4.03	1.84	0.04	-3.74	1.68	0.04	-3.81	1.65	0.03
Occupation (Unemployed, ref: Blue col)	–	–	–	-3.66	1.44	0.02	-3.48	1.59	0.04	-3.39	1.63	<0.05
Occupation (Man/prof/para,., ref: Blue col)	–	–	–	-3.55	1.35	0.02	-3.05	1.47	<0.05	-3.01	1.48	0.05
Occupation (Trade/clerical, ref: Blue col)	–	–	–	-5.03	1.62	<0.01	-5.02	1.63	<0.01	-4.97	1.65	<0.01
Reg. of visit (≤12 mths=0, >12mths=1)	–	–	–	1.16	1.05	0.28	1.48	0.97	0.14	1.38	1.01	0.18
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	-0.16	0.95	0.87	-0.76	1.03	0.47	-0.63	1.09	0.57
Health care card (Yes=0, 1=No)	–	–	–	0.60	1.45	0.68	0.13	1.24	0.91	0.22	1.28	0.86
Diff. in paying $100 bill (No=0, Yes=1)	–	–	–	-1.34	1.50	0.38	-1.32	1.45	0.37	-1.44	1.48	0.34
Avoid treat due to cost (Yes=0, No=1)	–	–	–	-4.43	1.00	<0.01	-3.89	1.14	<0.01	-3.84	1.99	<0.01
Dental service volume (Lo=0, Hi=1)	-1.97	1.01	0.06	-2.55	0.96	0.01	-2.69	0.82	<0.01	-3.03	1.15	0.01
	R^2=0.02, Model p=0.06			R^2=0.36, Model p<0.01			R^2=0.38, Model p<0.01			R^2=0.38, Model p<0.01		

4.3.4.3 Complexity of dental services

In Model 1 there was a negative relationship between complexity of dental care and the global general health transition statement, and the relationship was statistically significant (*p*<0.01, Table 127). There were not any first order terms or interaction terms for global general health transition statement and complexity of dental service.

Compared to Model 1, there was a greater negative parameter estimate for complexity of dental care in relation to the global general health transition statement score in Model 4 that additionally controlled for baseline OHIP-14 severity and treatment need. However the association between complexity of dental care and the global general health transition statement was not statistically significant.

The R^2 reduced from Model 1 to Model 4 (0.45 to 0.09) suggesting that the inclusion of baseline OHIP-14 severity and treatment need into the model reduced the proportion of variability that is accounted for in the model.

Table 127: Regression analysis for global general health transition statement and complexity of dental service of those who visited a dentist

	Model 1			**Model 4**		
	Crude model: Complexity			**Model 1 plus baseline OHIP severity and treatment need**		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	0.39	0.62	0.53	1.82	1.01	0.08
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	1.88	1.01	0.11
Treatment need (No=0, Yes=1)	–	–	–	-2.88	1.16	<0.01
Dental service complexity (Lo=0, Hi=1)	-0.76	1.00	<0.01	-1.75	0.94	0.09
	R^2=0.45, Model *p*<0.01			R^2=0.09, Model *p*<0.01		

4.3.4.4 Cost of dental services

In Model 1 there was not a statistically significant relationship (p=0.06) between cost of dental care and a negative global general health transition statement (Table 128). After adjustment for first order terms, there was a greater negative parameter estimate for cost of dental care in relation to the global general health transition statement and the relationship was now statistically significant (p=0.03).

The size of the global general health transition statement score was similar in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need as in Model 2. The relationship was still statistically significant (p=0.02).

The addition of interactions into the model resulted in a smaller negative parameter estimate for the cost of dental care in relation to the global general health transition statement, but now the relationship was not statistically significant (p=0.73).

Additional observations in Table 128 were that treatment need and occupation were statistically significant. Consistent with the model building strategy, other variables were included in Table 128 but were not statistically significant.

The greatest increase in R^2 occurred between Models 1 and 2, suggesting most of the explained variability in the global oral health transition statement came about due to the addition of the first order terms into the model. Based on their statistical significance, it was residential location and occupation that contributed most to the increase in R^2.

Table 128: Regression analysis for global general health transition statement and cost of dental service of those who visited a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Cost			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	0.99	0.65	0.14	2.96	1.69	0.09	4.11	1.57	0.02	4.25	2.21	0.07
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	1.26	1.23	0.32	0.81	1.19	0.50
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-2.49	0.85	<0.01	-3.01	1.93	<0.01
Location (Hobart=0, Other=1)	–	–	–	2.06	0.80	0.02	1.73	0.88	0.06	1.48	1.84	0.09
Income ($30,000-$59,999, ref: $29,999)	–	–	–	–	–	–	–	–	–	3.88	2.29	0.10
Income ($60,000+, ref: $29,999)	–	–	–	–	–	–	–	–	–	-3.79	2.54	0.15
Interaction term: $30,000-$59,999 x cost	–	–	–	–	–	–	–	–	–	-3.76	2.74	0.18
Interaction term: $60,000+ x cost	–	–	–	–	–	–	–	–	–	1.09	2.80	0.70
Occupation (Unemployed, ref: Blue col)	–	–	–	-2.38	1.40	0.10	-2.11	1.45	0.16	-3.31	2.22	0.15
Occupation (Man/prof/para,., ref: Blue col)	–	–	–	-3.62	1.56	0.03	-3.37	1.63	0.05	-3.05	1.72	0.09
Occupation (Trade/clerical, ref: Blue col)	–	–	–	-5.62	2.14	0.01	-5.72	2.06	0.01	-5.64	2.29	0.02
Diff. in paying $100 bill (No=0, Yes=1)	–	–	–	1.74	1.18	0.15	1.06	1.31	0.42	-0.46	1.39	0.74
Dental service cost (Lo=0, Hi=1)	-2.12	1.09	0.06	-2.78	1.20	0.03	-2.70	1.09	0.02	-0.46	1.34	0.73
	R^2=0.03, Model p=0.06			R^2=0.18, Model p<0.01			R^2=0.23, Model p<0.01			R^2=0.27, Model p<0.01		

4.3.5 Follow-up OHIP-14 severity

4.3.5.1 Visiting a dentist

In Model 1 the relationship between visiting a dentist and follow-up OHIP-14 severity (Table 129), was not statistically significant (p=0.66). Bivariate analysis showed that household income, regularity of attendance, and usual reason for attendance are confounders. After adjustment for first order terms and confounders, dental visits were associated with a larger parameter estimate in relation to follow-up OHIP-14 severity, and the association was statistically significant (p<0.01).

Compared to Model 2, there was a decrease in the parameter estimate for dental visits in relation to follow-up severity score in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need, and the association between dentist visiting and the follow-up severity was no longer statistically significant (p=0.08).

Model 4 showed that dental visiting had no statistically significant influence on follow-up OHIP-14 severity. Additional observations in Table 129 were that baseline OHIP-14 severity, treatment need and the usual reason for attending a dentist were statistically significant.

The greatest change in R^2 occurred between Models 2 and 3, suggesting most of the explained variability in OHIP-14 severity came about due to the addition of baseline OHIP-14 severity and treatment need into the model. Based on their statistical significance, both baseline OHIP-14 severity and treatment need contributed to the increase in R^2.

Table 129: Regression analysis for follow-up OHIP-14 severity and visiting a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Visit			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	5.72	0.71	<0.01	1.48	0.75	0.06	2.25	0.75	<0.01	3.10	1.81	0.10
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	6.14	0.75	<0.01	6.11	0.73	<0.01
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-2.30	0.70	<0.01	-2.32	0.77	<0.01
Country of birth (Australia=0, Other=1)	–	–	–	0.88	0.80	0.28	-0.42	0.76	0.59	-0.47	0.81	0.57
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	1.17	1.20	0.34	0.50	1.05	0.64	0.69	1.11	0.54
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	-0.24	0.91	0.79	-0.62	0.83	0.46	-0.71	0.81	0.39
Occupation (Unemployed, ref: Blue col)	–	–	–	–	–	–	–	–	–	-1.12	2.09	0.60
Occupation (Man/prof/para,., ref: Blue col)	–	–	–	–	–	–	–	–	–	-1.14	1.82	0.54
Occupation (Trade/clerical, ref: Blue col)	–	–	–	–	–	–	–	–	–	-1.12	1.66	0.51
Interaction term: occup: Unemployed x visit	–	–	–	–	–	–	–	–	–	2.13	2.55	0.41
Interaction term: occup: Man,prof x visited	–	–	–	–	–	–	–	–	–	1.84	2.49	0.47
Interaction term: occup: Trade,cler x visited	–	–	–	–	–	–	–	–	–	1.23	2.19	0.58
Reg. of visit (≤12 mths=0, >12mths=1)	–	–	–	1.06	1.03	0.31	1.05	0.95	0.28	1.00	0.94	0.30
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	3.45	0.72	<0.01	1.78	0.67	0.01	1.77	0.68	0.01
Visit a dentist (No=0, Yes=1)	0.40	0.89	0.66	2.31	0.72	<0.01	1.31	0.72	0.08	-0.12	1.89	0.94
	R^2<0.01, Model *p*=0.66			R^2=0.08, Model *p*<0.01			R^2=0.29, Model *p*<0.01			R^2=0.29, Model *p*<0.01		

4.3.5.2 Volume of dental services

In Model 1 there was no statistically significant relationship between volume of dental services and follow-up OHIP-14 severity (Table 130). That is, the parameter estimate (0.17) was close to zero, and was not statistically significant (p=0.90). After adjustment for first order terms in Model 2, dental visits were associated with positive parameter estimate in relation to OHIP-14 severity, although the association was not statistically significant (p=0.43).

Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need, showed a similar result to Model 2 in that the parameter estimate for the association between dental service volume and follow-up OHIP-14 severity, was similar in size and not statistically significant.

Model 4 incorporated the education interaction terms into the model. Education was also a first order term while the other statistically significant interactions were not. Education was a proxy for age, income, occupation, and eligibility for a health care card. There was a large increased positive parameter estimate for the volume of dental services in relation to follow-up OHIP-14 severity score, and the association was statistically significant (p=0.02).

The greatest increase in R^2 occurred between Models 2 and 3 suggesting most of the explained variability in follow-up OHIP-14 severity came about due to the addition of baseline OHIP-14 severity and treatment need into the model. This was supported by the fact that baseline OHIP-14 severity showed statistical significance (p<0.01). However, treatment need was not statistically significant (p=0.06), in the final model. An additional observation in Table 130 was that sex and the level of education and income were statistically significant. However, in the case of education, its associated interaction term was also statistically significant.

Table 130: Regression analysis for follow-up OHIP-14 severity and the main variable of volume of dental service of those who visited a dentist

	Model 1			**Model 2**			**Model 3**			**Model 4**		
	Crude model: Volume			**Crude model plus first order terms**			**Model 2 plus baseline OHIP severity and treatment need**			**Model 3 plus the education interaction terms**		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	6.05	0.75	<0.01	3.28	1.25	0.01	1.48	0.97	0.14	0.94	0.93	0.33
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	6.49	1.25	<0.01	5.95	1.10	<0.01
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-1.62	1.07	0.14	-2.13	1.08	0.06
Sex (ref: Male=0, Female=1)	–	–	–	1.96	0.88	0.04	2.68	1.11	0.02	2.40	1.10	0.04
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	1.69	1.75	0.34	1.37	1.26	0.29	3.42	1.25	0.01
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	0.63	1.67	0.71	-0.70	1.20	0.57	-1.42	1.49	0.35
Interaction term: educ (Deg/Tea/Nur) x vol	–	–	–	–	–	–	–	–	–	-5.46	2.24	0.02
Interaction term: educ (Tra/Dip/Cert) x vol	–	–	–	–	–	–	–	–	–	3.00	2.32	0.21
Dental service volume (Lo=0, Hi=1)	0.17	1.36	0.90	1.16	1.44	0.43	1.06	1.19	0.38	3.57	1.47	0.02
	R^2<0.01, Model *p*=0.90			R^2=0.04, Model *p*=0.11			R^2=0.28, Model *p*<0.01			R^2=0.30, Model *p*<0.01		

4.3.5.3 Complexity of dental services

In Model 1 the relationship between complexity of dental care and follow-up OHIP-14 severity was not statistically significant (Table 131). After adjustment for the first order terms in Model 2, complexity of dental care was associated with a lower parameter estimate in relation to follow-up OHIP-14 severity and the association was statistically significant.

Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need, showed a small increase in the parameter estimate for complexity of dental care in relation to follow-up OHIP-14 severity, but the association was not statistically significant (p=0.06).

Model 4 incorporated the education interaction terms, which acted as proxies for the occupation and difficulty in paying a $100 dental bill interaction terms. Model 4 expanded on that result by showing a large increased parameter estimate for complexity of dental care in relation to follow-up OHIP-14 severity and the association was statistically significant ($p<0.01$). Baseline OHIP-14 severity, sex, one of the education interaction terms, and avoiding or delaying dental care due to cost was statistically significant.

The greatest increase in R^2 occurred between Models 1 and 2, suggesting most of the explained variability in OHIP-14 severity came about due to the addition of numerous first order terms into the model. The R^2 value was large for Model 4 (0.52), a result that is not commonly seen in dental studies.

Table 131: Regression analysis for follow-up OHIP-14 severity and the main variable of complexity of dental services of those who visited a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Complexity			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus the education interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	5.30	0.81	<0.01	4.18	2.94	0.17	2.28	3.01	0.46	1.06	2.94	0.72
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	5.38	1.06	<0.01	5.33	1.02	<0.01
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	0.49	1.20	0.69	0.92	1.18	0.44
Oral disease (No=0, Yes=1)	–	–	–	2.18	1.67	0.20	2.00	1.40	0.17	1.74	1.42	0.23
Sex (ref: Male=0, Female=1)	–	–	–	2.29	1.39	0.11	3.08	1.37	0.03	3.00	1.30	0.03
Age (Age=15-44, ref: Age 60+)	–	–	–	-1.44	2.42	0.56	-1.51	2.41	0.54	-1.99	2.23	0.38
Age (Age=45-59, ref: Age 60+)	–	–	–	2.10	2.46	0.40	1.02	2.07	0.64	1.09	1.97	0.58
Country of birth (Australia=0, Other=1)	–	–	–	-1.79	1.70	0.30	-1.84	1.42	0.21	-1.72	1.56	0.28
Location (Hobart=0, Other=1)	–	–	–	2.39	1.21	0.06	1.34	1.05	0.21	1.17	0.89	0.20
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	0.69	2.05	0.74	0.88	1.72	0.62	3.59	1.84	0.06
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	0.28	1.37	0.84	-0.68	1.28	0.60	-0.68	1.64	0.68
Interaction term: educ (Deg/Tea/Nur) x com	–	–	–	–	–	–	–	–	–	-6.39	2.28	<0.01
Interaction term: educ (Tra/Dip/Cert) x com	–	–	–	–	–	–	–	–	–	0.50	2.11	0.81
Income ($30,000-$59,999, ref: $29,999)	–	–	–	-1.75	2.37	0.47	-2.54	2.16	0.25	-3.20	2.20	0.16
Income ($60,000+, ref: $29,999)	–	–	–	-2.29	2.49	0.37	-0.51	2.31	0.83	0.53	2.40	0.83
Occupation (Unemployed, ref: Blue col)	–	–	–	3.23	2.85	0.27	2.35	2.36	0.33	2.58	2.35	0.28
Occupation (Man/prof/para,., ref: Blue col)	–	–	–	3.40	2.16	0.13	1.74	1.76	0.33	1.29	1.89	0.50
Occupation (Trade/clerical, ref: Blue col)	–	–	–	0.78	2.03	0.70	-0.58	2.09	0.78	-0.56	2.07	0.79
Reg. of visit (≤12 mths=0, >12mths=1)	–	–	–	-0.12	1.35	0.93	0.08	1.46	0.95	0.12	1.57	0.94
Usual reason for visit (0=Check, 1=Prob.)	–	–	–	3.46	1.63	0.04	2.46	1.72	0.17	2.60	1.84	0.17
Health care card (Yes=0, 1=No)	–	–	–	1.13	1.73	0.52	1.05	1.87	0.58	0.04	2.01	0.98
Avoid treat due to cost (Yes=0, No=1)	–	–	–	-4.59	1.82	0.02	-3.46	1.43	0.02	-3.34	1.36	0.02
Dental service complexity (Lo=0, Hi=1)	1.94	1.08	0.09	1.65	0.80	<0.05	1.75	0.90	0.06	6.34	1.85	<0.01
	R^2=0.02, Model p=0.09			R^2=0.38, Model p<0.01			R^2=0.48, Model p<0.01			R^2=0.52, Model p<0.01		

4.3.1.4 Cost of dental services

In Model 1 the association between cost of dental care and follow-up OHIP-14 severity was small and not statistically significant (*p*=0.71) (Table 132). After adjustment for first order terms, dental cost was associated with a higher parameter estimate in relation to OHIP-14 severity but the association was still not statistically significant (*p*=0.34).

Compared to Model 2, there was a further increase in the parameter estimate for cost of dental care in relation to follow-up OHIP-14 severity in Model 3 that additionally controlled for baseline OHIP-14 severity and treatment need, but the association remained not statistically significant (*p*=0.13).

In Model 4, education was used as a proxy for income, occupation, and eligibility for a health care card. In Model 4, there was a large increase in the parameter estimate for cost of dental care in relation to follow-up OHIP-14 severity and the association was statistically significant (*p*<0.01). None of the variables, other than baseline OHIP-14 severity, included in Model 4 (Table 132) were statistically significant.

The greatest increase in R^2 occurred between Models 2 and 3, suggesting most of the explained variability in OHIP-14 severity came about due to the addition of baseline OHIP-14 severity and treatment need into the model. In the case of baseline OHIP-14 severity, this was supported by its statistical significance (*p*<0.01) in Model 4.

Table 132: Regression analysis for follow-up OHIP-14 severity and the main variable of cost of dental services of those who visited a dentist

	Model 1			Model 2			Model 3			Model 4		
	Crude model: Cost			Crude model plus first order terms			Model 2 plus baseline OHIP severity and treatment need			Model 3 plus interaction terms		
Parameter	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**	**Estimate**	**se**	***p* value**
Intercept	5.94	0.84	<0.01	3.31	1.17	<0.01	1.03	0.86	0.24	0.04	0.82	0.96
Baseline OHIP-14 severity (Lo=0, Hi=1)	–	–	–	–	–	–	6.62	1.27	<0.01	6.28	1.10	<0.01
Treatment need (No=0, Yes=1)	–	–	–	–	–	–	-1.51	1.02	0.15	-1.56	1.08	0.16
Sex (ref: Male=0, Female=1)	–	–	–	2.00	0.83	0.02	2.84	0.92	<0.01	2.58	0.88	<0.01
Educ. (Deg/Teach/Nurse, ref: No post-sec)	–	–	–	1.48	1.70	0.39	1.23	1.26	0.34	2.92	1.16	0.02
Educ. (Trade/Dip/Cert, ref: No post-sec)	–	–	–	0.71	1.65	0.67	-0.64	1.21	0.60	-0.09	1.65	0.96
Interaction term: educ (Deg/Tea/Nur) x cost	–	–	–	–	–	–	–	–	–	-3.67	2.51	0.16
Interaction term: educ (Tra/Dip/Cert) x cost	–	–	–	–	–	–	–	–	–	-0.99	2.52	0.70
Dental service cost (Lo=0, Hi=1)	0.41	1.09	0.71	1.18	1.21	0.34	1.64	1.04	0.13	4.34	1.49	<0.01
	R^2<0.01, Model *p*=0.71			R^2=0.04, Model *p*=0.04			R^2=0.29, Model *p*<0.01			R^2=0.31, Model *p*<0.01		

4.3.6 Summary of multivariate analysis

The results from multivariate analysis varied according to which dependent measure of HRQoL was used (Table 133).

When the dependent variable was change in mean OHIP-14 severity, visiting a dentist was associated with a statistically significant worsening of oral HRQoL. A similar, though not statistically significant, trend was true for high compared to low complexity, and high as compared to low cost dental care but not for high compared to low volume dental care. Follow-up OHIP-14 showed similar trends to change in mean OHIP-14 severity – that is, dental attendance was associated with worsening oral HRQoL, although the association was not statistically significant. Similar trends can be attributed to the moderate correlation observed between baseline and change in mean OHIP-14 severity.

In contrast, visiting a dentist was associated with a significant improvement in quality of life when the dependent variable was the global oral health transition statement. The global general health transition statement showed an unfavourable association of dental visits with HRQoL, although it was not statistically significant. In both cases of these global transition statements there were statistically significant interactions.

When the dependent variable was change in EQ-5D, there were not any statistically significant associations with the main explanatory variables.

There were not any statistically significant interactions when change in oral HRQoL was measured by change in OHIP-14 severity. For the other measures of HRQoL, the statistically significant interactions were usually with the level of education, though in some cases the level of education also acted as a proxy for other socio-economic status indicators. The notable exception was with the main explanatory variable of dental attendance with change in EQ-5D, and the global oral and general health transition statements, where perceived treatment need was an interaction term. In the case of the global oral health transition statement, oral disease was also an interaction term with dental attendance as was residential location with the global general health transition statement. Difficulty paying a $100 dental bill had a statistically significant interaction with cost of dental care and the oral health transition statement.

Table 133: Associations between main covariate/potential confounders and main explanatory variables and outcome measures

Main explanatory variable	Regression models	Change in OHIP-14 Severity	Change in EQ-5D	Oral Health Transition Statement	General Health Transition Statement	Follow-up OHIP-14 severity
Visiting	Model 1 = Crude Model	0	0	+ +	+	0
	Model 2 = Model 1 & first order terms	0	0	+ +	+	– –
	Model 3 = Model 2 & baseline severity & need	– –	0	+ +	+	–
	Model 4 = Model 3 & interaction terms	– – N	0 Y	+ + Y	– Y	0 N
Of those people who visited a dentist						
Volume	Model 1 = Crude Model	0	+	0	+	0
	Model 2 = Model 1 & first order terms	–	0	0	+ +	0
	Model 3 = Model 2 & baseline severity & need	–	0	0	+ +	0
	Model 4 = Model 3 & interaction terms	0 N	0 N	0 Y	+ + N	0 Y
Complexity	Model 1 = Crude Model	0	0	0	+ +	–
	Model 2 = Model 1 & first order terms	0	0	NA	NA	– –
	Model 3 = Model 2 & baseline severity & need	0	+	0	+	– –
	Model 4 = Model 3 & interaction terms	NA	+ N	+ + Y	NA	– Y
Cost	Model 1 = Crude Model	– –	0	+ +	+	0
	Model 2 = Model 1 & first order terms	– –	+	+ +	+ +	0
	Model 3 = Model 2 & baseline severity & need	–	+ +	+ +	+ +	–
	Model 4 = Model 3 & interaction terms	NA	+ Y	+ + Y	0 N	0 N

+ + = Beneficial association between main explanatory variable and improvement in quality of life $p<0.05$

+ = Association between main explanatory variable and improvement in quality of life $0.05 \leq p<0.20$

0 = Association between main explanatory variable and quality of life $p \geq 0.20$

– – = Harmful association between main explanatory variable and worsening in quality of life $p<0.05$

– = Association between main explanatory variable and worsening in quality of life $0.05 \leq p<0.20$

Y = At least one statistically significant interaction between main covariate/potential confounder and main explanatory variable and outcome measure $p<0.05$

N = No statistically significant interactions between main covariate/potential confounder and main explanatory variable and outcome measure $p \geq 0.05$

NA = Not applicable

When change in mean OHIP-14 severity was used to measure the change in oral HRQoL, the addition of baseline OHIP-14 severity and treatment need into the regression model consistently caused the greatest increase in the percentage of variation explained compared to the first order or interaction terms (Table 134).

However, when change in HRQoL was measured by change in EQ-5D, or by the global oral or general health statements, either there was little change in R^2 or the greatest change increase was caused by factors other than baseline OHIP-14 severity and treatment need.

When oral HRQoL was measured by follow-up OHIP-14 severity, with three out of the four main explanatory variables, the greatest increase in the percentage of variation explained occurred when baseline OHIP-14 severity and treatment need were added to the regression model. In the case of the global general health transition statement and complexity, the largest percentage of variation was explained by the complexity of dental care itself.

Table 134: Suggested cause of the greatest increase in percentage of variation explained (R^2) in the multivariate model

Main explanatory variable	Change in OHIP-14 Severity	Change in EQ-5D	Oral Health Transition Statement	General Health Transition Statement	Follow-up OHIP-14 severity
Visiting	Baseline OHIP/ Treatment need	Little change in R^2	First order terms	Interaction terms	Baseline OHIP/ Treatment need
Volume	Baseline OHIP/ Treatment need	Interaction terms	Interaction terms	First order terms	Baseline OHIP/ Treatment need & interactions
Complexity	Baseline OHIP/ Treatment need	Little change in R^2	Interaction terms	Complexity of care	First order terms
Cost	Baseline OHIP/ Treatment need	Interaction terms	First order & Interaction terms	First order terms	Baseline OHIP/ Treatment need & interactions

An increase in the *p* value of the association between the main explanatory variable and outcome measure with the removal of either of the main covariables, indicated that the inclusion of the main covariate in the regression model made it less likely to have occurred by chance. A summary table of the effect of covariables on the outcome variable is given in Table 135.

No matter which of the five outcome measures used, the exclusion of baseline OHIP-14 severity from the dental visiting regression models led to an increase in the outcome estimate and not much change in the *p* values (Table 135). This suggested that people’s baseline OHIP-14 severity influenced the association of dental attendance on HRQoL.

However, there wasn't such a clear trend for volume, complexity or cost of dental care. Nor was there a clear trend when treatment need was excluded from either the dental visiting, or volume, complexity or cost of dental care regression models.

Table 135: Summary of the effect of covariables on the outcome variable

Outcome measure	**Main explanatory variable**	**Model minus baseline OHIP-14 severity† Estimate(p)**	**Model minus treatment need‡ Estimate(p)**
Change in OHIP-14 severity	Visited (No=0, Yes=1)	1.70 (0.02)	2.72 (0.01)
	Volume (Lo=0, Hi=1)	1.47 (0.07)	0.19 (0.84)
	Complexity (Lo=0, Hi=1)	0.47 (0.53)	0.36 (0.67)
	Cost (Lo=0, Hi=1)	1.96 (0.01)	1.49 (0.07)
Change in EQ-5D	Visited (No=0, Yes=1)	4.87 (0.19)	1.31 (0.57)
	Volume (Lo=0, Hi=1)	0.36 (0.94)	1.13 (0.83)
	Complexity (Lo=0, Hi=1)	-4.12 (0.12)	-3.32 (0.18)
	Cost (Lo=0, Hi=1)	-7.70 (0.18)	2.52 (0.60)
Oral health transition statement	Visited (No=0, Yes=1)	-7.61 (<0.01)	-7.93 (<0.01)
	Volume (Lo=0, Hi=1)	0.15 (0.98)	-2.17 (0.70)
	Complexity (Lo=0, Hi=1)	12.00 (0.03)	10.72 (0.04)
	Cost (Lo=0, Hi=1)	-7.58 (<0.01)	-5.61 (0.03)
General health transition statement	Visited (No=0, Yes=1)	3.60 (0.23)	2.86 (0.35)
	Volume (Lo=0, Hi=1)	-2.80 (0.04)	-2.95 (0.03)
	Complexity (Lo=0, Hi=1)	-1.45 (0.16)	-1.09 (0.29)
	Cost (Lo=0, Hi=1)	-1.39 (0.36)	-1.26 (0.38)
Follow-up OHIP-14 severity	Visited (No=0, Yes=1)	0.23 (0.93)	-0.19 (0.92)
	Volume (Lo=0, Hi=1)	4.34 (0.49)	6.83 (0.24)
	Complexity (Lo=0, Hi=1)	7.23 (0.02)	6.05 (0.04)
	Cost (Lo=0, Hi=1)	2.22 (0.72)	5.93 (0.27)

† Baseline OHIP-14 severity (Lo=0, Hi=1).
‡ Treatment need (No=0, Yes=1)

Baseline oral HRQoL tended to have varying effects on change in oral HRQoL depending on how the latter was measured. For example, people with a high baseline OHIP-14 severity indicating a poor baseline oral HRQoL, their follow-up OHIP-14 severity was lower than the baseline OHIP-14 severity whether or not they had visited a dentist (Figure 26). However, if they had a low baseline OHIP-14 severity, their follow-up OHIP-14 severity was higher than baseline OHIP-14 severity whether or not they had visited a dentist. On the other hand, it was dental attendance, rather than baseline OHIP-14 severity, that was important to a negative global oral health transition statement. This may be more related to the lack of responsiveness of OHIP-14 severity that to the influence of baseline oral HRQoL on change in oral HRQoL.

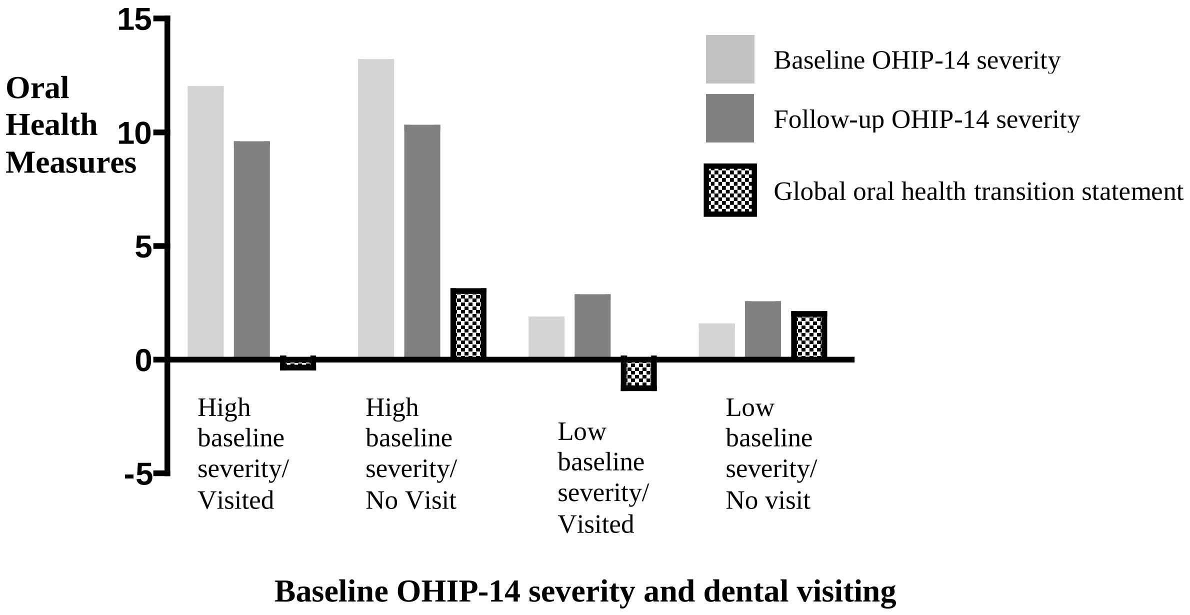


Figure 26: Baseline OHIP-14 severity and dentist visiting by oral health measures

Chapter 5: Discussion

In this chapter, the key results will be presented, and the credibility, novelty and implication of the results discussed.

1 Key results

1.1 Stand-out results

The relationship between dental care and quality of life varied according to the methods of measuring both dental care and quality of life. In several instances, the relationships were heterogeneous among population subgroups. These varying, even contradictory findings, mean that there is no single explanation as to how dental services influence general and oral HRQoL. For example, higher cost dental care was associated with improved HRQoL as assessed by change in EQ-5D, whereas the opposite was the case with change in OHIP-14. The findings endorse Locker's (2001) comment that "disentangling the relative effects of dental care from the other forces and factors influencing oral health is difficult at best and impossible at worst."

The standout result was the different directions of the association of dental care with HRQoL obtained with each measure of HRQoL. There were differences in the results between global transition and change scores. Both of the global transition scores trended towards net improvement; while both change scores trended towards net worsening in HRQoL (Table 136). The change scores had a U-shape association with the global transition scores (Figures 20 & 21) and bivariate results showed no association of dental attendance with HRQoL for the change scores, but a statistically significant association with HRQoL for the global transition scores.

Table 136: Summary of the multivariate association between the main explanatory variables and outcome

Outcome measure	Visited a dentist	High Volume	High Complexity	High Cost
Change in mean OHIP-14 severity	↓*	↓	↓	↓
Change in EQ-5D	↓	↓	↑	↑*
Global oral health transition statements	↑*	↑	↓*	↑*
Global general health transition statement	↓	↑*	↑	↑

* Statistically significant
↑ Improvement in HRQoL
↓ Worsening in HRQoL

Another key result was the differing directions of association of dental care with general health compared to oral health. The global general health transition statement was associated with volume and cost of dental care, while the global oral health transition statement was not. Low levels of care were associated with greater improvement in OHIP-14 severity than high levels of care. This indicated an adverse effect of dental care on oral HRQoL and was most notable for people without a perceived treatment need. This was exemplified by the fact that in the people with no perceived treatment need stratum, those who received low cost dental care had an improvement in oral HRQoL, whereas those who received high cost care suffered deterioration in oral HRQoL when measured by change in OHIP-14 severity.

Baseline oral HRQoL tended to have varying effects on change in oral HRQoL depending on how the latter was measured.

There was a statistically significant and large correlation between volume and cost of dental services, and a lesser, but moderate and statistically significant correlations between volume with complexity and complexity with cost of dental care.

Finally, in general it was the “well-to-do” as defined by income, education and occupation, in whom dental care had an adverse effect on oral HRQoL, whereas the “down-at-heel” were more likely to have a beneficial effect. However, most of these "associations were not statistically significant.

1.2 Effect modification, confounding and interactions

More variables created effect modification when change in oral HRQoL was measured by the global transition statements than by the change measures. So the association of dental care with change in HRQoL as measured by the transition statements was dependent on a greater number of survey participant factors than if change in HRQoL was measured by the change measures. The characteristics in question are those measuring pattern of attendance and access to dental care. Less regular dental attendees and people with poor access to dental care benefited from dental care.

Across all measures of HRQoL, the survey participant factors most often subject to effect modification where those related to socio-economic status, particularly education and occupation. People of higher SES were more likely to report that dental care had a harmful adverse association with oral HRQoL, while people of lower SES where more likely to report dental care had a beneficial association.

In the bivariate analysis, none of the survey participant factors were associated with both the main explanatory variables and the outcomes with the measures of change in mean OHIP-14 severity, change in EQ-5D, and the global general health transition statement. Residential location was associated with both the outcome and the main explanatory variable of dental attendance when change in HRQoL was measured by the global oral health transition statement. Interestingly, a few survey participant factors were associated with at least one of the main variables and the outcome when the latter was measured by the follow-up OHIP-14 severity score. This suggested that for OHIP-14 severity at a point in time after the dental care was received, the characteristics of sex, household income, pattern of attendance and eligibility for a health care card effected the influence of dental care on oral HRQoL, but did effect the change in oral HRQoL.

When there was evidence of confounding but no effect modification, the overall association is not the same as the causal effect of interest, but after stratification the association is the same within each stratum of the confounder. Across all five outcome measures, evidence of confounding was more common for baseline OHIP-14 severity, sex, country of birth, and difficulty paying a $100 dental bill. Age, residential location, education, reason for attendance, and avoiding or delaying dental care due to cost did not show evidence of confounding.

The fact that people with high baseline OHIP-14, with a perceived treatment need, who were born outside of Australia, who were unemployed, who were eligible for a health care card, or who had a lot of difficulty paying a $100 dental bill, who received high values of dental care consistently had greater favourable outcomes compared to people who received low values of care than found with the crude association, was consistent with that predicted in the concept diagram (Figure 1). This interesting result suggested that high values of dental care had a greater beneficial effect on the HRQoL of people with poorer access to dental care than those with better access to dental care. However, age, residential location, education, reason for attendance and avoiding or delaying dental care due to cost was not consistent with the concept model.

The multivariate analysis adjusted for confounding and permitted the description of interaction. That there were interactions with the global oral health transition statement for all four main explanatory variables of dental attendance, and levels of volume, complexity and cost of dental care but not with change in OHIP-14 severity may be at least partly explained by the moderate responsiveness of the latter indicator. As discussed later, it could also be a result of cognitive dissonance found with global transition statements.

The interactions of the global oral health transition statement with education, the proxy for socio-economic status, can be considered a problem for the health care system. The influence of socio-economic status with the dental care received on the change in oral HRQoL, in a way that is not simply additive, complicates health care planning.

In contrast, interactions between perceived treatment need with dental attendance and change in EQ-5D, and the global oral and general health transition statement scores are to be expected. It was expected that dental care would have a favourable impact on HRQoL for people with treatment needs, but no or even a harmful adverse impact for people without perceived treatment needs.

2 Credibility of the results

2.1 Limitations of the study design

The randomised control trial (RCT) is the "good standard" of study design. However, a RCT was not feasible for this study. To withhold dental care to people for people who require it, and to people whose poor dental health was adversely affecting their HRQoL was not ethical. In vitro or animal experimental models were not relevant. Thus, inferences had to be made from on an observational epidemiological study. Of the observational studies, a longitudinal design allowed for temporal effects and inferences on etiology.

2.2 Sources of bias

Of 2,159 Tasmanian telephone numbers selected at random, 1,745 were eligible household numbers. The telephone interview participation rate was 59.7% (n=901), and of those people in scope, 44.1% participated in the epidemiological examination (n=385). Of those Tasmanians who underwent a clinical examination, over three quarters (77.4%) completed the NSAOH mail questionnaire, while of those who did not have the examination, over half (51.6%) completed the back-up mail questionnaire. Nearly three-quarters of those who completed either of the baseline self-complete questionnaires also completed the twelve-month follow-up questionnaire (73.5%).

Compared to the rest of Australia the participation rates at baseline in the Tasmania component of the NSAOH were good. The telephone interview and the examination participation rates were higher than that for Australia overall (Mejia et al. 2007: 59.7% versus 49.0%, and 44.1% versus 43.7% respectively). For the Hobart area, the interview response rate was the highest of anywhere in Australia (64%).

The telephone interview participation rate for this study compared favorably with those from the Behavioural Risk Factor Surveillance System in the United States. Participation rates among the US states ranged from 34.6% to 67.4% with a median of 51.1% (CDC, 2005).

McLennon (1999) reported that telephone interviews have a higher response rate than personal collection of data. However, response rates for surveys have been falling over time and Frankel (2004) ascribes this to people spending less time at home, and increased use of both answering machines, and mobile phones. Anecdotal evidence suggested that the number of “cold calls” from telemarketers in Australia has increased over the last few years and that may reduce the willingness of people to answer telephone surveys.

Of those people who underwent the telephone interview, the examination participation rate was not as high as in recently published national oral health surveys. National oral health surveys from the USA, Germany and the UK have reported examination participation rates ranging from 63.1% to 88.4% (Dye et al. 2007; Micheelis and Schiffner, 2006; Kelly et al. 2000).

Due to limited resources, the Oral Health Services in Tasmania faced some difficulty in undertaking epidemiological examinations in the northwest of the state, resulting in some people not being offered examinations and a low examination participation rate for the region (35.9%) compared to the northeast (54.4%) and southern regions (43.2%). However, a greater proportion of people from the northwest responded to the back-up questionnaire than in the other two regions of Tasmania, with the result that the proportion of interviewed people who completed either one or the other baseline self-complete questionnaire was greater in the northwest region than the other two regions.

Of those people who had completed either of the baseline questionnaires, treatment details were obtained for 65.3%, a figure that compared favourably with the “Consequences of Success” study undertaken at ARCPOH (65%).

It was interesting to note that the frequency of OHIP-14 impacts at baseline of people in this study who completed the follow-up questionnaire was much lower (13.0%) than the cohort that included all people who completed either of the baseline questionnaires (19.6%) and did not significantly change over the one year follow-up period (12.3%). A similar result occurred with the OHIP-14 severity score. The

OHIP-14 severity score of all people who completed either of the baseline questionnaires was 7.44 (95% CIs=6.41, 8.48). Of those people who completed both the baseline and follow-up questionnaires the OHIP-14 severity score was 6.96 (95% CIs=5.34, 8.08) at baseline and 6.40 (95% CIs=5.35, 7.45) at follow-up.

It was expected that people who were more likely to place a high value on oral health, and hence take care of their mouths, would follow through on all stages of this study. These people were more likely to be routine dental attendees. We know from previous research that routine dental attendees have a better oral HRQoL than problem attendees (Bedi and McGrath, 2001). This hypothesis was supported by the fact that the prevalence of people who usually attended a dentist for a check-up, as opposed to with a problem, increased from 48.2% at the telephone interview stage to 54.6% at the follow-up stage of this study.

However, when baseline scores for OHIP-14 severity and EQ-5D were compared between people who were retained for follow-up and people who were not, there was not a statistically significant difference between the scores.

The composition of the study sample did not change significantly at any data collection stage of the study. Due to the good participation rates, the proportion of occupational groups and people born in Australia at the treatment details stage, being similar to that in the Tasmanian component of the Australian Census, the small proportion in Tasmania of Aboriginal or Torres Strait Islanders or people who spoke a language other than English at home and the lack of non-participation bias, it was concluded that this sample was representative of the Tasmanian population.

2.2 Outcome Measurements

2.2.1 Change scores versus transition statements

2.2.1.1 Directions of the associations

The biggest surprise in the results was that the change in oral HRQoL moved in opposite directions depending on whether change in mean OHIP-14 severity or the oral health transition statement was used as the measure of oral HRQoL.

A few related observations should be considered when interpreting this finding. The global oral health transition statements may have suffered by the fact that it was asked solely after treatment had been received. It could then include a ‘self-justifying effect’ attributable to cognitive dissonance. Cognitive dissonance is a feeling of unpleasant arousal caused by noticing an inconsistency in one’s cognitions (Festinger, 1957). According to this theory, people seek to reduce their own cognitive dissonance in ways that might seem contradictory. In this instance, survey participants might have justified to themselves that the money, effort and time spent in obtaining dental care was worthwhile, and as a consequence of that justification, they might form the belief that the dental care improved their oral health. This belief might have developed despite any change in severity or number of the oral health impacts on their quality of life. Otherwise the money, effort and time would have been wasted, a situation many people would not like to face. If this were true, the global oral health transition statement would not be the ‘gold standard’ as Locker (2001) maintained, but rather would over estimate the beneficial effect of dental care.

There was a strong correlation between baseline and follow-up OHIP-14 severity. One explanation is that OHIP-14 severity indexes a relatively stable trait rather than a state. Having noted that, it is important to remember that Slade et al. (1996) found in a cohort of community-dwelling South Australian elderly that many older adults experience short-term impacts of oral conditions during longer terms of temporal stability in perceived impact of oral health. This ‘background noise’ would reduce the responsiveness of OHIP-14. In contrast to the apparent trait nature of OHIP-14 measurements, there was considerable change in the oral health reported in the global transition statement.

Another possible explanation for the worsening of HRQoL, as measured by the change instruments, for those receiving dental care is the possibility of the beneficial effects of dental care being negated by its harmful side effects. For example, a dental extraction provided to relieve pain (the OHIP-14 painful aching dimension and the EQ-5D pain/discomfort dimension) may also have an unwanted side-effect such as leaving a the visible gap (the OHIP-14 self conscious and embarrassed dimensions and the EQ-5D social disability dimension). This dimension negating effect was not further investigated. To do so would have required the presentation of more results in an already long thesis and would have required enough survey participants where the dimension negation effect had the potential to occur. In this study, the change in OHIP-14 severity was small indicating that there was not enough power to further investigate the potential dimension negation effect. This is the end result of using a randon sample cohort study. To further study this issue, one would require a a sample of people who were about to have dental care that could have a beneficial effect on one change dimension, and at the same time, a harmful effect in another dimension.

A further complication is “response shift” where people are primed at follow-up to a previously-asked question. In this study, response shift would have occurred if asking about, say, a person’s social disability at baseline will influence their response at follow-up 12 months later. Allison et al. (1997) presented evidence that a person’s point of reference, i.e. the individual’s standards by which people judge their HRQoL, moves with time and experience, and are modified by various psychological phenomena. However, in this study, the likelihood that the survey participants will be influenced by one or two questions out of an eight-page self complete questionnaire asked some 12 months earlier and when they had not been contacted in the time of this study was unlikely. Furthermore, the results were generally similar using global transition statements which are not subject to the phenomenon of response shift. Hence, it seems unlikely that response shift might have biased the findings substantially.

A further reason for the differing results between change scores and the transition statements is that a dentist or physician often gives a better appraisal of a patient’s health than that expected by the patient. Those people who had visited a dentist or physician may come away from the visit believing that their health is better, even though the health-related impacts on their quality of life may not have changed. In such a case their OHIP-14 severity or EQ-5D would not have changed but their perception of their health as measured by the global health transition statements might indicate an improvement in general or oral health.

The results in this thesis are plausible if the different indices measure different constructs, one that improves, and another that worsens HRQoL following dental care.

2.1.2.2 Responsiveness of the measures

There are three types of responsiveness (Terwee et al. 2003). One is the ability to detect change in general, often defined as a statistically important change. The second is the ability to detect clinically important change. These definitions differ from the ones in the first group because they require an explicit, although often subjective, judgement on what is important. The third is the ability to detect real changes in the concept being measured. This definition can be considered a further extension of the previous two definitions, as it not only requires a judgement on what changes are important, but also a gold standard for the concept being measured.

Within these three groups, Sprangers and colleagues (2002) listed some 31 different measures for responsiveness, some of which are presented in Table 137.

Table 137: Measures for responsiveness (Sprangers, Moinpour et al. 2002).

NOTE:
This table is included on page 307 of the print copy of the thesis held in the University of Adelaide Library.

Two issues arise when one asks if certain measures are responsive to change in oral HRQoL. As many measures have validity when used to measure health conditions at a point in time, the first issue is to decide if cross-sectional validity is the same as responsiveness. If cross-sectional validity does not equal responsiveness then the second issue becomes: Is the measure, in this case OHIP-14 severity, responsive to change in oral HRQoL?

Guyatt and his colleagues (1987) emphasised that it is necessary to distinguish responsiveness from validity. Their main argument is that an instrument can be valid as a cross-sectional measure yet fail to detect important changes when they occur. In contrast, Hays and colleagues argue any valid instrument, by definition, should be responsive to change (Hays and Hadorn, 1992; Hays et al. 1998). Terwee and colleagues concluded that:

> “One can …. successfully argue …. that responsiveness should not be considered a separate property of the instrument but just an aspect of validity in the longitudinal setting (Terwee et al. 2003).”

A study by Lindeboom and associates (2005) asked: “is responsiveness a re-invention of the wheel?” When comparing instruments measuring similar health constructs, Lindeboom and associates found that an instrument sensitive to health differences is also likely to be sensitive to therapy-induced change as well.

The only responsible answer to the question of whether cross-sectional validity equals responsiveness is that at the moment the issue is still open to debate. On the basis that cross-sectional validity may not equal responsiveness the issue becomes: Is OHIP-14 responsive to change in oral HRQoL?

Locker and Allen (2002) maintain that when the 49 item OHIP (Slade and Spencer, 1994) was shortened to 14 items by Slade (1997) using least squares regression and a controlled stepwise procedure, it created problems for OHIP-14, such as floor effects, which compromised its sensitivity to change. Contending that short-form measures are always compromised, they developed an alternative short-form OHIP which they asserted may be preferable to the Slade OHIP-14 when attempting to detect change. It is open to debate whether a longer instrument would have been more responsive, and if it was, whether the change it measured would be trivial in nature. It may be that OHIP-14 is responsive and that routine dental care is not comprehensive enough to reduce the social impacts of oral health. Locker and Allen admit that the Slade OHIP-14 is likely to be better when the aim is to discriminate. As the cross-sectional NSAOH was the source of the baseline data, the Slade OHIP-14 was used in this study.

Locker and colleagues (2004) measured responsiveness of OHIP-14 using global transition statements as a "gold standard" on a sample of elderly people. Using effect sizes for change scores, they concluded that OHIP-14 appeared to be responsive to change when measuring the effects of dental care one month after the completion of treatment. However, the magnitude of change was modest by Cohen's benchmarks, probably because, the authors said, OHIP was designed primarily as a discriminative measure. That meant that because OHIP was designed to measure oral HRQoL at a point in time, its responsiveness could be expected to be only moderate. Other than noting a similar approach was used by Beaton and colleagues (1997) and Juniper et al. (1993, 1996), Locker does not attempt to justify using global health transition statements as the "gold standard" to judge the responsiveness of OHIP-14 but did note that others (e.g. Norman et al. 1997) have argued that global health transition statements are not valid because they are more likely to be related to the subject's rating of their current health rather than their change in oral health status.

Though it was only one of a few measures used, Juniper et al. (1996), when testing the responsiveness of the Paediatric Asthma Quality of Life Questionnaire over a four week period, examined the correlation of changes in quality of life with global ratings of health. Beaton and colleagues (1997) state that responsiveness requires a standard outside the questionnaires being assessed for responsiveness to indicate change and that "traditionally this has been the transitional index of health status," and cite more references. They also used a second criterion change: those expected to have a positive change between testing using their knowledge of the natural history of musculoskeletal disorders.

MacKenzie and colleagues (1986) in an article evaluating the responsiveness of the Sickness Impact Profile note that since there is no gold standard, evaluations of scale performance is always a comparison of one scale to another; a situation they call a dilemma.

They further note that some would argue that even if the transition index were reliable and valid, it would be inferior because it only contains one question while a questionnaire battery like the Oral Health Impact Profile contains fourteen. Kirshner and Guyatt (1985) disagree and argue that with evaluative, as opposed to discriminative, instruments increasing the number of questions increases the probability of including items that are insensitive to efficacious treatment.

It has not been proven that global transition statements are the “gold standard” from which to measure responsiveness. The myriad of measures of responsiveness suggest that a method to measure responsiveness that is universally accepted has not been found. As such the different responsiveness of change measures and global transition scores is not surprising.

2.2.2 General versus oral-specific measures

Studies have been undertaken to ascertain if generic quality of life measures are responsive to change. For example, an analytical literature review by McHorney and Tarlov (1995) found little evidence that all five of the most popular generic measures of HRQoL, had the responsiveness necessary for individual survey participant monitoring. The review covered the Functional Status Questionnaire, the Dartmouth COOP Poster Charts, the Nottingham Health Profile, the Duke Health Profile, and the SF-36 Health Survey.

On the other hand, in a longitudinal study of physical and psychiatric morbidity, Hemmingway and colleagues (1997) found that SF-36 was sensitive to changes in health in general populations.

A study by Dorcas Beaton and colleagues (1997) who compared the measurement properties over time of five generic health status measures found that the SF-36 was the most appropriate generic questionnaire to measure health changes in musculoskeletal disorders. They concluded that the selection of a health status measure must be context-specific, taking into account the purpose and population of the planned research. They noted that there are very few comparisons in the literature of different tools to help investigators determine the relative merits of each in certain applications, and even fewer articles explore responsiveness in head-to head comparisons.

In this study, the EQ-5D pain dimension at both baseline and follow-up were relatively high (39.6% and 33.8%) compared to the OHIP-14 pain dimension (7.5% and 4.3%). The most probable reason for this result is that pain being measured by EQ-5D is not oral in origin. Another reason is that the two measures use different reference periods. A third possibility is that the OHIP-14 pain dimension is not tapping into oral health issues causing pain. This last possibility is unlikely. Other studies suggest that disease-specific measures, and in particular OHIP, is more responsive to change when measuring the disease in question than generic measures. Jenkinson and co-authors (1997) noted that disease-specific measures were more sensitive to change than generic measures and Brennan and Spencer (2004, 2005) found that OHIP-14 was more sensitive than EuroQol to oral health factors in a cross-sectional study.

An anomaly was found with the differing direction of the effects of cost of dental care on change in HRQoL when measured by the two change measures. Higher cost dental care was associated with improved HRQoL as assessed by change in EQ-5D, whereas the opposite was the case with change in OHIP-14. One explanation may be the difference in the reference periods between EQ-5D and OHIP-14 resulting in the time periods for the impacts on health to occur being different. The former uses the time period of the day of the items being asked whilst the latter use the time period of the previous year. Having said that, there may not be a rational explanation for this anomaly and it maybe after a complex analysis with many variables that one or two anomalous results were generated.

2.3 Limitations of the conceptual model

Some may argue that more variables should have been included into the conceptual model. In particular, it may be asked what role would fluoride exposure, the people’s genetic makeup and oral health-related behaviours, such as oral hygiene, smoking, diet, alcohol intake, make on change in HRQoL over one year?

One simple answer why more variables were not included in the model was that it was not possible to incorporate every variable known to humankind that influences oral health into the conceptual model and keep the study to a reasonable size and time span.

However, the variables were excluded after a review of the literature. These were fluoride exposure, genomics, and the oral health-related behaviours of oral hygiene, sugar consumption, smoking and alcohol intake. Each has been discussed in turn below and the strength of the relationships in the multivariate models was verified by presenting their R^2 values.

2.3.1 Omission of fluoride exposure and other environmental influences

Probably the greatest single influence on caries experience over recent decades has been the exposure to fluoride, which is now widespread not only through drinking water, but also through toothpaste, professional applications, and by fluoride's presence in processed foods and drinks (Burt and Pai, 2001). Fluoride's mechanisms of action include incorporation of fluoride into enamel pre-eruptively, inhibition of demineralisation, enhancement of remineralisation, and inhibition of bacterial activity in dental plaque (US Department of Health and Human Services, 2000b).

Lifetime fluoride variable was not included in the model for three reasons. First, it had not been calculated for NSAOH survey participants at the time of this study. The second reason was that lifetime variable to fluoride was expected to be incorporated in a de facto fashion by the inclusion of other variables, in particular the presence of oral clinical diseases and baseline OHIP-14 severity. The third reason was that its influence on change in HRQoL over a one year period although not known, was not be expected to be large. All the survey participants were adults making the fluoride pre-eruptive mechanisms were irrelevant to this study. The influence of the post-eruptive mechanisms of fluoride over the one year was not expected to have a large influence on the change in HRQoL.

2.3.2 Influences of genomics and biological processes

Some believe that we are entering the era in which genetics and genomics will play a vital role in both oral health research and dental practice (Collins and Tabak, 2004). While micro-organisms have long been acknowledged as important aetiological factors, the research data has demonstrated that the two most common oral diseases of dental caries and periodontal disease have a strong hereditary base. Even in the presence of putative pathogenic micro-organisms, if the host individual is not genetically susceptible, the ensuing oral disease will be mild or even non-existent (Behnke and Hassell, 2004).

Genetic influences were not included in the analysis for two reasons. Although oral swabs were taken of all consenting survey participants, obtaining the full genome for each subject was too expensive. Research into the role genetics and genomics play on both oral disease and oral HRQoL is still in its infancy. This made selecting particular genes for study difficult. Secondly, similar to the case with exposure to fluoride, the baseline effect of the subjects' genome was expected to be incorporated into other variables, in particular the presence of oral clinical diseases.

2.3.3 Omission of oral health-related behaviours

Oral hygiene was not included in this study because it has not been proven that it reduces oral disease or whether it influences HRQoL. There have been few longitudinal cohort studies conducted among adults to discover if toothbrushing improves dental health and most of those were limited to unrepresentative samples of convenience (Reisine, and Psoter, 2001). Reisine and Psoter (2001) in a systematic review concluded that longitudinal studies of tooth-brushing are needed to understand its role in caries prevention and that little is known about the importance of time of day, duration of brushing or effectiveness. The influence of toothbrushing on oral disease appears to be a vehicle to apply regular low doses of topical fluoride. The influence of fluoride exposure on change in HRQoL has been covered above.

The relationship between sugar consumption and caries in high-income countries was long viewed as being virtually linear: the more sugar a population consumed and the greater the frequency of that consumption, the greater the prevalence and severity of caries was presumed to be. A systematic review found that the relationship of sugar consumption and caries is much weaker in the modern age of fluoride exposure than it used to be (Burt and Pai, 2001). With this in mind, it was believed that diet would not have a great influence on the change in oral HRQoL in one year.

The reasons for not including smoking and alcohol intake in the conceptual model were similar to that for the exclusion of the variables mentioned above. We know that smoking and alcohol intake are associated with poor oral health. For example, Grossi and colleagues (1995) found that the risk of alveolar bone loss for heavy smokers was 7 times greater than for those who have not smoked. Utilising data from the Australian NSAOH, Do and colleagues (2008) found that the population-attributable fraction of smoking for moderate-severe periodontitis was 32%. The oral health of alcoholics is generally poor, with high DMFT due to rampant caries and periodontal disease (Sainsbury 1999). However, although lifetime variable to smoking and alcohol has been shown to have effects on both clinical oral disease and quality of life, their influence over the shorter term was not determined. Secondly, their baseline effect had been measured in other variables, particularly baseline level of oral clinical disease and baseline OHIP-14 severity.

2.3.4 Percentage of variation explained in multivariate models

A way to ascertain if including some variables in the conceptual model would have had an important influence on the outcome was to look at how well the existing variables influenced the percentages of variation explained (R^2) as well as the statistical significance of the regression models (Table 138).

In every case, except visiting a dentist and change in EQ-5D, the regression models were statistically significant. The quality of life measure with the highest R^2 values was follow-up OHIP-14 severity (R^2=0.29–0.68). This was not surprising because the conceptual model had included the variables that influence HRQoL at a point in time. However, when the analysis moved into the area of what influences change in HRQoL, it was moving into the realm of the unknown, resulting in lower percentages of variation explained.

Even so, the high proportion of variance obtained for change in oral HRQoL with the included variables in the models in this thesis were quite high (R^2 range=0.15-0.48) compared to other models in population oral health research.

Table 138: Percentages of variation explained (R^2 values) and statistical significance of the final multiregression models

Main explanatory variable	Change in OHIP-14 Severity	Change in EQ-5D	Oral Health Transition Statement	General Health Transition Statement	Follow-up OHIP-14 severity
Visiting	0.17*	0.11	0.33*	0.24*	0.29*
Volume	0.22*	0.28*	0.48*	0.38*	0.45*
Complexity	0.15*	0.10*	0.24*	0.09*	0.68*
Cost	0.19*	0.37*	0.38*	0.27*	0.47*

* p<0.05

2.5 Strengths of the study

This is the first documented research that investigated the association between dental care and HRQoL that was prospective, that studied a representative sample of an entire adult population, and that related to a wide range of dental clinical treatment options. Being a prospective study it was able to demonstrate temporal sequence and being based on a population sample allowed the results to be representative of the Tasmanian population. Having a wide range of dental clinical treatment options allowed the results to be generalisable. Having a one-year follow-up period that is longer than found in most previous studies, allowed the measurement of longer term changes in HRQoL. It also reduced the influence of post-treatment cognitive resonance.

The study design was thorough. The outcome measures used have been widely validated and are considered to be the best at this point in time. Multiple measures were used of the main explanatory variable. An extensive array of likely confounders and effect modifiers were investigated, many more than is usually done in these kind of studies. Finally, in depth analysis was undertaken, including stratified analyses to search for possible heterogeneity of effects among population subgroups.

3. External validity

3.1 Relationship between dental care and QoL

None of the five studies that have previously investigated the influence of routine dental care on HRQoL found a worsening of HRQoL for those receiving dental care (Fiske et al. 1990; Peterson and Nortov, 1995; Locker, 2001; Fisher et al. 2005; Gagliardi et al. 2008). Each of these studies and their results were compared with comparable results in this thesis. They were discussed in chronological order and summarised in Table 139.

In the Fiske et al. (1990) study, one hundred elderly British people requesting dental care were interviewed and treated. An assessment was made before and after treatment using a socio-dental index that included the four categories of oral handicap of impairment of function, comfort, self-image and social interaction. Probably for ethical reasons, there was not a comparison group of elderly British people requesting dental care who were not treated.

In this thesis, the closest group to that used in the Fiske study was the group of people with a treatment need who visited a dentist. When this group was investigated, the subjects had a reduction in OHIP-14 severity (-1.44, Table 62) indicating an improvement in oral HRQoL. In contrast, among those people with a treatment need and who visited a dentist, there was a worsening in oral HRQoL when indicated by measures other than change in mean OHIP-14 severity. There was a slight increase in EQ-5D (0.2, Table 70), and positive global oral and general health transition statements (0.16, Table 79 and 1.74, Table 87).

In the Peterson and Nortov (1995) study, 187 Danish pensioners aged 67-70 years were given care that included comprehensive curative and preventive care as well as oral health education. After three years, the percentage of participants who reported poor function of dentures declined and, at follow-up, less of the elderly felt embarrassed by teeth or preferred food that was easy to chew. The changes in self-reported oral health status were supported clinically by a reduction both in the number of untreated decayed tooth surfaces and in the number of teeth with gingival bleeding and pockets.

Comparing the Peterson and Nortov results with this study was complicated by two factors. First, with an age group of 67-70 years, many of the Danish pensioners would be edentulous, and edentate people were excluded from this thesis, making the results not directly comparable. Second, like the Fiske study, there was not a comparison group of elderly Denmark pensioners who were not given care. Hence, the closest group in this thesis to that in the Peterson and Nortov study was the same as in the Fiske study, with the same results.

In the Locker (2001) study four indices concerned with chewing, pain, other oral symptoms and psychosocial impacts of oral conditions were used to assess the relationship between self-perceived change in oral health status and the provision of dental treatment in an older adult Canadian population. Over the three-year period, one-tenth of subjects reported that their oral health had improved and one-fifth that it had deteriorated. Those who improved made significantly more dental visits and received significantly more dental services that those who deteriorated or did not change.

Locker's study and this thesis are not directly comparable. Locker's study used frequency of dental visits over a three year period, while this thesis used whether the subject had visited a dentist or not over a one year period. The closest group in this thesis for comparison with Locker's study are those people who accessed dental care over the one year time period compared to those who did not access care. In this group, those people who had visited a dentist had a greater reduction in OHIP-14 severity than those who didn't visit a dentist, though the relationship was not statistically significant (OHIP-14 change for group that visited a dentist = -0.73, -0.69 for the group that did not visit a dentist, p=0.14, Table 68). There was not any difference in the reduction in EQ-5D between the two groups (-1.8, -1.8, p=0.50, Table 77). There was a negative global oral health transition statement for those people who visited a dentist and a positive global oral health transition statement for those people who did not visit a dentist and the difference was statistically significant (-0.79, 2.44, p=0.02, Table 85). With the global general health transition statement, the worsening in general HRQoL was statistically significantly less for those people who visited a dentist than for those who did not visit a dentist (0.75, 1.40, $p<0.01$, Table 93).

In the Fisher et al. (2005) study, the effect of dental services on recovery from oral disadvantage was measured using data from the prospective longitudinal Florida Dental Care Study cohort. Recovery from an oral disadvantage was defined as no longer reporting a disadvantage and an oral disadvantage was defined as avoiding laughing or smiling because of unattractive teeth or gums, avoiding talking to someone because of unattractive teeth or gums or bad breath, or being embarrassed by the appearance of teeth or gums. The Fisher et al. study found that dental services were effective in resolving oral disadvantage, and even more effective in resolving oral disadvantage among persons with specific symptoms. As with the Fiske and the Peterson and Nortov studies, the closest group in this thesis with the Fisher *et al*. cohort was the group of subjects with a treatment need who visited a dentist.

In the Gagliardi et al. (2008) study, they conducted a prospective single group intervention study of adults aged 75+ years receiving care through the South Australian Dental Service. Again there was not a comparison group of untreated subjects. The subjects were receiving dental care, but we cannot be certain that they had a self-perceived treatment need. However, we can assume that they had a clinically determined treatment need. Hence, the closest comparison group in this thesis was those people who visited a dentist who had an oral disease. In this cohort, no matter how HRQoL was measured in this thesis, there was an improvement: Change in mean OHIP-14 severity (-1.10, Table 69), change in EQ-5D, (-2.1, Table 77), global oral health transition statement (-4.53, Table 86), and global general health transition statement (-1.18, Table 96).

Table 139: Summary of the comparison of previous studies with this thesis

Study	Sample	Instruments	Results	This thesis comparison group	This thesis results
Fiske et al. (1990)	Elderly (80+ years) British requesting dental care and received treatment	Socio-dental index that included oral handicap of impairment of function, comfort, self-image and social interaction	Benefited from treatment	Subjects with a treatment need who visited a dentist	1/ ΔOHIP-14: Benefit 2/ ΔEQ-5D: Slight worsening 3/ Oral: Worsened 4/ General: Worsened
Peterson and Nortov (1995)	Denmark pensioners aged 67-70 years who were given care	Self-reported oral health status both at baseline and 3 years later	Improved self-reported oral health status	Subjects with a treatment need who visited a dentist	1/ Δ[†]OHIP-14: Benefit 2/ ΔEQ-5D: Slight worsening 3/ Oral[‡]: Worsened 4/ General: Worsened
Locker (2001)	Older Canadians who were provided with dental treatment	1/ Indices of chewing, pain, other oral symptoms and psychosocial impacts of oral conditions 2/ Global health transition judgements	1/ No statistically significant change 2/ Those who improved made more dental visits and received more dental services	Subjects who accessed dental care compared to those who did not access care	1/ ΔOHIP-14: No statistically significant change 2/ ΔEQ-5D: No statistically significant change 3/ Oral: Benefit 4/ General: Benefit
Fisher et al. (2005)	Florida Dental Care Study cohort who received dental services	Recovery from oral disadvantage	Dental services were effective in resolving oral disadvantage	Subjects with a treatment need who visited a dentist	1/ ΔOHIP-14: Benefit 2/ ΔEQ-5D: Slight worsening 3/ Oral: Worsened 4/ General: Worsened
Gagliardi et al. (2008)	South Australians aged 75+ years receiving dental care	ΔOHIP-14 severity scores	Dental care was associated with improvements in subjective oral health	Subjects with oral disease who visited a dentist	1/ ΔOHIP-14: Benefit 2/ ΔEQ-5D: Benefit 3/ Oral: Benefit 4/ General: Benefit

[†]: Δ= change in
[‡] Oral = Global oral health transitions statement. General = Global general health transitions statement

From the above, it was apparent that if similar cohorts were compared and HRQoL was measured by change in mean OHIP-14 severity, this thesis confirmed the results of previous studies by showing an improvement in HRQoL of those subjects who visited a dentist. In contrast to findings of Fiske et al. (1990), Peterson and Nortov (1995), and Fisher et al. (2005), in this thesis change in EQ-5D and the global oral and general health transition statements showed a trend towards a worsening of HRQoL for subjects with a treatment need who visited a dentist. When investigating those subjects who visited a dentist who had an oral disease, this thesis had similar results to those of the Gagliardi et al. (2008) study, no matter which measure of HRQoL was used.

3.2 Volume, complexity and cost of dental care

Locker's study (2001) was the closest one to this thesis. He measured the volume of dental care over three years by the number of dental visits made, and the dental treatments received. The latter was measured by the treatment codes in the Ontario Dental Association fee guide, the codes being converted into numbers of services and the associated relative value units (RVUs). In the Ontario Dental Association fee guide a dollar conversion factor is then used to determine the fee for each procedure. Locker used these measures to reflect the volume and value of dental care provision. Hence, the definition of 'value of dental care' in Locker's study is similar to that of 'cost of dental care' in this thesis. Change in oral health was measured in two ways: first, by means of change scores derived from four oral health indices and secondly, by global transition judgements.

Locker found that those whose global transition judgements had improved made significantly more visits and received significantly more dental services than those whose HRQoL had deteriorated or had not changed. He noted that the data suggested that the volume, value and pattern of dental care were of importance in terms of oral health outcomes. However, he found that there was no association between service provision and change scores derived from the oral health indices. He suggested that these results raised questions concerning the measurement in change in oral health status.

Our results were consistent with Locker's results in that both studies found a statistically significant association between volume of dental service provision and global transition judgements but not between volume of dental service and oral health indices.

3.3 Baseline oral HRQoL

Baseline oral HRQoL tended to have varying effects on change in oral HRQoL depending on how the latter was measured. This may be more related to the lack of responsiveness of OHIP-14 severity than to the influence of baseline oral HRQoL on change in oral HRQoL. It has been noted previously in this thesis that Locker and colleagues (2004) found that the responsiveness of OHIP-14 was modest by Cohen's benchmarks and Slade (1998) found that changes in mean OHIP scores over time were masked by regression to the mean.

OHIP-14 has also shown to be susceptible to floor effects. For most measures a floor effect occurs when data cannot take on a value lower than some particular number. In the case of OHIP-14 severity, the floor effect occurs because a large percentage of the population fall close to or have the value of zero. When used within an old and medically compromised population, 31% of whom were edentulous, the measure had significant "floor" effects (Bindman et al. 1990). That is, 30.3% to 45.8% of subjects overall had a score of 0, depending upon the method of calculating scores, as did 17.8% to 35.6% of subjects rating their oral health as only fair or poor. This means that the measure would be unable to detect improvements in oral HRQL in a large minority of this population following an intervention of known efficacy.

Locker and Allen (2002) suggest that this floor phenomenon may have arisen because the development of a short-form measure "must of necessity compromise content validity." However, one should remember that OHIP-14 was never designed to measure positive oral HRQoL defined as a person's oral condition improving his/her HRQoL. It was designed to measure the negative impact of poor oral health on quality of life. The large percentage of the population with OHIP-14 severity scores close to zero reflects the underlying distribution of oral impacts on quality of life of the population. If the oral health of the community were to deteriorate drastically then this floor effect would vanish. However, it also means that improvements in oral health cannot be measured for that segment of the sample with baseline OHIP-14 scores of zero and may explain why OHIP-14 might be only moderately responsive to change.

3.4 Descriptive statistics

The frequency of OHIP-14 impacts at baseline of all subjects (n=476) was 19.64% with 95% confidence intervals of 13.85 and 27.07. This was greater than that found in the UK (1998 Adult Dental Health Survey) and Australia (1999 National Telephone Dental Interview Survey) (18.2% and 15.9% respectively, Slade et al. 2004) and in NSAOH Australia-wide (17.5%, Crocombe et al. 2009) but less than in New Zealand (23.4%, Lawrence et al. 2008). However, the mean frequency of OHIP-14 impacts in the UK, Australia and New Zealand were within the 95% confidence intervals of the mean frequency of OHIP-14 impacts found in this study indicating that the differences were not statistically significant.

A comparison of the UK, Australian and New Zealand baseline mean OHIP-14 severity results with the baseline score from this study were similar to that found with frequency of OHIP-14 impacts. The mean OHIP-14 severity score in the UK (5.1%, SE=0.11) was lower than in Australia (7.4%, SE=0.13) which in turn was lower than that in New Zealand (8.0, SD 8.1). In contrast with the frequency of OHIP-14 impacts result, the OHIP-14 severity score from this study (7.44, 95%CIs=6.41,8.48) equalled that obtained from the 1999 National Telephone Dental Interview Survey. Again the results in the UK, Australia and New Zealand were within the 95% confidence intervals of the mean OHIP-14 severity score found in this study.

As oral health related quality of life is associated with age (Tapsoba et al. 2000; Steele et al. 2004), the higher results in New Zealand may be partly explained by the fact that the results were obtained from the Dunedin Multidisciplinary Health and Development Study when all the survey participants were 32 years of age while the people in the UK and Australian studies had median ages of approximately 40 years (Lawrence et al. 2008).

Just over 40% of subjects perceived they had any treatment need except a check-up or scale/clean. This result was similar to the 40.8% of subjects who stated they had a dental problem in the Florida Dental Care Study (Heft et al. 2003).

3.5 Bivariate analysis

In all but one instance, none of the survey participant factors were associated with both the main explanatory variables and four of the outcome variables: change in OHIP-14 severity, change in EQ-5D, global oral health transition and global general health transition. Hence it would be unlikely that there was confounding of the association between dental care and those four measures of HRQoL by these survey participant variables. The exception was residential locality which was associated with both the outcome as measured by the global oral health transition statement and the main explanatory variable of dental attendance. The relationship of residential location and dental visiting behaviour was shown by Spencer and Harford (2007) when they found that rural people were less likely than their city counterparts to attend a dentist at least once a year. When oral health is measured by clinical oral health instruments, those people in rural areas have poorer oral health than their city counterparts. They are more likely to suffer from complete tooth loss, to have less than 21 teeth, to wear dentures, and to have greater numbers of missing teeth (Roberts-Thomson and Do, 2007). It was not surprising that at least one instrument measured that rurally-based people have poorer oral health-related quality of life than city-based people.

There was a statistically significant and large correlation between volume and cost of dental services ($r=0.73$, $p<0.01$). Fees in Australia are commonly charged per service, rather than by a time period. The Australian Dental Association advises its dentist members to set their fee per service using a modified cost-plus pricing system and supply an online fee setting model (ADA, 2000) to assist dentists calculate their service fees. Cost-plus fee setting involves estimating the cost of the product or service, and adding an additional amount for profit. The result was the more dental services received the higher the cost.

The ADA also recommended in the same setting model that an allowance in the form of an increased profit be made for the complexity of the treatment supplied. However, guidelines to define complexity of dental care were not given. These factors explained why a lesser but still moderate and statistically significant correlation existed between volume with complexity and complexity with cost of dental care.

4 Implication of the results

4.1 New contributions

This thesis showed that dental care was associated with a worsening in HRQoL when measured using change scores but an improvement when using global health transition statements. Both effects were small and they were not observed consistently across a range of indices used to measure dental care.

A possible explanation for this apparently contradictory finding is change scores measure different aspects of health than global health transition statements. Locker (2007) wondered what measures of oral HRQoL actually measure. He noted that the assumption that the functional and psychosocial impacts, which instruments such as OHIP-14 and EQ-5D measure, must affect quality of life have been subject to critical scrutiny in medicine but not in dentistry. Consequently what is being measured by indices such as OHIP-14 was not clear. Similarly, what is being measured by global transition statements is also not clear. Locker (2007) maintained that there is a compelling rationale for suggesting that measures of health status and measures of HRQoL are distinct. Some may argue that this thesis supports Locker's contention. However, it is important to note that the OHIP was originally designed as a scaled index of the social impact of oral disorders on a person's well-being (Slade and Spencer, 1994). It was developed to provide a comprehensive measure of self-reported dysfunction, discomfort and disability attributed to oral conditions (Slade, 1997). The authors did not say that OHIP was designed to measure oral HRQoL. Rather, OHIP was, post-hoc, classified as an oral HRQoL measure.

The literature review for this thesis described how the concept of oral HRQoL suffers from a lack of an agreed definition. An equivalent problem is an implicit belief/assertion that a global self rating truly is a measure of QoL. Thus, the research community has a major problem with terminology. What can reasonably be concluded from this study is that computed change in OHIP-14 and change in EQ-5D reflected change in one aspect of health, whereas the global health transition statements reflected change in quite a different aspect of health. However, we are not any closer to knowing whether one or both such aspects represent HRQoL.

By using the instruments of OHIP-14 and EQ-5D both before and after dental care, we have also seen that these instruments do not register as much statistically significant change as the global health transition statements, particularly when measuring the influence of volume, complexity or cost of dental care on change in HRQoL. At the same time, baseline OHIP-14 severity had varying effects on change in oral HRQoL depending on how the latter was measured. The large correlation between baseline and follow-up OHIP-14 severity, and not so large but statistically significant negative correlation between baseline and change in mean OHIP-14 severity suggested that OHIP-14 severity was subject to only moderate change. This may be a result of the change in OHIP-14 severity scores being masked by the increments in some OHIP-14 items cancelling out decrements from others (Slade, 1998). It may also be related to a floor effect. Whatever the reason, this type of result has lead people to suggest that OHIP-14, and may implication possibly EQ-5D, show only moderate responsiveness (Locker and Allen, 2002).

However another explanation could be that the change measures are responsive and that it requires an major or comprehensive treatment intervention, or that the person has to have a pre-treatment health social impact on their health, for treatment to effect a change in the measures. The focus in this study has been to detect statistically significant differences. However, the mean change scores for OHIP-14 severity were small. This raised the issue of whether the effect of routine dental care on oral HRQoL was clinically significant or important. One would hope that dental care would have a positive effect on oral HRQoL. Minimally important change is defined as “changes which are considered to be minimally important by patients, clinicians, or relevant others” and is dependent on, among other things, the type of measure used, the definition of ‘minimal importance’ on the measure, and on the baseline score (de Vet et al. 2006). The previous longitudinal studies investigating the association between routine dental care and HRQoL have been limited to older adults (Fiske et al. 1990; Peterson and Nortov, 1995; Locker, 2001; Gagliardi et al. 2008), and/or to subjects with an oral disadvantage (Fiske et al. 1990; Fisher et al. 2005; Gagliardi et al. 2008). These studies reported an improvement in oral HRQoL. Locker concluded that improvements in the oral health of older adults depends upon access to comprehensive dental treatments which can address fully their clinical and self-perceived needs.

Studies also suggest that large dental interventions effect a clinically significant improvement in oral HRQoL. As mentioned in the literature review, longitudinal studies have investigated individual dental interventions, such as dental implants, wisdom tooth removal, dentures, orthodontics, and orthognathic surgery, and found that the intervention improved oral HRQoL (Awad et al. 2000; Allen et al. 2001; Att and Stappert, 2003; Strassburger et al. 2004; McGrath et al. 2003; John et al. 2004; Heydecke et al. 2004; de Oliveira and Sheiham, 2004; Cunningham et al. 1996; Hatch et al. 1998; Bennett and Phillips, 1999; Locker and Jokovic, 1997; Steele et al. 2004; Dao et al. 1994, Schliephake et al. 1996).

This research combined with the studies cited in the previous two paragraphs indicate that OHIP-14 may be responsive, but rather it is major or comprehensive dental interventions that are required to reduce the social impacts of oral health conditions. A similar contention could be made for EQ-5D.

Another key result was the differing effect of dental care on general health compared to oral health. Locker contended that it was fairly ludicrous to attach the concept of health to any individual part of the body (Locker, 1997). The results in this study indicated that the effect of dental care on oral health and general health may move in different directions with one improving while the other worsens. Hence, contrary to Locker’s contention, it may not be ludicrous to attach the concept of health to at least one part of the body, namely the mouth. Particularly, when there is an entire segment of the health care industry devoted to the mouth, and it is the activity of that very industry that has been measured. However, one cannot assert that this research showed that oral health is a concept in its own right. Data has not been presented on systemic health or medical history. Further, whether EQ-5D or OHIP-14 measure general health or oral health respectively, is open to debate. As mentioned previously, OHIP-14 was designed to measure psychosocial impacts of oral disease and not health.

The correlations between volume, complexity and cost of dental services indicated that they, at least in part, measured a similar aspect of dental care.

4.2 Effect on policy

Clinical disease should not be used as the sole determinant of resource allocation. Quality of life should be included. The impact of oral conditions on well-being needs also to be assessed.

However, if quality of life instruments were to be used, without the support of clinical data, they may perpetuate inequalities and condemn people to their social roles. For example, older people express that they have a better oral HRQoL but also have poorer clinically determined oral health compared to their younger counterparts (Steele et al. 2004). If health planners were to allocate dental resources purely on the results of quality of life instruments, older people would miss out on dental care and continue to have poorer clinically determined oral health. Both clinical and quality of life data should be used to assess treatment need.

As mentioned in the literature review, the Wilson and Cleary model (1995) conceptualises the relationship between clinical factors and HRQoL and subjective well-being. When Baker et al. (2007) tested the relationship between clinical and non-clinical variables in a randomised control trial at two London teaching hospitals, the results supported Wlison and Cleary's model of patient outcomes as it applied to xerostomia. Their research highlighted the complexity of the interrelationships between key clinical and non-clinical variables. In particular, their data suggested that the impact of a chronic condition, namely xerostomia, cannot be captured by clinical assessment alone. A similar contention has been made by Gift and colleagues (1995) with respect to oral conditions.

This research having shown that change instruments measure a different aspect of health than transitions statements means that both measures should be used when determining resource allocation. Further, as it is possible for dental care to influence oral and general health in opposite directions, measuring both aspects of health is also important when determining resource allocation.

The result suggested that high values of dental care had a greater beneficial effect on the HRQoL of people with poorer access to dental care than those with better access to dental care. This fact will be of interest to health planners. Improving access to dental care for those people with poor access to care will improve their HRQoL without a corresponding decrease in the HRQoL of people with better access to dental care.

The results also suggest that to improve HRQoL, dental care should be large or comprehensive, or targeted towards people who already suffer from a reduced oral HRQoL. Health planners wanting to an improvement in overall community oral HRQoL should focus their limited resources into providing such dental care.

4.3 Effect on future research

This literature review and research has shown that there are various differing definitions of health and HRQoL, as well as oral health and oral HRQoL. Further, what different instruments actually measure has also not been consistently defined. Researchers need to devise consistent definitions of these concepts.

Future researchers delving into change in oral HRQoL should be aware of the possible moderate responsiveness of OHIP-14 severity, and that EQ-5D has lower responsiveness again when measuring changes in oral HRQoL. They could consider larger than usual sample sizes to increase power and/or using change in global health statements to obtain a possibly more responsive measure of change in oral and general HRQoL. However, they would need to ask themselves that if the effect sizes are so small, whether it is worth the effort collecting large samples in an attempt to obtain statistical significance. It is possible that large or comprehensive treatments are required to reduce the social impacts of oral health.

Further research is also needed into whether computed change in OHIP-14 reflects change in one aspect of oral health, whereas the global oral health transition statement reflects change in quite another aspect of oral health. The correlation between baseline and follow-up OHIP-14 severity suggests that OHIP-14 may be measuring a trait while the global oral health transition statement reflected a state.

4.4 What should have been done differently

The problem with this research which stands out is the possible lack of power. Any capable researcher would ask if the lack of a definite result in those instances where the change in HRQoL was not statistically significant be due to a lack of power. However, the effects could simply have been small. Calculations prior to the research indicated that the sample size was enough to be able to decide if different volumes, complexities and costs of dental care were associated with changes in OHIP-14. In the perfect world the most important thing that should have been done differently is to have a larger sample size to improve the power of the study. However, being able to utilise the telephone interview, clinical epidemiological examination, and self-complete questionnaire of the Australian National Survey of Adult Oral Health (Slade et al. 2007) just as it was about to start surveying in Tasmania for the baseline component of this study provided a good platform to test the impact of dental services on HRQoL.

Another approach that could have been considered was to use a nearly-randomized design, utilising people who held a health care card who are currently on the public dental care waiting list. People would be randomly selected to receive dental care now, while the same number of people would be randomly selected to wait a year for their dental care. A one-year wait is not unusual for public sector dental care in Australia. Then the change in oral HRQoL could be compared between the two groups.

Due to the fact that the indices of health are measuring a different aspect of HRQoL than the global transition statements, another thing that could have been done differently would be to add pre- and post-dental treatment global oral and general health statements, and compute their change.

Another approach of value is the use of qualitative interviews. Kvale (1998) defined qualitative research interviews as “attempts to understand the world from the subjects’ point of view, to unfold the meaning of people's experiences, to uncover their lived world prior to scientific explanations." In this study, post-quantitative research interviews may have been useful in evaluating how the dental care influenced the HRQoL outcome. While quantitative results may be dismissed on methodological grounds such as lack of power, by those who disagree with the findings, it can be harder to dismiss the actual words of participants that portray their powerful emotions. It may help in understanding the meaning of dental care to its recipients. Further, the interviews could have been used to delve into why the effect of dental care on oral health varied with different measurement instruments. On the other side of the coin, interviewing may be seen as intrusive, subject to the personalities of both the interviewer and interviewee, and can be expensive and time-consuming requiring considerable skill and experience.

Chapter 6: Summary

This study was an observational prospective cohort study of a sample of randomly selected dentate adult Tasmanians surveyed in 2006 and followed over a one-year period. It used collection procedures of a computer-assisted telephone interview, an oral epidemiological examination, a baseline mail self-complete questionnaire, a back-up questionnaire for people who were not able to attend the examination, a service use log book, and a twelve-month mail self-complete questionnaire.

The participation rates at baseline were higher than that experienced in NSAOH for Australia overall. Follow-up details were obtained for nearly two-thirds of people from whom baseline data was obtained and the sample was considered to be representative of the Tasmanian population.

The results varied according to which dependent measure of change in HRQoL was used. When the dependent variable was change in mean OHIP-14 severity, visiting a dentist was associated with a statistically significant worsening of oral HRQoL. In contrast, visiting a dentist was associated with a significant improvement in quality of life when the dependent variable was the global oral health transition statement. The global general health transition statement showed an unfavourable effect of dental visits, although it was not statistically significant. In both cases of these global transition statements there were statistically significant interactions. Follow-up OHIP-14 showed similar trends to change in mean OHIP-14 severity – that is, dental attendance was associated with worsening QoL, although the effect was not statistically significant.

When change in HRQoL was measured by the global general health transition statement, high when compared to low volume of dental care had a statistically significant favourable influence on HRQoL. With the global oral health transition statement, high complexity dental care was associated with a statistically significant worsening of HRQoL, while high cost dental care was associated with a statistically significant improvement of HRQoL.

The results suggested that computed change in OHIP-14 reflected change in one aspect of health, whereas global transition reflected change in quite a different aspect of health. OHIP-14 and EQ-5D showed only moderate responsiveness. Volume, complexity and cost of dental services, at least in part, measured a similar aspect of dental care. Dental care had a differing effect on general health compared to oral health, suggesting that although oral and general may be linked, oral health is a concept in its own right. Researchers need to devise consistent definitions of health, HRQoL, oral health and oral HRQoL.

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