THE DETERMINANTS OF CHILDREN'S ORAL HEALTH RELATED QUALITY OF LIFE

A thesis submitted in fulfillment of the requirement for the Degree of Doctor of Philosophy

Dr Amdah Mat

Academic Unit of Dental Public Health
School of Clinical Dentistry
University of Sheffield

2010

ABSTRACT

Background: Oral health can impact on children's functioning and well-being. However, few studies have systemically examined the range of clinical and psychosocial factors which may influence children's Oral Health Related Quality of life (OHRQOL).

Aim of the study: To identify the determinants and consequences of oral health related quality of life in children.

Methods: Prospective longitudinal clinical and questionnaire study guided by the Wilson and Cleary (1995) model. Variables included, clinical examination (Caries, Periodontal status, Malocclusion, Filled teeth and Trauma) and self reported questionnaire (self esteem, health locus of control, sense of coherence, oral health beliefs, OHRQOL, general health perceptions and overall QOL) at baseline and 6 months follow-up.

Results: Full data were collected from 439 Malaysian 12-13 year olds. Dental disease (Caries, Periodontal status, Malocclusion, Filled teeth and Trauma) levels were low (DMFT = 0.499 $\pm$ SD 0.955). Lagged analysis indicated that a psychological factor; sense of coherence influenced the experience of symptoms, functional status and overall quality of life whereas variation in dental diseases had little influence on subjective experiences.

Conclusions: The linear relationships of the Wilson and Cleary model were not strongly supported. The non linear relationships involving individual factors were broadly supported. Sense of coherence predicts subjective oral health related quality of life more consistently than clinical status in this low disease population.

ACKNOWLEDGEMENT

I thank and praise Almighty god who gave me strength and determination to enable me to pass through the difficulties during this challenging course.

I wish to express my deepest gratitude and appreciation to my academic supervisor, Professor Peter G. Robinson, for giving me the opportunity to conduct this study under his supervision. I'm most indebted to him for his continuous encouragement, his inspiring guidance, intellectual input, invaluable advice and suggestions regarding this thesis. The way he challenged me to do better, inspired me to finish this course.

I am grateful to my second supervisor, Dr Sarah Baker for her continuous guidance, precious knowledge especially with psychological input towards my study as well as in my personal life. The friendly support really assisted me greatly through a difficult time. Without her encouragement and constant advice I could not have finished this study.

My appreciation also to the Public Service Department of Malaysia for the academic and financial support, to the directors of Oral Health Division, Ministry of health, Datin Dr. Norain Abu Talib for giving me the opportunity to finish my study. Thank you also to Prof. Dato' Dr. Wan Mohamad Nasir bin Wan Othman, Dr. Venugopal a/l. Iyawoo, Dr. A. Hamid Mohamad and Dr Nomah Tahrim for the opportunity and support to further my study.

I would like to acknowledge the moral support given to me by my daughters Sara, Maisha and Khalila and not to forget my husband, Zulkifli Mohd Yusuf. Special thanks also to Zurairah Berahim, Mohd. Arif Abdullah, Jamiliah and family, my mum and dad for their continuous support and encouragement.

To all my friends and staff at the University of Sheffield especially Jenny Porritt and Mrs Helen Owen, thank you for all your help!

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ABBREVIATION	
ACAM	Australian Centre for Asthma Monitoring
BT	Backward Translation
CHLC	Child Health Locus of Control
COHRQOL	Child-Oral Health Related Quality of Life
COIDP	Child-Oral Impact on Daily Performances
CPI	Community Periodontal Index
CPITN	Community Periodontal Index Treatment Needs
CPQ*11-14*	Child Perceptions Questionnaire for *11–14*-year-old children
CPQ*8-10*	Child Perceptions Questionnaire for *8-10*-year-old children
CPQ*6-7*	Child Perceptions Questionnaire for *6-7*-year-old children
DMFT	Decayed/Missing/Filled Teeth
E-LOC	External Locus of Control
EWB	Emotional Well being
FBT	Forward-Backward Translation
FL	Functional Limitation
FT	Filled Teeth
GHP	General Health Perception
GRRs	General Resistance Resources
HLOC	Health locus of control
HRQOL	Health Related Quality of Life
ICIDH	International Classification of Impairments, Disabilities and Handicaps
I-LOC	Internal Locus of Control
IOTN	Index of Orthodontic Treatment Needs
LOC	Locus of Control
MAPI	MAPI Institute
OHB	Oral Health Beliefs
OHIP-14	Oral Health Impact Profile
OHRQOL	Oral Health Related Quality of Life
P-CPQ	Parental-Caregiver Perceptions Questionnaire
QOL	Quality of life
RSES	Rosenberg Self Esteem Scale
SDI	Socio-dental Indicators
SES	Socio-economic status
SLSS	Student Life Satisfaction Scale
SOC	Sense of Coherence
SWB	Social Well being
T1	Time 1
T2	Time 2
USA	United State of America
WHO	World Health Organisation
WHOQOL	World Health Organisation Quality of Life

CHAPTER ONE

INTRODUCTION

Oral health-related quality of life (OHRQOL) refers to the impact of oral disorders on aspects of everyday life that are important to patients and persons, with those impacts being of sufficient magnitude, whether in terms of severity, frequency or duration, to affect an individual's perception of their life overall. OHRQOL has become an important focus for assessing the impact of oral conditions on every day life, sometimes as an outcome of clinical care (e.g. Allen *et al* 2001; Locker 2004; Marshman and Robinson 2007).

To date, several studies have explored children's OHRQOL using such child-centred measures. These studies show that oral health can impact on children's functioning and well-being. However, none of these studies have incorporated a broad range of clinical and other non-clinical variables factors that may influence children's OHRQOL or attempted to explicitly test the relationships between them within a theoretical model. Such research hopefully would highlight important issues to further our understanding of the antecedents and consequents of children OHRQOL in order to facilitate effective intervention strategies.

Thus, this research aims to assess relationships between clinical and non-clinical variables in relation to children's OHRQOL. The theoretical model chosen to guide the research is that by Wilson and Cleary (1995), which classifies the variables at five main levels; clinical status, symptom status, functioning, general health perceptions and overall quality of life. The model has been used in adults in relation to several health chronic conditions, including oral health (Baker *et al* 2007; Baker *et al* 2008) but is relatively untested in children's oral health and oral health related quality of life.

This thesis is structured as follows:

Chapter One captures the overview of the research.

Chapter Two is a narrative review of the literature. It considers health as conceptualized within different approaches; the biomedical, psychosocial model and bio-psychosocial models, to develop an understanding on OHRQOL. The review also introduces two models feasible for use in the study; Locker (1988) and Wilson and Cleary (1995). The Wilson and Cleary model is then used to structure a brief discussion on individual factors, sense of coherence, self esteem, oral health beliefs and health locus of control that may play a role in OHRQOL. Included also are environmental factors such as parental income, education level and work status.

Chapter Three summarises the rationale, aim and objectives of the study. It argues that clinical and non clinical variables impact on children's QOL. Individual factors and environment issues may be important factors that need to be considered in understanding children's oral health. Furthermore, no study so far has systematically considered these factors guided by a theoretical framework. The study therefore aimed to identify the determinants and consequences of oral health related quality of life in children. The objectives are as follows;

- To test the relationships between clinical variables, symptom status, functioning, general health perceptions and overall well-being as hypothesised within Wilson and Cleary's model of patient outcomes.
- To examine whether socio-demographic and individual difference factors influence children's OHRQOL and the key relationships identified within the Wilson and Cleary model.
- To explore different configurations of SOC, COHRQOL and the model

Chapter Four describes the translation procedures conducted to achieve high quality translated measures that are suitable for children.

Chapter Five details the material and methods including a brief description on the data analysis strategy, missing data management and data analysis management.

Chapter Six presents the research findings. The sample had good clinical status. Broadly speaking in lagged analyses the linear relationships of the model were not strongly supported, whereas individual factors, notably sense of coherence, were consistently linked to symptoms, functional limitation and overall quality of life.

Chapter Seven brings together the discussion highlighted from the findings.

Chapter Eight highlights the major conclusions and summarises the recommendations arising from the research.

Chapter Nine lists the references.

Appendices section contains copies of key research documents.

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition of health

How people define health is of central importance to healthcare. Health has been defined in various ways, ranging from negative concepts such as 'absence of disease' to positive concepts of 'fitness' or 'well-being'. Knowledge on health and experiences of health can enhance our understanding and help us accommodate patients' needs in relation to preferences for care; outcomes of treatment; practicality and other benefits of treatment. It can empower patients to improve their health. Thus, an understanding of health from the patient's perspective is promoted by WHO (1947) and widely accepted. This subjective concept of health is termed health related quality of life (HRQOL).

This thesis is about children's oral health related quality of life (OHRQOL). First, though I will detail health as conceptualized within different approaches; the biomedical, psychosocial model and bio-psychosocial models which are relevant to understanding on OHRQOL.

2.1.1 Health within the biomedical model

The biomedical approach emerged during the early twentieth century. The doctrine, based on Cartesian philosophy, saw the body as a machine with the assumption that disease was generated by specific etiological agents that lead to changes of the body's structure and function. This model conceptualised health within a reductionist approach and relies on 'germ-theory'. It is the predominant model used by physicians in the diagnosis and treatment of disease. Health in this model is simply 'absence of disease' (Capra 1982; Engel 1980; 1977).

The biomedical model was severely criticised as a limited approach to health, ignoring the complexity of human factors. Especially neglecting the ideas that humans are organisms that interact with biological as well as social and psychological factors to enhance or damage health. Thus, biomedicine omits the influences of non biological circumstances on biological processes and loses sight that people are humans. The

model is disease orientated, emphasising illness over health. It is interventionist and overly intrusive (Dubos 1959; McKeown 1976; Engel 1977; Engel 1980; Capra 1982).

A further criticism is the dependence of medical care on complex technologies leading to 'engineering approaches'. The shortcomings of this approach are seen in terms of direct health care and opportunity costs. Clinical effectiveness and fulfilment of needs increasingly rely on the restrictive nature of medical technology for diagnoses, surgical procedures and conducting tests that are eventually leading to escalation of health care costs and promoting profit (McKee 1988). The biomedical model becomes a commissioner of a budgetary system with allocation of resources primarily determined by diagnosis and specific treatments regardless of the availability of other effective interventions (Wade and Halligan 2004). Health within this model relies on physician's information and fails to provide information suited to the patient's perspective.

2.1.2 Biomedical model and medical iatrogenesis

Dependence on medical treatments raises questions of their benefits. Illich (1979) expounded polemic views on iatrogenesis claiming that medical technology and its advancement were pernicious, bringing more harm than good and ultimately damaging to health. He described iatrogenesis in three broad categories; clinical, social and cultural. Clinical iatrogenesis refers to mistakes or complications of treatment, with medications, physicians and hospitals as the sources. Social iatrogenesis refers to unintended consequences of the sick role or illness behaviour in society. The sick role is the 'medicalisation of life', a social control mechanism which creates more dependency on the institution of medicine. This leads to an individual's loss of autonomy and capability of self-care and places the responsibility for health in the hand of professionals.

In line with this thinking, many social scientists resist the biomedical model and seek alternative approaches to understand what health means within a comprehensive model that explains how physical and social environments interact with individual biology and psychology.

2.1.3 Health within the psycho-social model

Challenges to the biomedical model encouraged health to be conceptualised within a 'whole-person viewpoint', whereby the subjective experiences and socio-cultural background of a person are taken into account. Thus, psychological and sociological science supplemented the medical paradigm to embrace the scope of 'social constructionists' (Barry and Yuill 2002). Those concepts provide the cornerstone of the psychosocial model that considers the individual's psychological and social values. The model is consistent with the broader concept of health as 'a complete state of physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO 1947).

Health within the psychosocial model is not only concerned with the absence of disease but as a state of well-being, of integrated function involving the physical, mental, social and spiritual dimensions of a person (Madjar 1992). Health, therefore, is the interplay of many factors. Importantly, the model recognizes humans are dynamic creatures constantly in a state of 'flux' affected negatively or positively by experiences and exposures in their daily life (Deep 1999). Therefore, the model allows broad exploration of each individual's heterogeneity, complex relationships and actions within the social environment that can influence a person's states of health (Chick 1992).

The model also promotes primary prevention and health promotion as ways of effectively meeting needs (Ahmed *et al* 1979) rather than relying on medicine with its escalating cost.

2.1.4 Health within the bio-psychosocial model

The biomedical and psychosocial models deviate from each other, rather than encompassing a gradation of health within a comprehensive model. Engel (1977) recognised those flaws and proposed a 'bio-psychosocial model' which embraces both paradigms to provide a full understanding of health.

The bio-psychosocial model comprehensively interconnects health within a spectrum of biological, psychological and socio-cultural systems. Thus, it fosters the integration of

clinical and psychosocial assessment and provides a comprehensive framework for a multidisciplinary research (Borrell-Carrió *et al* 2004).

The model reflects the WHO (1947) definition of health as reflected in the latest WHO International Classification of Functioning, Disability and Health ICF (WHO 2001) (Steward and Rosenbaum 2003). Both emphasise the multi factorial concept of health and employ positive views of health.

Broadly, health now can be viewed in both spectra: 'disease' as in the biomedical model and 'health' as a psychosocial concept, to create a comprehensive balance of negative and positive perspectives. Biomedical perspectives allow the diagnosis of a disease in order to clarify the intervention needed and summarize the morbidity and mortality. Psychosocial perspectives will reflect the impact of condition and intervention on the patient's health. Within this integrated concept, the condition of an individual will be clearly understood and the interventions offered may eventually meet the patient's needs (Bowling 2005a).

Locker (1988) and later Wilson and Cleary (1995) acknowledged the importance of this model, linking clinical variables to patient perspectives which describes health on a continuum of increasing biological, social and the psychological complexity. The model also allows greater conceptualisation of the term oral health related quality of life.

2.1.5 WHO (1947) definition of health

The psychosocial and bio-psychosocial models are rooted in the WHO (1947) definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO 1947). Although this definition is widely accepted it is not without criticism, for health cannot be defined as a 'state' nor does it remain 'constant' because humans continuously undergo adjustments and changes to adapt to life's demands. Larson (1991) saw the WHO (1947) definition as synonymous with a 'holistic approach', too idealistic and impossible to achieve (Bowling 2001). The word 'complete' brings challenges of how to quantify and qualify the health condition. It also raises concerns that an ideal of 'complete physical and mental well-being' may lead to over medicalisation of the human experience (Bok 2004).

Unrealistic and utopian as it may sound, the WHO (1947) definition demands a multidisciplinary approach. It provides an alternative to biomedical perspectives as a cornerstone of the psychosocial and bio-psychosocial models of health integrating two essential components of a concept of health: 1) man is an entity of biological, psychological and sociological elements and 2) health concerns the individual perspectives (Barenthin 1975). The biomedical and the psychosocial and bio-psychosocial paradigms work synergistically at the individual level allowing comprehensive construction of health measurements (WHO 1980; Locker 1988; Wilson and Cleary 1995). These integrated models represent a shift, regarding health from a patient's personal assessment.

2.2 Quality of life

Consideration of the subjective experience of health conditions has led to a focus on quality of life. The assessment of QOL is not an easy matter. No measure as yet can legitimately claim to encompass the entirety of QOL. The difficulty arises because there is little agreement about what constitutes QOL and how it can be measured in a suitable manner. There is no single definition of QOL that is universally accepted as yet.

In this thesis QOL is taken to mean 'the interaction of a person's personal values with their life conditions and life satisfaction which will determine their level of QOL' (Cummins 1995).

HRQOL describes the medical and health dimensions of QOL. A much narrower concept is Oral health related quality of life (OHRQOL) which Locker and Allen (2007) defined, as 'the impact of oral disorders on aspects of everyday life that are important to patients and persons, with those impacts being of sufficient magnitude, whether in terms of severity, frequency or duration, to affect an individual's perception of their life overall' will be adopted in this study.

However, these definitions are not universally accepted. Therefore, this section will review definitions of QOL, HRQOL and OHRQOL and discuss the implications and applications of these measures.

2.2.1 What is quality of life?

Quality of life is a complex and amorphous phenomenon with multiple dimensions defined in multiple ways and meaning different things to different people (Bowling 2001). The QOL concept can be viewed as subjective, objective or both and is conceptualised as either unidimensional or multidimensional (Meeberg 1993). Most authors are satisfied to use QOL as a pragmatic working construct or organising concept and to restrict the domains under consideration depending on the purpose to which it applied (Koot 2001).

Various definitions of QOL are drawn. For example, Cummins (1995) proposed that the interaction of a person's personal values with life conditions and life satisfaction will determine their QOL. Shin and Johnson (1978) think income has a substantial influence, satisfying a person's needs, wants and desire and thus influencing achievement in personal development and self actualisation. Similarly, Veenhoven (2000) thinks that personal resources reflect one's chances of having a good life and capability to enhance perceived QOL. Andrews (1974) suggests a person's sense of life quality is a combination of affective responses to their life 'domains', fulfilling basic human needs and achieving pleasure and satisfaction. However, most of these definitions relate to a researcher's purpose in using the term 'QOL' rather than developing a theoretical construct (Raphael *et al* 1996; Koot 2001).

It is not the purpose of this thesis to resolve the debate about definitions of QOL since our interest is in OHRQOL. However, it is necessary to stress the main idea of QOL is not easily understood since it is related to human issues. It needs careful interpretation, must be viewed comprehensively and any measures employed must capture a multi dimensional approach. No single measure can adequately assess QOL but it should include all aspects of the individual's life. Thus, QOL research needs to employ a broad conceptual framework tailored to the research questions and subject to vigorous empirical testing. We shall see that similar concerns pertain to HRQOL and OHRQOL.

2.3 What is health related quality of life?

HRQOL is the medical and health dimensions of the broader concept of QOL (Eiser *et al* 2000; Bowling 2005a) which represent both objective life conditions and subjective personal appraisals (Testa and Simonson 1996). As QOL encompasses non-medical aspects of a person's life, the two phrases should not be used synonymously (Feldman *et al* 2000).

Health related quality of life has been defined in numerous ways. For example, it can be regarded as a '..... concept of individual responses to the physical, mental and social well-being effects of illness on daily living which influence the extent to which personal satisfaction with life circumstances can be achieved' (Bowling 1991). Similarly, Schipper (1990) defined HRQOL as 'the functional effect of an illness and its consequent therapy upon a patient, as perceived by the patient'. Both of these definitions, it is claimed, relate to the WHO (1947) definition of health and highlight the notable shift from traditional measures of disease. However, measures of illness, diseases and disability on core domains of a human's life (physical, mental and social well-being) are related to the traditional biomedical view. To link HRQOL to the effects of illness upon an individual's competencies and ability limits the focus of health by stressing its relationship with diseases (Raphael *et al* 1996). Such measures are questioned in their applicability to healthy people. Nevertheless, the measures provide valuable information.

Calman (1984) defines HRQOL as the gap between actual HRQOL and preferred HRQOL. He predicted that a large gap represented lower HRQOL and narrower gap indicates good HRQOL. This definition leaves scope for the concept of 'response shift' allowing for people to change their self-evaluations, resulting from changes of their internal standards or reconceptualisation of their HRQOL (Sprangers and Schwartz 1999). Sprangers and Schwartz (1999) felt this model enabled a person with difficult life circumstances to maintain a reasonable HRQOL.

Though various HRQOL definitions have been offered, the fundamental concept accepted by many is that HRQOL recognises subjective inter-relations of the effects of illness and disease on everyday life and is multidimensional and dynamic, thus it

changes over time and situations (Calman 1984; Bowling 2005a; Gregory *et al* 2005). Therefore, any definition accepted will need to encompass this comprehensiveness. HRQOL needs a broad definition that will reflect the health, health condition and that people change according to their condition and personal values. WHOQOL (1995) suits this purpose. HRQOL should be defined as the 'individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the persons' physical health, psychological state, level of independence, social relationships and their relationship to salient features of their environment (WHOQOL 1995).

This definition clarifies that HRQOL is subjective and must comprise both positive and negative dimensions. It should be viewed via multidimensional perspectives involving six domains; a) physical; b) psychological; c) level of independence; d) social relationships; e) environment; and f) spirituality/religion/personal beliefs (WHOQOL 1995). Furthermore, the definition acknowledges cultural values that influence interpretations of health, QOL and HRQOL.

The presence of so many dimensions of HRQOL increases the complexity of HRQOL assessment. These facts drive the need for adoption of comprehensive conceptual frameworks to identify potential links between various dimensions, to guide the constructs employed to fully operationalise and explore the associations existed (Ashing-Giwa 2005). A clear conceptual framework will also provide guidance to answer the research questions, broaden the understanding of the HRQOL domains which will make a unique contribution to the development of new theories, concept development, appropriate interpretation of HRQOL and which promote appropriate measurement (Fawcett and Downs 1992).

Few theoretical frameworks of HRQOL are tailored to the area of enquiry in this thesis. One in particular is by Wilson and Cleary (1995). The model is comprehensive and multidimensional and accounts for clinical factors and patient's perspectives yet also incorporates individual and environmental characteristics. It is well accepted and widely tested in the medical field but has only occasionally been used in relation to oral health.

2.4 Unidimensional and multidimensional approaches to HRQOL measurement

There are two approaches to assess HRQOL; unidimensional or multidimensional. Both are applicable and reliable in their own way. Unidimensional approaches are considered the broadest. Simplicity is their advantage and the items are easier to interpret clinically (Mozes *et al* 1999). They create less respondent burden and can provide important information, such as predicting help seeking behaviour or health services use (Bowling 2005b). This approach tries to summarise various domains of HRQOL simultaneously in a single question (sometimes referred as global domain measures). For example, "How do you feel about your life as a whole?" could be a global assessment of a range of divergent and complex factors (Beckie and Hayduk 1997).

However, unidimensional approaches have disadvantages. The information obtained does not show the comprehensiveness of HRQOL. It fails to reflect adequately the range of HRQOL or the relevant domains involved. It lacks details on which HRQOL dimensions, domains or sub-domains influence individuals' responses. It fails to highlight the relative impact of the individual's physical, psychological and social domains of health (Sloan *et al* 2002). Thus, the information obtained from unidimensional assessment only reflects the general impression of the patient's HRQOL. The assessment does not take into consideration that a person varies in what they perceive to be important in their life. They may subconsciously place a different level of importance on the contributions of various factors to their HRQOL (Meeberg 1993). For instance their responses maybe related to a specific health problem rather their general physical functioning (Bowling 2005b).

Furthermore, limited response options to single items give fewer options for the individual to reflect their true meaning of HRQOL. Thus they reduce the instrument's precision and content validity, sensitivity and reliability and so consequently, their ability to discriminate differences in HRQOL (ACAM 2004). Therefore, careful interpretation is needed if HRQOL assessment depends solely on this type of measure (Bradley 2001).

In contrast, multidimensional approaches are more useful to measure the breadth and depth of the core domains and various dimensions of HRQOL (Testa and Simonson

1996). Such measures contain multiple items in multiple dimensions which enable assessment of physical, psychological and social domains of HRQOL more comprehensively. For example, to measure the effects of an intervention, the questions will cover all aspects of the dimensions to capture the entirety of a person's experience. This effort will lead to greater precision and content validity.

Thus, multi-item, multi-dimension instruments generally measure HRQOL with greater content validity and more precision than unidimensional instruments. The disadvantages are, however, that they are longer, involve a greater respondent burden and are more expensive to implement. However they are more precise (ACAM 2004), more comprehensive and tailored to the research question, model and measures selected.

2.5 Oral health related quality of life

Oral conditions affect many people throughout the world. They are not often life threatening but their consequences affect physical functioning and social and psychological well-being which can influence general health and well-being. The notion of OHRQOL arises from the need to consider the impact of oral diseases on different aspects of life. These contribute the ideas of developing theories, concepts and models involving multiple factors to determine a person's oral health and OHRQOL. Seeking information using multiple factors is a departure from simple linear measures to involve several dimensions simultaneously. Usually the beginning of assessment involves health dimensions effecting functional, psychosocial and economic effects on quality of life. This research will seek information only on two dimensions of OHRQOL; functional and psychosocial dimensions.

2.5.1 Definition of oral health related quality of life

Oral health related quality of life can be regarded as a subset of HRQOL (John *et al* 2004). Again lacking a universally adopted definition, it is a multidimensional concept of interrelated domains (Gift *et al* 1997). This section will profile definitions of OHRQOL before stating one appropriate to this study that will help in selecting models and constructs for the thesis.

There are various definitions ranging from simple to complex. The United States Surgeon General's report on oral health defines OHRQOL as 'a multidimensional construct that reflects (among other things) people's comfort when eating, sleeping and engaging in social interaction; their self esteem; and their satisfaction with respect to their oral health' (Surgeon General Report 2000). The definition is a linear concept, linking oral health to its consequences. On the other hand, rigorous definitions adopted by some researchers conceptualize OHRQOL in line with their research needs (Al Shamrany 2006). For example, Gherunpong and colleagues (2006) describe OHRQOL based on needs assessment and state OHRQOL as a subjective indicator that provides information on the impact of oral disorders and conditions and the perceived need for oral health care. This definition links two conceptually unrelated ideas; OHRQOL and needs assessment, thus far lacks empirical detail to support its utility.

Another example of a rigorous definition of OHRQOL is by Gift and colleagues (1997) who define OHRQOL as 'opportunity/resilience, health perception, functional states, impairments/diseases and duration of life, cultural upbringing, current and past experiences of oral disease or health care, current states of mind such as depression, happiness and hopes for the future'. They defined OHRQOL within the complex inter-relationships of the oral cavity as the outcome; the effect of the oral condition on the whole body; and the effects of systemic health and HRQOL on the oral cavity and OHRQOL. Inglehart and Bagramiam's (2002) overlapping concept of OHRQOL includes a person's appearance, self esteem and social factors such as interactions with others attached to the experience of pain and discomfort.

Locker's (1988) original definition described OHRQOL as a 'measure of the extent that health status and conditions disrupt normal social-role functioning and bring about major changes in behaviour, such as inability to work, attend school, undertake parental or household duties'. This definition addresses common issues of oral diseases and their consequences on individual roles and functioning but never claimed to solve all QOL or HRQOL issues (Locker and Allen 2007). However, it provides useful information about broad implications of oral diseases and is considered a cornerstone for further development of patient-based oral health measures (MacEntee *et al* 2006).

The definitions stated above will not be used in our study, but are examples of the diversity of OHRQOL included by some researchers. The most recent OHRQOL definition proposed by Locker and Allen (2007) will be used instead. It is more comprehensive and precise, reflecting a person's perception of OHRQOL. The definition states OHRQOL as;

'the impact of oral disorders on aspects of everyday life that are important to patients and persons, with those impacts being of sufficient magnitude, whether in terms of severity, frequency or duration, to affect an individual's perception of their life overall' (Locker and Allen 2007 p.409).

This definition clarifies patient-centred subjective evaluation of their current oral health status involves functional and psychosocial domains (Locker and Allen 2007). We will adopt this definition to guide our research questions.

2.5.2 Applications of the HRQOL and OHRQOL constructs

Many authors have highlighted potential applications of HRQOL measures (Locker 1996; Fayers and Machin 2000; Robinson *et al* 2003). The applications can be summarised in three broad categories; political, theoretical and practical (Table 2.1).

Political uses involve planning public health policy (Guyatt *et al* 1993) and are concerned with resource allocation (Fitzpatrick *et al* 1992). Practical fields deal with research, public health and clinical practices. Research concerns the effectiveness and efficiency of health interventions and differentiates the effects of medical interventions (Wennberg 1990; Locker 1995). Public health informs policy decisions in planning, monitoring and evaluating health services and deals with describing and monitoring illness in population. It also deals in needs assessment and prioritizing health care (Gherunpong *et al* 2006). While in clinical practice, they may facilitate the patients' assessments to monitor and evaluate care (Fayers and Machin 2000; Higginson and Carr 2003).

Table 2.1 Potential use of health-related quality of life measures

Field of Work	Potential uses in health field\oral health related quality of life
Political	Planning public health policy Planning in resources allocation
Clinical uses	Communication tools Commissioning program of care Evaluating intervention Assessing the outcomes of new treatment To aid understanding of patients point of view Screening purposes Identifying and prioritising patient problems and preferences Monitoring and evaluating individual patient care Identifying which patients have more benefit from the treatment Involving patient's perspectives in decision making and self care To predict outcomes in order to provide appropriate cares Clinical audit
Research	Evaluating outcomes of healthcare interventions Elucidating the relationships between different aspects of health
Public Health	Describing and monitoring illness in population Planning, monitoring and evaluating services Needs assessment and prioritizing Encouraging greater lay participation in healthcare
Theoretical	Exploring models of health Describing factors influential to health

2.5.3 Historical and theoretical perspectives of oral health related quality of life

Dental problems are largely social and behavioural in origin and have psychological and social outcomes (Cushing *et al* 1986). This led many authors to criticise existing clinical indices and their failure to recognize such outcomes (Cohen and Jago 1976; Nikias *et al* 1979; Reisine 1981; Nikias 1985; Locker 1988). Cohen and Jago (1976) proposed the use of socio-dental indicators (SDI) as 'measures that add a dimension of social impact to the clinical indicators'.

In the late 1970s, the OHRQOL concept started to evolve as more evidence grew of the impact of oral disease on social roles (Cohen and Jago 1976; Cushing *et al* 1986; Ettinger 1987). Reisine (1996) stated that the systematic data collection on patient-based measures of oral health only began in the 1980's in response to Cohen and Jago's (1976) seminal paper.

OHRQOL lacked a theoretical model until 'Parson's sick role theory' was adapted by Reisine (1981) and 'social role theory' by Nikias and colleagues (1979). Nikias and colleagues (1979) defines these dental-related social issues as SDI and they were subsequently defined as 'measures of the extent to which oral health condition disrupt normal role functioning and bring about major changes in behaviour, such as inability to work, attend school, undertake parental or household duties' (Locker 1988). This approach offered promising guidance for the construction of SDI (Slade *et al* 1996).

One limitation of sick-role theory, although theoretically appealing, was that measures based on this approach can be insensitive to individual impacts, although it is more useful in population-base (Reisine 1984a; Locker 1988). This is because dental conditions rarely place a person into the 'sick domain'. However, the use of SDI adjuncts to clinical indices were seen to provide additional information regarding how people are affected by oral disease (Cohen and Jago 1976; Reisine 1981; Reisine 1984b).

Davis (1976) and later Locker (1988) rejected role theory because dental conditions were usually chronic 'indispositions'. The definition of the extent to which dental and oral disorders disrupt normal role functioning was too narrowly defined to do justice to the full range of events involved in the assessments and measurements of oral health. Many of the experiences and psychological outcomes of these conditions were subtle at the personal level and might be ignored, but they were more powerful at the society level (Locker 1988).

Gift and colleagues (1992) and Reisine (1984a) confirmed these concerns in relation to work loss due to dental conditions which was substantial at the population level but minimal at the individual level: a mean between of 1.48 to 1.26 hours per person per annum. This proved work loss measurements were not a useful outcome at the individual level (Reisine 1984a; Gift *et al* 1992). Broader issues such as social functioning, need, socioeconomic variables and attitudes about oral health need to be included to enhance the impact of oral problems (Nikias 1985; Gift *et al* 1992).

Adopting the sick role theory was also considered an extension of the biomedical model with a rigid 'doctor-sick role dyad-authoritative', which regarded patients as a receptive recipient (Davis 1976). Not all individuals willingly succumb to a sick role and not all

individuals have to be in a sick role to be a patient, such as in the case of preventive visits (Davis 1976).

The rejection of role theory allowed measures that were more comprehensive, involving multidimensional concepts to provide better understanding of oral health and its consequences. Such measures should be sensitive enough to detect possible changes in wellbeing caused by oral conditions especially at an individual level. They should involve both clinical, subjective indicators, biophysical, psychosocial and social domains (Locker 1988). Efforts were made by researchers to develop such measures. These measures are in the form of standardized questionnaires and termed as OHRQOL (some authors still refer OHRQOL as SDI).

2.6 The importance of adopting a conceptual model

The ability of OHRQOL measures to supplement clinical findings is hampered without a coherent theoretical or conceptual model (Locker 1988; Wilson and Cleary 1995) that conceptualises the relationship between clinical variables and HRQOL and the factors that mediate this relationship.

Models conceptualise these interrelated variables and form a construct that provides an explanation of critical elements of HRQOL and its determinants to indicate the complexity of the links between clinical conditions and their personal and social outcomes (Locker 1988; Ferrans *et al* 2005). They predict events, for example, in postulating the direct and indirect interrelationship between characteristics (Heo *et al* 2005), which is unique to individuals or populations. Consequently, a model acts as a guiding framework of how to choose a measure, interpret results, plan analysis and even select healthcare interventions. They provide important information for clinicians and researchers in attempting to develop effective interventions to enhance HRQOL in patients (William *et al* 1998; Heo *et al* 2005).

Failure to acknowledge the importance of the relationships within a model will hamper demonstration of the effectiveness and utility of the HRQOL measures (Baker *et al* 2007). Research will lack consistent findings if the potentially associated variables of HRQOL are not examined simultaneously based on a theoretical model (Heo *et al*

2005). Furthermore, models assist in communication about research and interventions in the field.

In summary, without a theoretical model the measure will not reflect the effects of interrelating variables in HRQOL, it merely describes consequences separately (Coons *et al* 2000). Thus, to facilitate the effectiveness of HRQOL and OHRQOL constructs in health care, it is necessary to clarify the antecedents and consequents of OHRQOL and the pathways underlying HRQOL or OHRQOL and well-being in specific patients or populations (Sullivan *et al* 2000). Thus, adopting a theoretical multidimensional model will be more definite to guides the OHRQOL research questions.

2.7 Models relevant to oral health related quality of life

Multidimensional models which conceptualise how health may be related to individual experiences include those by Locker (1988) and Wilson and Cleary (1995). Both models were based on theory, clinical practice and research findings to distinguish among conceptually distinct dimensions and antecedents of health and HRQOL (Locker 1988; Wilson and Cleary 1995).

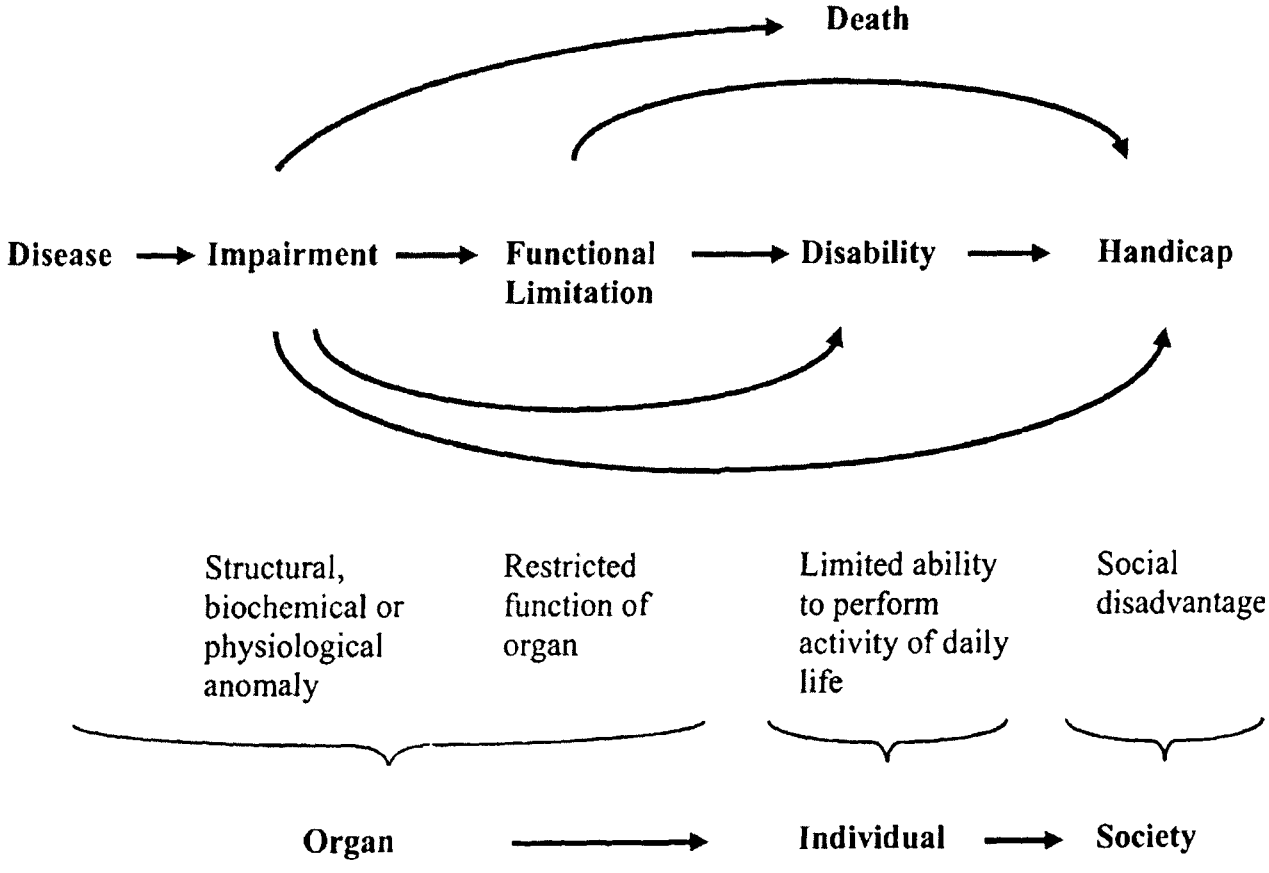
2.8 Locker's (1988) conceptual model

Locker's model (1988) combined biological, psychological and social levels and was a breakthrough in the development of measuring oral health and OHRQOL. Locker's work is based on the functional and psychological characteristics proposed by Culyer (1983) in a dynamic framework developed based on ICIDH (WHO 1980). He proposed that the framework begins with disease formation which disrupts the functioning of biological systems (Figure 2.1). Progressive diseases lead to impairment of the organs, thus leading to functional limitation of body parts. Pain and discomfort refer to the experiential aspects of oral conditions in terms of symptoms. These consequences may lead to physical, psychological or social disability. The ultimate consequence is handicap, a deprivation of normal social functioning. Whilst, 'Death' is denoted a non-favourable indicator, in dentistry such cases are rare.

2.8.1 Applicability of Locker's model (1988) in the current research

Locker's model has been of value in the understanding of oral disease and its consequences and is applicable at individual, group or community and population levels (Baker *et al* 2007). However, this framework did not clarify the personal and socio-environment variables that may link its key components, even though it has been noted that they are likely to play an important role in oral health (MacEntee *et al* 1997; Baker *et al* 2007). Such variables are important since humans interact within society, actively constructing meaning from their life exposure and displaying a range of cognitive mechanisms to continually adapt to changing circumstances (Ring *et al* 2005; Gregory *et al* 2005).

Figure 2.1 Locker's (1988) conceptual framework of oral health



2.9 Wilson and Cleary Model (1995) - Linking clinical variables with health-related quality of life

The Wilson and Cleary model (1995) provides a link between the biomedical and psycho-social models. It conceptualises the relationship between clinical factors and HRQOL or OHRQOL and subjective well-being. The model also provides a framework for the empirical analysis of personal characteristics along with social and environmental influences on the causal framework. The authors proposed that a reciprocal relationship can be applied at all levels in the model and absence of arrows between non adjacent levels do not mean the relationships do not exist. This model was later revised by Ferrans and colleagues (2005).

Wilson and Cleary (1995) described five main levels of variables, arranged from left to right according to a pathway of biological, social and psychological complexity. The pathway begins with biological and psychological signs and symptoms progressing through more complex and integrated measures of functional status, general health perceptions and ends with overall QOL (Wilson and Cleary 1995; Ferrans *et al* 2005). Its conceptualisation clarifies the distinction between symptoms, function, general health perception and QOL by identifying them as separate entities, giving clear definitions for each and enabling separate measurement (Ropka 2002).

The model predicts higher correlation of physical signs and symptoms with the concepts immediately adjacent in the model (functional status) than subsequent concepts (general health perceptions and overall QOL) (Wilson and Cleary 1995; Ferrans *et al* 2005). In addition, the potential effects of individual and environmental characteristics are shown to have an impact on each of the main model levels. Individual characteristics include symptom amplification personality/motivation and values/preferences. Environmental characteristics include psychological supports, social and economic supports and social and psychological supports. Since the ultimate outcome is overall QOL, the impact of non-medical factors is also accounted for in this model as modifying factors that cannot be controlled by clinicians or any health care system (Wilson and Cleary 1995). The complexities of the relationship between the levels lead to the difficulty of evaluating HRQOL by assuming a simple measure as traditionally defined (Wilson and Cleary 1995).

The model is widely accepted in the medical field (e.g.; Nokes *et al* 2000; Janz *et al* 2001) yet has only recently been tested in dentistry (Baker *et al* 2007; Baker *et al* 2008). The model is shown in Figure 2.2.

2.10 Variables of the Wilson and Cleary (1995) model

This section details the key variables in the Wilson and Cleary model.

2.10.1 Biological and physiological factors

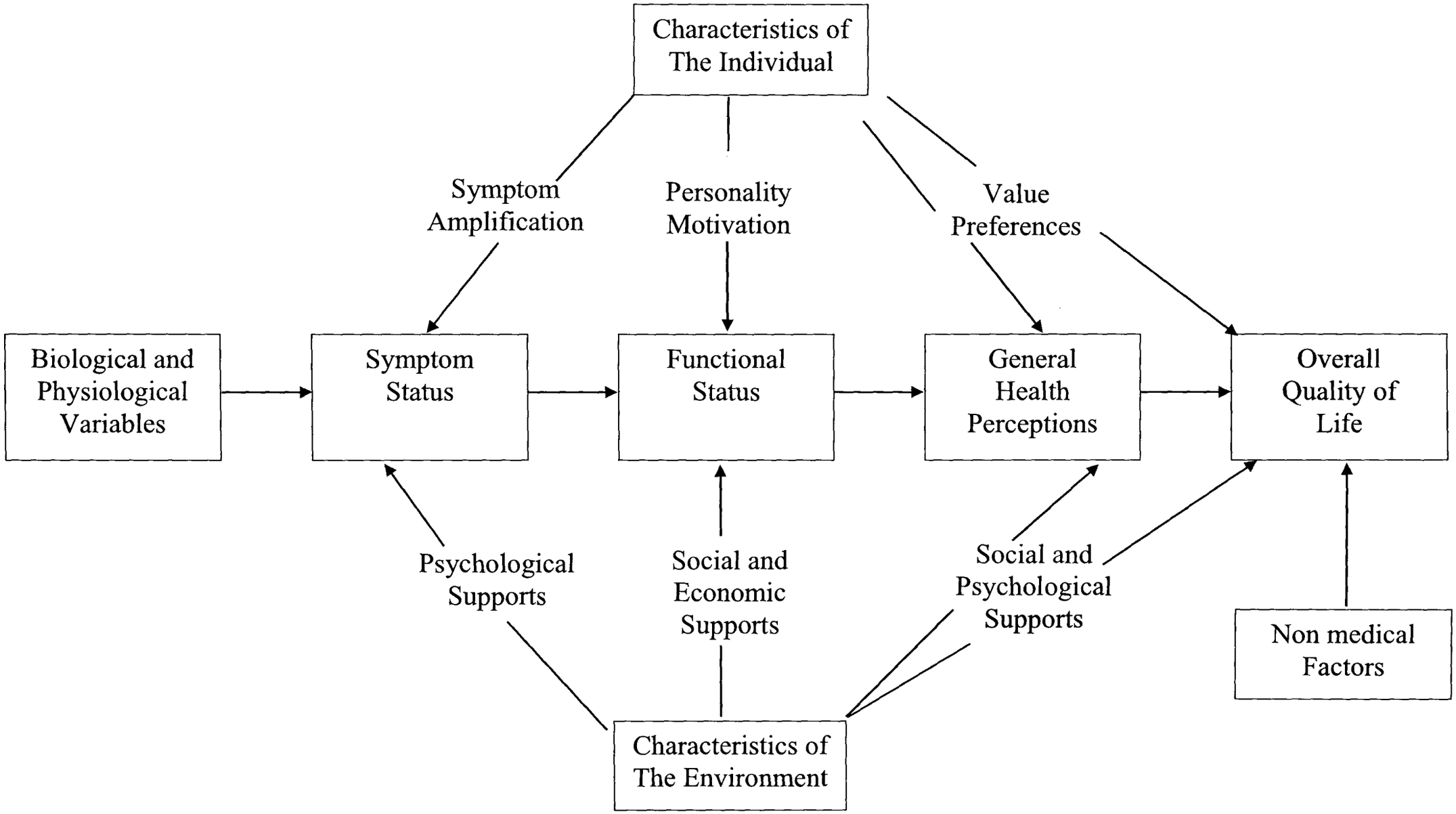
Biological and physiological factors are commonly used in clinical practice. Changes in cells, organs, systems and function can affect other components of health, including symptoms, functional status, perceptions of health and overall QOL.

2.10.2 Symptoms status

Symptoms were defined by Wilson and Cleary (1995) as; 'a patient's perception of an abnormal physical, emotional, or cognitive state' yet they are not necessarily an indicator of an illness (Mechanic 1995). These expressions of subjective experiences summarize and integrate data from a variety of disparate sources such as the complex interactions of biological, social and environmental processes. The magnitude of a symptom varies in severity or its persistence (Mechanic 1995; Ferrans *et al* 2005). Thus defining the level of symptoms can be problematic. A person at different points in time may perceive symptoms as normal experiences whereas it can cause alarm about their health state (Mechanic 1995).

Therefore, the relationship between biological or physiological variables and symptoms is complex. A person may present with a condition without biological or physiological abnormalities (clinically identifiable), i.e. in the cases of temporo-mandibular disorder. A person can also manifest biological and physiological changes without experiencing symptoms (for example, dental caries). Such diseases need to progress sufficiently to manifest symptoms (Smith and Sheiham 1979; Reisine and Baillit 1980). Recognizing the severity of the symptoms can influence a person to seek treatment.

Figure 2.2 Wilson and Cleary Model (1995) - Linking Clinical Variables with Health-Related Quality of Life.



In this case the subjective awareness of symptoms, influences dental care as much as any clinician's judgments (Reisine and Locker 1995). This was shown by Heft and colleagues (2003) and Ostberg and colleagues (2003) who noted discrepancies between clinician judgments, patient's perception and the perceived significance of dental signs and symptoms.

2.10.3 Functional status

Functional status refers to the impact of health problems and treatments on multiple domains of health. The variable includes physical functioning, social functioning, emotional functioning and role functioning (Wilson and Cleary 1995). Wilson and Cleary (1995) defined functional status as: 'the ability of the individual to perform particular defined tasks'. It is usually seen as summarizing the concepts of 'disability' and 'social handicap' (McDowell and Newell 1996) as they were defined by the three levels of the 'ICIDH' scheme. Seen in this way, functional status as represented in the Wilson and Cleary model (1995) is closely related to HRQOL or OHRQOL.

2.10.4 General health perception

Two salient characteristics of general health perceptions were defined by Wilson and Cleary (1995): health components and subjective ratings. In short, general health perceptions are the assessment of symptoms and functional abilities and take into account the satisfaction with health as well. However, how people rate their health will be affected by numerous factors. Physiological processes, symptoms and functional ability are consistent predictors of general health perceptions (Bjorner *et al* 1996). Cleary and colleagues (1993) also suggest symptoms are the best predictors of general health perception and that studies which test these associations may yield important findings.

Ferrans and colleagues (2005) disagreed with including the concept of symptoms in general health perceptions. Although general health perceptions are influenced by the earlier components of the model, they are different from the others. Thus, it is not appropriate to use those components to assess general health perceptions. Instead, the

use of a single global question asking people to rate their health based on Likert scale ranging from poor to excellent is recommended (Ware and Sherbourne 1992).

2.10.5 Overall quality of life

The end of the continuum is subjective well-being. This concept is related to how happy or satisfied a person is with their life as a whole. The way people perceive things however, changes as circumstances change according to their values, preferences, expectation and aspirations. Therefore, to associate health with satisfaction in life will not be easy. Objective life circumstances may not be strongly related to life satisfaction, happiness or overall QOL. For example, an impairment can pose a burden to some but not to other people (Wilson and Cleary 1995).

2.10.6 Environmental and individuals factors affecting HRQOL/OHRQOL

According to Wilson and Cleary (1995) the way people respond to clinical conditions and how they value their HRQOL depends on a number of factors. HRQOL is not entirely determined by biophysical attributes or medical and dental treatment but by the way these things interact with individual and environmental factors.

These individual and environmental factors have multiple linkages in the model. Characteristics of the individual are distinguishing traits or qualities that identify a human being. Characteristics of the environment are the external conditions that influence the life of human beings or are influenced by human beings (Sousa *et al* 1999).

Having considered, briefly, how individual and environmental factors may mediate HRQOL, this review will further consider both sets of factors.

2.10.6.1 Environmental factors

Environmental factors play important roles influencing health outcomes which can be categorized as socio environmental factors and physical environmental factors. Social environmental factors are the interpersonal or social influences on health outcomes,

including the influence of family, friends, healthcare providers, socio-economic status (SES) and level of education. Physical environment factors on the other hand, are those settings such as the home, neighbourhood and workplace (Yen and Syme 1999). This research will detail only social environmental factors taking socio economic status (parental level of income, working status and level of education) to represent an aspect of the environmental factors in the Wilson and Cleary (1995) model. The relationships between demographic and health or HRQOL have been long and extensively documented (Table 2.2).

In health, the interaction of individuals with their environment can affect human biological function. If a person is exposed to a life-long smoking habit this might alter the human gene-environment so developing chronic obstructive lung disease or lung cancer (Ferrans *et al* 2005). Caries susceptibility in younger individuals may be the result of environmental insults (e.g., diet or microbial), host factors such as salivary composition, or more surfaces 'at risk' (Bretz *et al* 2005). Surfaces 'at risk' may be under genetic influences (Ravassipour *et al* 2000; Kirkham *et al* 2000).

Socio economic status has the potential to influence individual oral health and OHRQOL. For example lower SES is associated with poor oral health among children (Jones and Worthington 1999; Reisine and Psoter 2001). Lawrence and colleagues (2008) suggest factors such as gender and SES are also the moderator in OHRQOL differences. They found diseases-oriented dental attendees and the groups with low financial resources were likely to experience more oral disadvantages compared to their counterparts. Consequently groups with better SES (i.e. income, education or occupation) status have better OHRQOL (Reisine and Bailit 1980; Atchison and Dolan 1990; Locker 1992; Chen and Hunter 1996; Locker 2009). Most recently, Bernabe and colleagues (2009) suggests childhood SES could also influence health-enhancing behaviours in adulthood.

The mechanisms of how SES plays a role, whether moderating or mediating oral health and OHRQOL are not clearly understood. Lawrence and colleagues (2008) suggest it is more than just material deprivation. They found access to care by itself was not a factor to improve oral health and OHRQOL (citing Tubert-Jeannine (2004) who found 63% of economically disadvantaged adults eligible for free treatment experienced poor oral

health). Sanders and Spencer (2005) suggested psychosocial factors are important in understanding pathways between socioeconomic position, oral health and OHRQOL. They suggest direct pathways of SES are the affordability and accessibility of health goods and health services. Indirect pathways relate to risks and protective behaviours and facilitating of psychosocial development (Sanders and Spencer 2005). According to Taylor and Seeman (1999) psychosocial resources; optimism, coping and personal control may mediate or moderate the impact of SES on health. So that positive social relationships may buffer individuals against the adverse effects of SES-related stress. In oral health, Bernabe and colleagues (2009) relates SOC to SES in relation to adults' oral health behaviour.

Socio economic status can also be a determining factor in satisfaction with life domains and satisfaction of needs (Gitmez and Morcol 1994). Furthermore, oral health and general health rating are also associated with SES. Lower SES individuals rated oral health and general health lower (Atchison and Gift 1997).

Table 2.2 Socio-demographic factors, OHRQOL and satisfaction in life

Authors	**Socio-demographics factors**	**Outcome**
Atchison and Dolan (1990)	Ethnicity, high education and high income	Related to variation in OHRQOL
Lawrence and colleagues (2008)	Low SES resources	Lower OHRQOL
Reisine and Bailit (1980); Locker (1992); Chen and Hunter (1996); Locker (2009)	High SES resources	Better OHRQOL
Gitmez and Morcol (1994)	Lower SES, ethnicity, level of education and income	Related to variation in satisfaction with life
Atchison and Gift (1997)	Ethnicity and Low SES	Related to variation in GHP and OHP

Many environmental factors are relatively unchangeable (such as gender and ethnicity). However, these factors are important because they are useful in targeting interventions for specific groups. 'Targeting' requires taking into account the subgroup characteristics in order to design group-level interventions (Kreuter and Skinner 2000). For example,

biological/physiological and demographic factors give direction to healthcare providers in targeting health promotion to decrease risk (Watt 2007). Furthermore, failure to account for the differences stemming from SES factors can provide misleading information at many levels of the health care system (Lubetkin *et al* 2005).

2.10.6.2 Definition of SES commonly accepted in study

This thesis regards SES as resources that can influence an individual's subjective oral health outcomes (SOHO). However, there is no conclusive agreement between researchers on how the term SES should be defined and used. Some draw a distinction based on access to various forms of capital such as financial capital, human capital and social capital (Lynch *et al* 2000; Liberatos *et al* 1988).

There are differences between countries in the use of SES proxies. For example, within the UK, social class indicators are used, however, in Canada SES is often categorised using area based methods (Locker 2000). It is, however, generally recognized that different indicators of SES (such as household income, education, occupational status or class and neighbourhood characteristics) tend to reflect underlying aspects of social position (Lynch and Kaplan 2006). The most widely used SES indicators are income, occupational status and education (Winkleby *et al* 1992; Adler and Ostrove 1999). According to Adler and Ostrove (1999) income, education and occupation status are the SES proxies that could reflect at the individual level and could also reflect at the societal level. For example, income at the individual level may be seen as an indicator of material resources, while occupation and education may reflect both economic status or prestige (Liberatos *et al* 1988).

Studies in Malaysia have used related dimensions (NOHSS 1997; NOHSA 2000; Kamaruddin 2001). For example, low SES (measured by literacy and occupation status) was associated with poorer health among the elderly whereas no differences were detected between the three major ethnic groups: Malay, Chinese and Indian (Wu and Rudkin 2000). With regard to oral health, there was a significant difference between parental education level and childhood caries prevalence and severity. Children from highly educated families had lower disease status compared to children of less educated families (NOHSS 1997).

So far there has been no study conducted to examine the relationship of SES with symptoms, functional limitation, general wellbeing and the overall QOL (SOHO) simultaneously involving individual factors, especially among children.

2.10.6.3 Individuals Factors

Ferrans and colleagues (2005) following Eyler and colleagues (2002) categorized individual factors as demographic, developmental, psychological and biological factors. However, this research will focus on psychological factors where individual factors may influence OHRQOL. Personality is a set of organized characteristics and dynamic possessed by a person that uniquely influences their way of thinking, emotion, motivation or behaviors according to their life experiences and exposures (Ryckman 2004). Thus, for ease of discussion, the term individual factors will be adopted in the whole thesis.

Individual factors are hypothesised to affect a person at every level being potentially relevant to biological and physiological factors, symptoms and functional status, the way they perceive their general health and overall QOL (Ferrans *et al* 2005).

Cumulatively, this suggests that individual factors have wide-ranging impacts on an individual's subjective experience of health. Many studies have demonstrated such associations. For example, Kempen and colleagues (1997) suggests mastery and self efficacy are implicated in HRQOL. Neuroticism is a predictor of lower HRQOL (Yamaoka *et al* 1998; Kressin *et al* 2000). Individual factors involving positive mood, sociability, conscientiousness, dependability and goal-directedness (Kempen *et al* 1997; Yamaoka *et al* 1998) are dynamic, modifiable, responsive to interventions (Cox 2003) and capable of influencing one another. Therefore, it is important to identify the relevant individual factors to able to assess their influence as core psychosocial resources that can contribute to well-being in individuals. However, individual factors alone might not provide a clear picture of how people see things in life. They may interact with numerous factors.

The following section will review briefly individual factors that have been implicated in oral health and OHRQOL. However, it will focus on three factors: self esteem (SE),

locus of control (LOC), sense of coherence (SOC) that may play important roles and for which robust measures exist. Developmental factors will be discussed elsewhere in the thesis. Oral health beliefs (OHB) may also be a potential psychosocial factor mediating symptoms, OHRQOL, GHP and overall QOL.

2.10.6.3(i) Developmental factors

Developmental status cannot be changed or altered by interventions. Nevertheless, interventions to improve care-management or modify behaviour require consideration of these factors. Therefore a clear description of the individual is needed when studying life condition and HRQOL (Koot 2001). As this thesis is about children's OHRQOL, details of developmental issues pertaining to OHRQOL are discussed elsewhere.

2.10.6.3(ii) Self Esteem

Self esteem is a widely concept in psychology, sociology, education and health. It is multidimensional and varies in definition largely depending on the researchers' field of interest. This phenomenon makes measuring self esteem difficult. For example, a researcher who wants to study self esteem must be able to differentiate whether they are measuring a situational (state) or trait self esteem.

Self esteem may also not be a discrete concept. It is strongly connected to sense of competence and worthiness (Reasoner 2000), self concept (Butler and Gasson 2005); self image (Hughes 1984) or may be interchangeable with self concept or self-acceptance (Meggert 2000).

Other definitions include James (1983) who defines self esteem as the ratio of one's successes to one's pretensions, that is; one needs to increase achievement or lower expectations to enhance the level of self esteem. Fowler and Fowler (1996, p.760) on the other hand defined self esteem as 'a favourable opinion of one's own character and abilities'. Rosenberg (1965) saw self esteem as an evaluative attitude towards the 'self' that is 'a positive or negative attitude' (Rosenberg 1965 p.30). This broad connotation tends to a proposition that self esteem favours a positive evaluation of oneself. For the ease of discussion we adopt this common usage of 'self esteem' in this thesis.

People with high self esteem are more successful in life (Rosenberg 1979) and more likely to cope better with negative experiences (Gillibrand and Mosley 1995). Thus, they will experience fewer psychological problems if exposed to adverse life events (Rutter 1985). Individuals with high self esteem have more confidence in themselves. They learn to accept their deficiencies and learn to accept the situations they encounter.

High self esteem is associated with having control over life experiences and protects a person against environmental stressors and social strains (Pearlin and Schooler 1978). Such people are capable of distinguishing their feelings well and are more responsive to situational changes. They are more persistent in facing failures and capable of forming adaptive strategies to choose alternatives solutions (Baumeister *et al* 2003). Thus, they are more competent to achieve success. On the other hand, individuals with lower self esteem more easily lose their confidence, self respect and acceptance of themselves (Rosenberg 1965). They feel more helpless, defensive, inadequate and show low tolerance of frustrations thus exhibiting their fear or anxiety (Coopersmith 1967).

Because of the various overlapping self esteem concepts, we need to clarify the definition used in this research. In addition, the assumption that a theoretical definition of self esteem carries the same meaning and may be used interchangeably across cultures may not be correct (Watkins and Dhawan 1989). For that reason, we will adopt the broad and frequently cited definition of self esteem from Rosenberg (1965). An advantage of this definition is that it relates to the self esteem scale constructed by Rosenberg (1965). This scale is widely used (Rosenberg *et al* 1995) and repeatedly tested in research (Wylie 1979; Rosenberg 1985).

The development of childhood self esteem

Self esteem develops early in childhood. This development is considered a precursor of self esteem in adolescence (Mruk 1999). During infancy, children are more passive but as they grow, they are exposed to socio-environmental factors and thus start to acquire and develop their own type of self esteem (Mruk 1999). They build their concept of worthiness, growing competence and developed sense of individuality. Past experience will influence how they perceive risk, evaluate chances, determines their level of

motivation and so on. These factors shape their level of self esteem and are probably felt most during adolescence (Baldwin and Hoffmann 2002).

Self esteem is a dynamic concept changed by experiences and new perceptions (Santrock 1986). Those changes are affected by many factors and different sources at different stages of development (Baldwin and Hoffmann 2002), such as the level of stress due to increasing of responsibility during adolescence. For example, Youngs and colleagues (1990) found that stressful events are a good predictor in decreased self esteem. Social support such as family relationships and parental nurturance also affect one's self esteem (Robert and Bengston 1996; Baldwin and Hoffmann 2002). A prospective study on transition of self esteem from youth to adulthood (Baldwin and Hoffman 2002) demonstrated that self esteem during adolescence was dynamic, influenced by shifts in life events and family cohesion.

Self esteem varies between individuals and across situations (Baldwin and Hoffman 2002; Delignieres *et al* 2004). However, there is a basic sense of worthiness and competence which helps the individual to face challenges of their living situation (Mruk 1995). Therefore, the fluctuations should not be regarded negatively as they are a powerful motivating factor and a good contingency investment (Crocker and Wolfe 2001).

Self esteem and oral health and oral health behaviour

The role of individual factors mediating oral health and oral health behaviours is not widely explored in dentistry. In a few studies however, self esteem is associated with positive oral health behaviours such as tooth brushing. This oral health behaviour is health-related to cleanliness and grooming rather than health-directed for prevention of dental diseases (Hodge *et al* 1982; MacGregor and Balding 1987). MacGregor and Balding (1991) correlate this behaviour with specific dimensions of personality and self esteem is the construct widely accepted.

Self esteem may be regarded as a common psychological factor influencing dental self-care (Kneckt *et al* 2001), motivating preventive and grooming behaviours (Regis *et al* 1994). High self esteem may generate feelings of worthiness and self-confidence, which

can promote good oral self-care (Kneckt *et al* 2000). On the other hand, success in self-care can also strengthen one's self esteem. Kenealy and colleagues (1991) proposed self esteem can be both 'cause' and 'effect'. Thus, strengthening patients' self esteem could help patients to maintain good oral health or oral health behaviour, for example, in daily self-care.

Kallestall and colleagues (2006) on the other hand, found a diminished association between self esteem and oral health behaviour in a four year follow-up study. They proposed individual factors like self esteem are context-dependent and unstable during adolescence. Oral health was associated with self esteem (explaining 8% of the variance) (Kenealy *et al* 2007). Albino and colleagues (1994) found treatment of orthodontic cases did not influence self esteem.

While not all research has found significant benefits of self esteem, high self esteem is much appreciated. Individuals with high self esteem are thought to have more cognitive ability to differentiate between relevant and irrelevant information (Lewin 1935). They can use information to perceive the consequences of certain actions related to their oral health. This can enhance positive health behaviour and help patients to maintain daily self-care.

The process of socialisation that develops self esteem may enable people to cope in various situations, for example, managing one's oral health problems. In this way, self esteem can be regarded as a mediator between social background and oral health and oral health behaviour. A person with high self esteem is considered to have a personal resource in the same way as social support and political involvement are seen as resources (Kallestal *et al* 2000) which empower them to prevent oral health problems (Schou *et al* 1990; MacGregor *et al* 1997).

Hence, self esteem can be use to enhance a 'personal dynamic of change', helping to foster good oral health decision making. For this reason, health education tools and interventions often focus on self esteem as a factor affecting personal risk-avoiding and preventive behaviours among children and adolescents (Cast and Burke 2002).

Self esteem and oral health related quality of life

Discomfort or functional limitations may lead to adverse perceptions of OHRQOL (Kressin *et al* 2001) by impairing physical functioning, social functioning and self esteem (Mumcu *et al* 2007). This is similar to Onyeaso's (2003) findings where students' perceived their teeth to be important for their appearance and self esteem. This suggests that aesthetics and appearance impact on an individual's self esteem and may improve their interactions with others (Inglehart and Bagramian 2002).

Albino and colleagues (1994) suggests that a person with an unaesthetic dentition attracts unfavourable social responses and consequently develops low self esteem. However, concern about appearance can motivate a person to seek treatment. For example, orthodontic treatment might enhance the social acceptance and self esteem of an individual (Shaw *et al* 1979). However, Kenealy and colleagues (2007) found self esteem unaffected by orthodontic treatment.

The relationship between physical appearance and perception of aesthetic deviation on self esteem and body image can be considered as an important issue to determine the benefits of the treatments (Gosney 1986). It is assumed a person with good appearance will have more self confidence and appreciate a high level of self esteem thus positively affecting their level of OHRQOL. Thus, it is useful to suggest on focus of potential links between OHRQOL and individual factors such as self esteem. Kenealy and colleagues (2007) found adulthood self esteem was associated with QOL perception. Similar pattern also observed with children OHRQOL (Locker 2007; Agou *et al* 2008).

However, previous studies have tended to be cross-sectional, which may not be appropriate since oral conditions are chronic and the impact of conditions may not be apparent for long periods of time. Therefore, a longitudinal design is warranted.

2.10.6.4(iii) Locus of control

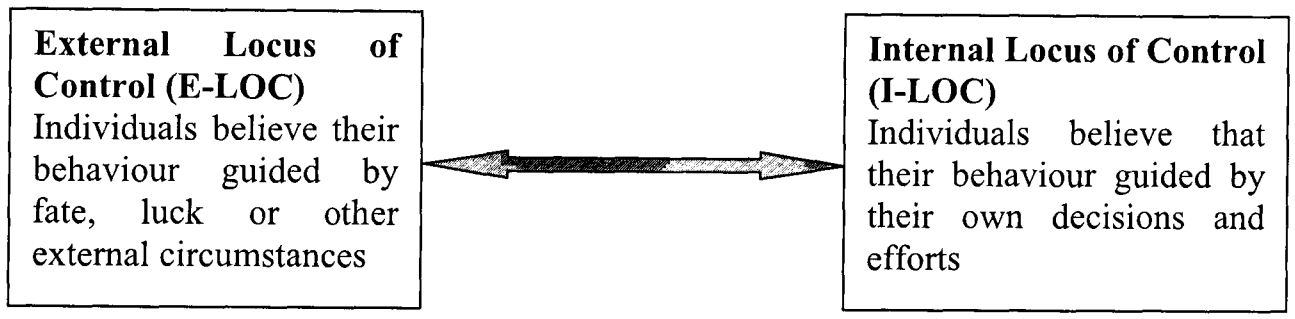
The concept of Locus of Control (LOC) is well established in medicine but little used in dental research. Understanding of the role of LOC has the potential to assist patients, dental and medical professionals to adopt greater control of their health. Few studies (Medline via Ovidsp) of the correlations between LOC and oral health status have been

reported. None have considered the role of LOC in mediating or buffering the relationship between children's clinical status and their OHRQOL.

The Concept of Locus of Control

Locus of Control refers to an individual's perception of the causes of events in life and specifically the extent to which they believe that they have the ability to control their life. The concept, pioneered by Rotter (1966) ascribes an important aspect of personality as the interaction of the personal and the environment. He conceptualized LOC as a unidimensional bipolar construct from external LOC (E-LOC) to internal LOC (I-LOC) (Figure 3).

Figure 2.3 The concept of locus of control (Rotter 1966)



Rotter (1966) conceives people as optimistic, adapting reinforcement mechanisms to react to their life experiences drawn forward by their ambitions. Thus he perceives the character as always changeable.

'Internal control' is the belief that control of future outcomes uphold primarily within oneself, while external control refers to the expectancy that control is outside of oneself. People with high I-LOC believe they control their own life. They believe events are from their own behaviour or that actions are within their own control and by their own skills and effort (Rotter 1966). I-LOC can also be referred to as "self-agency", "personal control" or "self-determination". I-LOC, described as "the self agent" 'can consciously or unconsciously direct, select and regulate the use of all knowledge structures and intellectual processes in support of personal goals, intention and choices' (McCombs 1991). Applying this understanding, it seems logical that those who feel they have

control over their own life might adopt prevention strategies in order to improve the state of their life.

Rotter (1966) found strong evidence that individuals with high I-LOC are more likely to be aware of environmental factors that may influence future behaviour and thereby take steps to improve their environmental conditions. They also emphasize the value of skills or achievement enhancement and will be resistant to conformity and other attempts to influence their behaviour. In simplistic terms, greater I-LOC is generally desirable. People are more adaptive and more enthusiastic to challenges and may succeed in their future endeavours (Rotter 1966).

In contrast, Rotter (1966) believes people who have high E-LOC, tend to attribute their experiences to fate, chance, or luck. They believe physical, socio-environmental factors or spirits such as an almighty god control their life. They are reluctant to exhibit responses to circumstances occurring in their life. This will make individuals less likely to reach their full potential due to a lack of motivational, emotional and cognitive capability. They are more likely to suffer from depressive situations because they believe their actions cannot improve their current position. Therefore, people with an external LOC may be more likely to experience a high level of stress than those with a more internal LOC (Li and Lopez 2004).

Whilst LOC has been found to be a relatively stable personality disposition, some research has found that it may be influenced by experiences and circumstances (Ho Cheung *et al* 2009). For instance, a study conducted by Hattie and colleagues (1997) found that interventions could effectively promote the use of an internal LOC. Thus, understanding locus of control is essential to aid in designing appropriate interventions to promote self control in facing their life endeavours.

Health locus of control

Rotter's Locus of Control theory has been applied to the health domain. Locus of control and health locus of control (HLOC) are similar concepts except HLOC has been specified in relation to how people view their health, as a disposition to act in a certain manner in health-related situations (Wallston 1992). The concept was introduced in the

1970s by Wallston and colleagues who examined the degree to which individuals believe that their health was controlled by internal or external factors. The notion of external HLOC is that one's health is under the influence of others, for example, medical professionals, health care policies and facilities, fate, luck or chance. On the other hand, internal HLOC beliefs regard 'one's health as subject to one's own actions,' people accept they are responsible for their own health (Wallston 1992).

Internal LOC has been associated with knowledge about health and disease (Seeman and Evans 1962; Wallston *et al* 1976). For example, Seeman and Evans (1962) suggest of that patients who suffered with tuberculosis and with a greater sense of I-LOC sought more information about the disease compared to those with an E-LOC. Patients with greater I-LOC are also more likely to comply with medical regimens (Lewis 1978) and to take actions to prevent health problems (Carlisle-Frank 1991). They will be more cooperative and will not be severely affected by health consequences. Patients with acute myocardial infarction with I-LOC adapted well in life despite their illness, conversely patients with E-LOC suffered depression and had poor prognosis (Cromwell *et al* 1977). High LOC is also associated with health behaviours such as physical exercise (Sonstroem and Walker 1973; Carlisle-Frank, 1991) and the capabilities to quit bad health behaviours (e.g.; areca/betel quid chewing) (Lai *et al* 2006).

High internal LOC also seems to moderate stressor-symptoms when people are exposed to adverse events (Kliever and Sandler 1992). People may use this psychological resource to adapt to certain conditions and may use other factors such as coping simultaneously (LefCourt 1982; Harkapaa *et al* 1991). These findings explain that I-LOC individuals are more self motivated, put more effort toward reaching goals and maintain greater control over their lives.

Development of health locus of control

HLOC is a learnt process primarily formed in childhood and remains relatively stable throughout the life span. Seligman (1975) noticed that individuals conditioned to life without control developed E-HLOC and gave up trying if subjected to situations out of their control. Such individuals were maladaptive to any situation changes. These concepts are thought to have effects on health beliefs and health related behaviour.

Health locus of control and oral health and oral health behaviours

A few studies have considered LOC in relation to oral health and oral health behaviours. Locus of control has been associated with regular dental checkups (Williams 1972), oral health conditions (Wolfe *et al* 1991; Borkowska *et al* 1998), tooth brushing behaviours (Regis *et al* 1994; Macgregor *et al* 1997) and a plaque control programme (Galgut *et al* 1987). However, West and colleagues (1993) failed to find any correlation between LOC and dental appointments. Similarly, Syrjala and colleagues (2004) findings suggested that LOC is not the best predictor of oral health behaviour but suggested self efficacy as an alternative. Odman and colleagues (1984) were also unable to detect any relation between LOC and oral hygiene skills in their study. Wolfe and colleagues (1991) on the other hand found a shift from external to internal locus of control beliefs as a consequence of oral hygiene intervention, whereas Scruggs and colleagues (1989) did not find a significant effect.

While not all attempts to correlate the two have been successful and most of the studies produced mixed results, LOC is widely accepted as a potential psychological resource to associate with a variety of health behaviours and health outcomes (Moorman and Matulich 1993) and presumably oral health and oral health behaviours.

Further understanding of LOC in relation to OHRQOL could help to explain the impact of oral conditions on everyday life. However, there is a limited body of literature focused on HRQOL especially among adolescents. No studies of the association between LOC and OHRQOL among adolescents could be found. However, it might be expected that personality variables such as LOC are critical to healthy development especially the association between internality and the likelihood of making healthy choices among young adolescents. There is therefore, a need for the greater understanding of LOC, oral health behaviours and oral health generally.

2.10.6.4(iv) Sense of Coherence

Sense of coherence was first described by Antonovsky (1979) as the central concept of a 'Salutogenic Model'. 'Salutogenesis' reflects an emphasis on seeking health rather than illness (pathogenesis). The fundamental elements in the salutogenic theory are (1) the

individual orientation towards problem solving and (2) the capacity to use available resources. The ability to comprehend both situations is called sense of coherence (SOC). Therefore, SOC is:

'a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable (comprehensibility); (2) the resources are available to one to meet the demands posed by these stimuli (manageability) ; and (3) these demands are challenges, worthy of investment and engagement (meaningfulness) (Antonovsky 1987: p.19)'.

Sense of Coherence consists of three components: 'comprehensibility', 'manageability' and 'meaningfulness' (Antonovsky 1987). Comprehensibility refers to a cognitive component of how a person understands the life challenges to which they are exposed. Manageability is a behavioural component that refers to person's ability to utilize the resources they have to cope with any influences they confront. Meaningfulness refers to a motivational concept which relates to a person's judgment to cope with life situations or challenges.

The fundamental core of Antonovsky's theory is one's responses to stimuli and use of resources within them to confront stressors. The resources are: Generalized resistance resources (GRRs) such as biological, material and psychosocial factors. Typical GRRs are money, knowledge, experience, self esteem and healthy behaviour. With available resources at their disposal together with high SOC, people will be more motivated, understand what is needed and be capable of mobilizing cognitive, behavioural and motivational factors to cope with life and perceive their lives as consistent, structured and understandable. Therefore, SOC is not a personality trait but instead a global, orientation (Lindstrom and Eriksson 2006).

This concept is applicable to health. Antonovsky (1979) conceptualized health within a stress-resource orientated concept, focused on the availability of resources, to maintain and improve one's movement towards health and to generate health promoting

behaviour. Strong SOC is much appreciated and associated with good health (Lindstrom and Eriksson 2006).

Development of sense of coherence over the life span

Antonovsky (1987) theorised that individual SOC fluctuates and gradually stabilizes during early adulthood. Thereafter it should be fully developed and should be strongly resistant to change. If any changes occur after this time they are only fluctuations around a mean age level.

Antonovsky (1987) believed that exposure to the broader social environment starts early in childhood, via interaction between children, other relationships and most importantly the family. At adolescence any basis laid in childhood for a strong SOC will be disturbed due to unprecedented freedom in life-choices and a growing ability to consider the effects of present decisions on the rest of one's life (Marcia 1980). Further exposure to environmental sources of information such as interaction with other people and institutions e.g.; schools, work place and community or society at large will mould or shape an individual's stronger or weaker SOC. However, by the age of about 30, an individual will reach their full potential of SOC and consider stable and resist to any drastic changes (Antonovsky 1987).

However, the stability of SOC is not well supported. Empirical work by Lundberg (1997) did not find found strong relationships between SOC in childhood and adulthood conditions. For example, childhood conditions (indicated as father's social class) or economic hardship did not predict their low SOC as an adult. Children who were exposed to family conflicts during childhood have only minimal tendency to have low SOC later in life. Therefore, like many other psychological characteristics, the development of SOC is complex and multi factorial. Other social or environmental factors should be considered.

The stability of SOC is still in debate. Neither, Antonovsky and colleagues (1990) nor Sagy and colleagues (1990) have empirically studied the individual SOC *per se*. Most studies have been cross sectional, demonstrating age-specific SOC. Geyer (1997)

proposed further investigations to confirm this concept of age stability in Antonovsky's theory.

A few studies have considered this issue longitudinally, but the findings are inconsistent. SOC has appeared to be moderately stable over time in adults (Suominen *et al* 1999; Schnyder *et al* 2000; Feldt *et al* 2003). Lundberg and Peck (1994) and Larsson and Kallenberg (1996) found SOC varied with age. Eriksonn and Lindstrom (2006) who extensively reviewed SOC research between 1992-2003 to prove the validity of Antonovsky's SOC scale provided evidence that none of the findings support age stability. Therefore, the stability of SOC in adulthood is still open to debate, due to the lack of empirical evidence (Geyer 1997). There are no studies of stability or change of SOC in childhood.

Despite mixed analyses of the SOC theory, it is still viewed as an important psychosocial resource in life situations. Geyer (1997) propose that SOC could explain the strength of adaptability in major life orientation in a person to focus in problem solving in the case of major life changes. Individuals will use all the resources available as protective or coping mechanisms to facilitate adjustment to the tension or stressors associated with a variety of life situations they have to adhere.

Sense of coherence influences oral health and oral health behaviour

Only a few studies have considered SOC, oral health and oral health-related behaviours. Freire and colleagues (2002) investigated how parental SOC influences children's oral health behaviour. Their findings revealed children whose parents had low SOC were less likely to visit a dentist and experienced more anterior caries. Consistent with this, the children whose parents had strong SOC experienced less dental caries, less gingival bleeding and favoured routine dental check-ups. They concluded that mothers with higher SOC were likely to have more positive attitudes and behaviours towards their children's oral health. Of course other factors such as parent's behaviours and knowledge can influence children's oral health behaviours as well (Chen 1986; Attwood *et al* 1993) but the extent to which the relationships merely mediate the SOC is not known.

Friere and colleagues (2001) study was cross-sectional and could not show causative relationships. Moreover, the study considered the effect of SOC on disease status rather than OHRQOL. So far, no longitudinal study has investigated how SOC mediates oral health behaviour among children.

Savolainen and colleagues (2005a) findings suggest strong SOC is associated with good subjective oral and general health behaviour. She found oral health behaviour (dental attendance, tooth-brushing frequency and level of oral hygiene) positively associated with SOC. This supports the idea that SOC is a health-promoting determinant (Savolainen *et al* 2005a; Savolainen *et al* 2005b; Savolainen *et al* 2005c). SOC can be a personal psychosocial resource to promote and motivate individuals to adopt a healthy lifestyle and to cope with the impact of life/health conditions and develop preventive strategies.

Sense of Coherence and OHRQOL

The use of SOC in dental research is at a preliminary stage. Early research sees SOC as a psychosocial resource that interacts with factors such as socio-economic and demographic factors to promote the ability to stay healthy.

Savolainen and colleagues (2005a) found an association between the SOC and the OHRQOL (as measured by OHIP-14) particularly in relation to the psychological discomfort, psychological disability and handicap. A strong SOC was associated with good subjective oral health and general health. They suggested that SOC is a factor that has a broad impact on an individual's subjective assessment of health and could be a determinant of oral health.

The single cross sectional study conducted by Savolainen and colleagues (2005a) suggested SOC as a health-promoting determinant of good oral health and good OHRQOL. However, a cross-sectional study of health outcomes needs to be interpreted with caution. It is difficult to determine cause and effect. Thus, to provide a well-augmented significance of SOC in relation to OHRQOL further research via longitudinal design is appropriate.

The role of SOC among children and OHRQOL is largely unexplored. No study identified so far has considered SOC as a mediating factor in children's perception of signs and symptoms, function and general health perception and overall QOL.

2.10.6.4(iv) Oral health beliefs

Beliefs can be defined as a powerful personal resource influencing a person's life at any period of time, to enable them to produce results by their actions and to negotiate their lives through various life cycles (Bandura 2006). As a psychological state, beliefs not only affect how people behave, but what they perceive or place confidence in. Furthermore, if they believe, they also will perceive information to support that belief. Thus, beliefs alter expectations (Dweck 2008). According to Rosenstock's (1966) theory, oral health beliefs are related to oral health behaviours. However, understanding of the relationship is complex.

Many previous studies have applied the oral health beliefs (OHB) construct to explain oral preventive health behaviours, oral health status or predict oral health outcomes. For example, changes in OHB resulted in changes of oral health behaviour (Broadbent *et al* 2006) predicted a person's self-care and utilization patterns (Chen and Tatsuoka 1984) and were associated with other predisposing factors such as socio-demographic variables to influence oral health behaviours and outcomes (Andersen and Davidson 1997; Nakazono *et al* 1997). Oral health beliefs are also associated with perceived control of oral health. Increased E-LOC was associated with higher plaque scores Wolfe *et al* 1991). Thus, beliefs operate through their impact on cognitive, motivational, affective and decisional processes (Bandura 2006) contributing to good health.

Even though many previous studies have applied belief constructs to explain oral preventive health behaviours, oral health status or predict oral health outcomes, none so far have examined OHB in relation to OHRQOL. The present research will determine whether OHB is a mechanism through which clinical variables may impact on a person's symptom status, OHRQOL, health perceptions and overall well-being.

2.11 Applicability of the Wilson and Cleary model (1995) in the current research

The Wilson and Cleary (1995) model offers a comprehensive approach to guide this research. Its maps the relationships between impairment and patient outcome measures linking the characteristics of the individual and of the environment which may influence their OHRQOL and wellbeing. These discrete parameters also help in choosing specific tools to assess them. The model has proven its applicability in adults (Baker *et al* 2007; Baker *et al* 2008). Further understanding on its applicability among children is needed for a better understanding of children's OHRQOL.

However, any research involving children will not be easy. They are at a transitional phase of the life course which involves many changes due to the development of psychological processes, such as growth, pubertal development, socialization and intellectual maturation as well exposure to new challenges and experiences. These attributes may have impacts on socio-biological factors, their personality, level of functioning and well-being (Eccles *et al* 1993; Bandura 2006). Therefore children's OHRQOL will never be fully understood by *ad hoc* studies of one or two variables but should involve, simultaneously, various factors which are considered important. In this case, biological factors, OHRQOL and the effects of their personality and socio-economic status on their wellbeing. Given the comprehensiveness of the Wilson and Cleary (1995) model in recognizing these factors, the model is a valuable guide to the research.

2.12 Child oral health related quality of life (COHRQOL)

Most oral conditions are not life threatening but are capable of affecting children's health, general well-being and quality of life. Oral disease can give rise to symptoms of pain, discomfort and disruption of sleep and can reduce abilities in chewing and eating. Further consequences include acute or chronic infections whose severity may cause disfigurement, a higher risk of hospitalization, higher treatment costs and loss of school days with impacts on ability to learn. Absence from school because of toothache is a ready indicator of children's health. In the USA, dental visits or dental problems accounted for 117 000 hours of school lost per 100 000 children (Gift *et al* 1992). David and colleagues (2006) also reports similar findings whereby nearly one-fourth (23%) of

838 12-year-old schoolchildren in Southern India with oral problems reported that their conditions affected their school performance. However, subjective experiences provide different information.

Several studies have documented impacts on OHRQOL associated with oral conditions. For example, children with caries and malocclusion were likely to experience lower OHRQOL (Klages *et al* 2004; Do and Spencer 2007). de Oliveira and Sheiham (2004) detected significant differences of QOL associated with the receipt of orthodontics. Treated cases were found 1.85 times (95% CI 1.30 to 2.62) less likely to have an oral health impact on their daily life activities than those who were currently undergoing treatment and 1.43 times (95% CI 1.01 to 2.02) than those who never had treatment.

On the other hand, some studies have identified children with good oral conditions who experience poor OHRQOL. For example, children of whom 43.1% were caries free complained of high oral impacts (89.8%) on their daily life (Gherunpong *et al* 2004). Similarly, 73% of New Zealand children with good clinical status complained of at least one dental symptom in the past year (Chen and Hunter 1996). Children from Malaysia also had similar experiences, whereby 60.1% of those who reported an oral impact had good oral health status (Jaafar 1999).

The magnitudes of these findings suggest that not all patients with oral health problems report a low level of OHRQOL and vice versa. They vary on how they perceive their own health. Locker (2007) suggests the variation of OHRQOL can be explained by the differences in a person's personal resources mainly psychological and psychosocial factors. Further study is much needed to identify how these factors moderate or mediate the dynamic of children's OHRQOL. More importantly, to quantify children's oral health impacts on their QOL, it is best to ask the children themselves and use measures that are child-focused.

2.12.1 Different approaches to the measurement Children's OHRQOL

There are three approaches to measure children's OHRQOL. The first is to adapt adult instruments. Given that children and adults have different life experiences and priorities and so do not necessarily share the same meaning of health and illness, this approach is

likely to be of limited value. The second approach seeks opinions of 'experts' to select items that are considered important to children. The information will not reflect children's values so much as the interest of the experts. The third approach actively involves children in creating the measures, sometimes with the involvement of parents and healthcare professionals. The information from this approach will reflect the children's values guided and interpret by the experts. Few researchers have taken this latter approach in using a child specific measure (Eiser and Morse 2001), one of them is CPQ *11-14* by Jokovic and colleagues (2002).

2.12.2 Introduction to children and their cognitive ability of health

One fifth of the world's population is adolescent (aged 10-19) (WHO 2003). Adolescents are one of the most important target groups of any healthcare system. They suffer numerous oral disorders that can affect QOL (Surgeon General Report 2000).

In order to capture children's perspectives of health and QOL, it is important to understand children's development. For most people, there are four or five such stages on the road to adulthood: infancy (birth to age two), early childhood (ages 3 to 8 years-old), later childhood (ages 9 to 12 years-old) and adolescence (ages 13 to 18 years-old). Persons 18 and over are considered adults in society (Piaget 1929).

From early childhood (age 7–11 years-old) children are able to relate to logical thinking, perform multiple classification tasks, order objects in a logical sequence and comprehend the principle of conservation. Their thought becomes less transductive and less egocentric. Henceforth, the child is capable of concrete problem-solving (Piaget 1929).

In relation to health, at the age of six, children start to compare their appearance, build their own personality and are able to form their own ideas. At approximately eight years they develop their own of health concept and health practices (Normandeau *et al* 1988; Hetherington *et al* 1999). They understand health as a set of somatic and emotional symptoms. Importantly, they begin to understand that ill health has psychosocial impacts (Bee 1998). Gradually, children develop the ability to use a wider spectrum of internal cues to identify their illness. Their ability in memory recollection starts to lengthen and understanding of the frequency of events begin to emerge (Rebok *et al*

2001). Thus children of this age can start to make their own judgment of themselves and their lives.

Later, at the age of 11 or 12, their self-concept acquires dimensions such as displaying passion, forming imagination and seeking popularity with peers. They are capable of viewing health as a multidimensional concept organized around the constructs such as being functional, adhering to a good life style and behaviour, a general sense of well being and relationship with others (Reebok *et al* 2001). These stages indicate the importance of assessing the relevance and comprehensiveness of the children's own domains of health and QOL. It follows that children can be a primary source of valid and reliable information.

2.12.3 Developmental and cognitive challenges in COHRQOL

There are many reasons why child specific measures are required. Adult measures may lack 'child-friendliness', especially those creating response burdens which are not practical for children (Eiser and Morse 2001). Lengthy questions (Long *et al* 1996) and broad response scales may confuse children's understanding. Furthermore, they may be too young to justify their choices (Apajasola *et al* 1996). Long reference periods may be unsuitable for children with limited recall periods. Children tend to remember recent events better than earlier ones (Juniper *et al* 1996). In addition, any changes to the structures of an adult scale will alter the psychometric properties of the measure. Therefore, a measure that is useful among adults might not be so in children (Eiser and Morse 2001). For these reasons, before the use of any measure the author needs to be certain of these aspects. The use of inappropriate measures will undermine the findings and inferences.

Children have a unique way of viewing life and health (Juniper *et al* 1996; Eiser and More 2001). They may not share the same meaning, experiences or expectations. For that reason, children need to be approached differently at different ages, including in the same child over time (Wallander *et al* 2001). Children and adolescents continuously and rapidly develop through multiple changes in physical, cognitive, emotional and social domains. This 'fluidity' occurs as the child, family, culture and circumstances change (Kuyken *et al* 1994). The child has been described as a 'moving target' because of the

rapid changes within psychological domains (Lollar *et al* 2000) and children's dental and facial feature.

These developmental issues, together with a lack of social experiences and continued dependency, explain why children have different priorities and interpret events differently than adults (Eiser *et al* 2000). However, recognizing changes of children's perception across settings and time, within various domains, it is possible to understand why there are interpersonal variations in HRQOL (Hanson 2001).

Nonetheless, the related issues of developmental difference, cognitive ability and concerns about consistency of evaluation continue to limit our ability to measure HRQOL across and between age-groups in children. Furthermore, cognitive and developmental issues reflect an individual's capacity to learn, adapt to and exploit the opportunities available within one's environment. They also exhibit a high level continuity in children to adulthood (Najman *et al* 2004). Thus, not only do limited cognitive and linguistic skills affect children's ability to complete questionnaires, but they may also be related to their health perceptions (Eiser and Morse 2001). Therefore, concerns about whether children are able to reads or even if they can read, are able to understand the questions, relate their experiences on the multiple choices of closed questions or be adept in using them understanding the end-points of the measures (Jokovic *et al* 2002) need to be acknowledged before beginning a study.

Of equal concern are the domains and items used. Domains are items that aggregate to reflect dimensions of HRQOL. However, it is wrong to assume items and domains are universal across the life-span (Eiser and Morse 2001). Children may appreciate different things than adults. Thus, HRQOL measures need to recognize the developmental differences when developing items and domains (Rosenberg *et al* 1990).

In support of these theories, data show that children conceive health differently as they mature. They begin to describe their illness more specifically rather than using a global, non-specific understanding (Natapoff 1978). Older children also are more aware of psychological, emotional and social implications of illness (Bibace and Walsh 1980; Perrin and Gerrity 1981). Therefore, cognitive maturity is important, as greater age

brings more sophisticated understanding of health and illness concepts (Berry *et al* 1993).

2.12.4 Children's information as valid in its own right

Despite the interest in children's subjective experience of health, they are often regarded as unreliable respondents. Most researchers analyze their health by proxies, using either parental or physician views. Even though the parent's information is reliable we should not assume those information can be substituted for the children's own view (Eiser and Morse 2001). Children and parents do not necessarily share similar views about health. Adult's perceptions of the child's experiences will focus more on external factors than the internalised problems of a child (Landgraf and Abelts 1998). Likewise, physicians' appreciations of children's health are distorted by the patients' expression of anxiety, depression and distress. Equally, doctors have limited sensitivity to the psychological burden of childhood illness and its treatment (Sprangers and Aaronson 1992). Therefore, there are now calls to involve children more directly in decisions about their own care and treatment.

The use of COHRQOL puts children at the centre of inquiry and gives due weight to their opinion. It is more child-focused and may improve communication between patients, parents and the dental team (Weintraub 1998). It can provide greater understanding of the consequences and salience of oral health states in children's lives and the lives of their families (Holt 2001). Furthermore, information derived will be clear and it is at the child's existing level of understanding. This form of communication is in line with the current notion that children have the right to be informed about their condition and treatment and must be allowed to actively participate in decisions pertaining to their care. From this view, it is the moral and ethical responsibility of a practitioner to take a child's views into account (Rushforth 1999).

Descriptive information regarding the health status of the children can facilitate the identification of children with different levels of diseases (Eiser 1995). Moreover, the data provide a measure of outcomes for clinicians to assess the quality of care. Especially in planning oral health policy and care for children, the assessment of QOL can assist in needs assessment, prioritization of care and evaluating outcomes from

treatments strategies and initiatives (Sheiham *et al* 1982). Hence, informed judgments can be made whether or not treatment is appropriate and which choices might be the best for the child (Eiser and Morse 2001) and tap greater opportunity to improve care that is more patient-centred.

2.12.5 Required properties of COHRQOL/CHRQOL measures

Child health related quality of life instruments must have applicable scales that facilitate health planning policy, assessing risk, tracking health status and measuring treatment outcomes in paediatric populations (Eiser and Morse 2001). They must reflect children's preferences for health states and must have the usual psychometric properties including reliability and validity.

Validity is concerned with whether a scale measures what it is supposed to measure. Criterion validity is assessed against a standard criterion if one exists, but there is rarely a gold standard of COHRQOL to compare with. Content validity refers to the extent to which a measure represents all aspects of the attribute to be measured. Face validity is a more superficial assessment of whether a measure appears to be correct. Construct validity refers to whether a measure is related to other variables within a construct (Bowling 2005a). With the absence of a gold standard in HRQOL or OHRQOL construct validity it is a standard requirement of validity assessment (Eiser and Morse 2001).

Reliability is the consistency or repeatability of the measurement or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects (Bowling 2005a). There are three forms of reliability; 1) test-retest 2) internal consistency and 3) inter-rater reliability. Test-retest assesses the ability to obtain the same result on repeated application of the measure and is quantified using the correlation between the two scores if there is no change in the underlying condition (Eiser and Morse 2001). Internal consistency refers to the extent to which the domains or sub-scales assess the same domains. Inter-rater reliability concerns whether an instrument administered by different interviewers achieves the same scores (Eiser and Morse 2001).

2.12.6 Existing measures of child oral health quality of life

Two types of HRQOL and OHRQOL measures exist; generic and disease-specific. Disease-specific measures include domains designed to be valid for a specified condition (Guyatt *et al* 1989). They focus on areas of particular concern and are more sensitive to disease impacts as well as being clinically useful in responding to improvements in interventions (Eiser and Morse 2001). Generic measures are broadly applicable across conditions regardless of severity or treatment (Patrick and Deyo 1989). They permit comparison across interventions and diagnostic conditions and are therefore useful for making decisions on resource allocation (Eiser and Morse 2001). Generic measures are also applicable for comparing across disease states and for individuals experiencing several diseases (O'Connor 1993).

To date, two generic instruments have been developed to measure OHRQOL in children; Child-Oral Health Quality of life (COHRQOL) (Jokovic *et al* 2002) and Child-Oral Impact on Daily Performances (COIDP) (Gherunpong *et al* 2004). Both were developed from a defined conceptual model of HRQOL and subjected to psychometric evaluation (Jokovic *et al* 2002; Gherunpong *et al* 2004). Even though these measures have similar concepts, they differ in length, the health domains they address and complexity of the scoring mechanisms (Locker *et al* 2004). Table 2.3 summarises the appraisals of these measures.

2.12.6.1 Child oral health quality of life measure (CPQ*11-14*)

Child oral health quality of life (COHRQOL) was developed to assess the impact of oral health from the child's perspective. The objective of COHRQOL is to measure the impact of dental, oral or oro-facial diseases and disorders on the QOL of 6 to 14 years-old children (Jokovic *et al* 2002). It conforms to the WHO definition of health and is based on a conceptual framework developed from a review of child QOL measures (Guyatt *et al* 1986; Juniper 1996). It measures the impact of oral and oro-facial conditions on the four health domains; oral symptoms; functional limitations; emotional well-being; and social well-being of children aged between 6 to 14 years (Jokovic *et al* 2002).

COHRQOL consists of a Parental-Caregiver Perceptions Questionnaire (P-CPQ) and Child Perceptions Questionnaires (CPQ) for children aged 6 to 7 (CPQ_{6-7}), 8 to 10 (CPQ_{8-10}) and 11 to 14 years (CPQ_{11-14}). The measures were developed according to homogeneity in the roles and cognitive abilities of children at these ages. The recall period also differs according to age-group, for CPQ_{11-14} the recall period is three months whereas CPQ_{8-10} uses four weeks. This thesis will focus on CPQ_{11-14}.

CPQ_{11-14} involved two stages of development, a preliminary stage identified 46 items from a review of existing oral health and child health status measures. The comprehensiveness, relevance and clarity of these items were checked by a committee (expert panel and 33 parents of children having oral and oro-facial conditions). Further modifications and revisions, were made by 11 child patients. Finally, items which were important to the target population were selected (Jokovic *et al* 2002).

CPQ_{11-14} consists of 37 items within 4 health domains: oral symptoms (6 items), functional limitations (9 items), emotional well-being (8 items) and social well-being (12 items) (Peer interaction, schooling and leisure activities). The response options consist of a 5-point Likert scale ranging in frequency from "Never" scored = 0; "Once/twice" scored = 1; "Sometimes" scored = 2; "Often" scored = 3; and "Every day/almost every day" scored = 4. A single question about oral health impacts on current health was also included, worded "Would you say that the health of your teeth, lips, jaws and mouth is . . .", and a rating to which oral and oro-facial conditions affect overall well-being worded "How much does the condition of your teeth, lips, jaws and mouth affect your life overall?" These use a five response scale ranging from "Excellent" (scored = 0) to "Poor" (scored = 4) for oral health and from "Not at all" (scored = 0) to "Very much" (scored = 4) for well-being.

In the original evaluation of CPQ_{11-14}, validity and internal consistency were tested among 123 children (Jokovic *et al* 2002). Cronbach's alpha for the sample as a whole was 0.91 with an Intra-class Correlation Coefficient (ICC) (95% CI) at 0.90 (0.84-0.94). The domains coefficients showed substantial agreement, ranged from 0.64 for oral symptoms to 0.86 for emotional well-being, indicating acceptable to good internal consistency (Streiner and Norman 1994). The test-retest reliability of CPQ_{11-14} showed almost perfect agreement with ICC of 0.90 for the total score. There were significant

associations between the CPQ*11-14* scores and global ratings of oral health and overall well-being, demonstrating good construct validity.

The authors concluded that the CPQ*11-14* was valid and had excellent reliability both in clinical and population samples. Children were reliable informants capable of giving valid information about their health. The measure took into account not only the consequences of diseases but also the children's personal and characteristics aligned to the concepts of Wilson and Cleary (1995). However, for future applicability of the measure, the authors suggested longitudinal studies to confirm its evaluative properties in health outcomes.

2.12.6.2 Child oral impact in daily performances (COIDP)

The Child-Oral Impact on Daily Performances (COIDP) is an adaptation of the original Oral Impact on Daily Performances (OIDP) (Gherunpong *et al* 2004). OIDP was based on an interpretation of WHO (1980) International Classification of Impairments, Disabilities and Handicaps (ICIDH) and Locker's (1988) framework of health (Adulyanon and Sheiham 1997). COIDP intended to seek information of oral disorders that compromised a person's ability to perform physical, psychological and social behaviours. Initially developed in the Thai language, it was later translated to English and French. It is used as an interview guide.

The COIDP was a modification to suit a child's capability in relation to intellectual, cognitive, language and memory capabilities. The recall period was shortened to 3 months. The measure was simplified and aided by pictures to make interviews more enjoyable and less time consuming (Tubert-Jeanine *et al* 2005). The pictures were specifically age-appropriate and culturally acceptable with no deviation from the original meaning (Gherunpong *et al* 2004). The use of probes when questioning children used to promote better understanding and good responses (Eiser and Morse 2001).

Table 2.3 shows examples of studies which have used COIDP.

The COIDP encompasses physical domains, psychological and social impact on nine daily performances; eating; speaking; cleaning mouth; sleeping; emotion; smiling; study; and social contact. Children are expected to reflect their perception of oral health outcomes based on 18 sets of pictures, with response options on a 4-point Likert scale (scored 0-3). It is estimated to take10 minutes to complete it.

The development involved 513 schoolchildren aged 11-12 years in Thailand and 1,100 children in the re-evaluation process. They found no negative correlation between any items selected, the corrected item-total correlation coefficients were between 0.4 - 0.7, Standardised Cronbach's alpha coefficient was 0.82. There was a significant association with perceived oral treatment need and perceived oral health problems. The authors declared the measure as valid in terms of face, content and concurrent validity as well as internal and test-retest reliability (Gherunpong *et al* 2004).

The authors also concluded that COIDP is straight forward, simple and practical for use in OHRQOL assessment among children, easily applicable to dental service planning especially in dental needs. However, Marshman and Robinson (2007) suggested there was no indication given as to how the index is applicable to this function. Furthermore, the use of COIDP requires an interviewer which can be costly and time consuming.

Table 2.3 Measures of CPQ*11-14* and COIDP

Authors	Measures	Sample	Age (years)	Conclusion
Jokovic *et al* (2002)	Child Oral-health-related Quality of Life In Canada.	123	11-14	Excellent technical properties in terms of specificity, a valid and reliable tool
Marshman *et al* (2005)	Child Perceptions Questionnaire in UK	89	11-14	CPQ*11-14* is reliable and valid in relation to life overall but not clinical status
Robinson *et al* (2005)	Child Perceptions Questionnaire in Uganda	174	12	Confirmed CPQ*11-14* has acceptable validity and reliability
Foster-Page *et al* (2005)	Child Perceptions Questionnaire in New Zealand	435	12-13	The psychometric properties of the CPQ*11-14* were valid
Locker (2007)	Child Oral-health-related Quality of Life (SF) In Canada	370	11-14	The CPQ*11-14* was valid with Cronbach alpha=0.85. Differentiate OHRQOL/SES
Goursand *et al* (2008)	Child Perceptions Questionnaire in Brazil	160	11-14	CPQ11-14 satisfactory in psychometric properties
Agou *et al (2008)*	Child Perceptions Questionnaire in Canada	199	11-14	The CPQ*11-14* scores were related to self esteem and malocclusion
Barbosa *et al (*2009)	Child Perceptions Questionnaire in Brazil	210	8-14	The Brazilian CPQ*11-14* was reliable but discrimant validity was sporadic due to impacts mediated by personal, social and environmental factors
Gherunpong *et al* (2004)	Child-Oral Impact on Daily Performances in Thailand	1126	11–12	COIDP psychometric properties were excellent
Tubert-Jeannin *et al* (2005).	Child-Oral Impact on Daily Performances in France	414	10	Psychometric properties relevant as a tool to measure COHRQOL
Yusuf *et al* (2006)	Child-Oral Impact on Daily Performances in UK	232	10–11	The psychometric properties were reliable
Castro *et al* (2008)	Child-Oral Impact on Daily Performances in Brazil	342	11-14	Child-OIDP was a measure of OHRQOL applicable to Brazilian children
Bernabe *et al* (2007)	Child-Oral Impact on Daily Performances in malocclusion in Peru	530	11-16	Child-OIDP reliable to assess oral impacts in Peru (Spanish version)

CHAPTER THREE

RATIONALE FOR THE STUDY

Increasing attention is being given to the use of the OHRQOL measures to assess oral health and the benefits of dental programmes. There is now a strong call to include children in oral health research in order to yield generalisable knowledge about their oral health. In line with current concepts, research should work with children to get information directly from them.

It is recognized that clinical and non clinical variables may impact on children's OHRQOL. An understanding of these factors will aid evaluation of effective healthcare interventions. However, no study so far has conceptualized these intervening variables in each stage of Wilson and Cleary (1995) model of health nor attempted to explicitly test the relationships between them within a theoretical model.

Individual factors (self esteem, sense of coherence and locus of control) and environment issues such as their level of SES may be important factors that need to be considered in understanding children's oral health. No study so far has systematically considered these factors in relevance to OHRQOL, guided by a theoretical framework.

Therefore this research explores children's OHRQOL in relation to possible direct and moderating influences of characteristics and environment factors.

3.1 Aim of the study

To identify the determinants and consequences of oral health related quality of life in children.

3.2 Objectives of the study

3.2.1 To test the relationships between clinical variables, symptom status, functioning, general health perceptions and overall well-being as hypothesized within Wilson and Cleary's model of patient outcomes.

3.2.2 To examine whether socio-demographic and individual difference factors influence children's OHRQOL and the key relationships identified within Wilson and Cleary model.

3.2.3 To assess different configurations of SOC, COHRQOL and the model.

CHAPTER FOUR

METHODOLOGY – TRANSLATION

For reasons of practicality and relevance to my employment, data were collected in Banting, Selangor, Malaysia.

4.1 Translation

The questionnaires for this study were needed in the Malaysian language. Thus translations were required to ensure suitability and feasibility among children in Malaysia. This section will detail the reasons for translation and the procedures adopted.

4.2 Cross cultural aspects of HRQOL

Cultural and linguistic variations influence how people express health, illnesses, symptoms, the meaning of QOL and expectations of care as part of their cultural belief system (Hutchinson 1996; Guarnaccia 1996). Such beliefs unconsciously act on every aspect a person's day-to-day life especially on health practices and health perceptions (Hilton and Skrutkowski 2002). These cross-cultural beliefs will have significant impacts in HRQOL research requiring cross-cultural adaptation of instruments (Hutchinson 1996; Guarnaccia 1996). It is important to establish whether different nations or ethnic groups share the same HRQOL concepts or conceptualize similar sets of concepts about QOL (Schmidt and Bullinger 2003). For example, a 'healthy state' may have different meanings in a different culture.

4.3 Do we adopt the existing HRQOL or develop a new measure?

Two options are available: 1) to develop a new measure or 2) to use a measure previously developed in another language. The generation of a new measure is time-consuming as the bulk of the effort is devoted to the conceptualization of the measure and the selection and reduction of its items.

On the other hand, translation of existing HRQOL measures involves both linguistic translation and cultural adaptation. Linguistic translation involves several techniques to ensure equivalency of meaning across settings and cultures (Guillemin *et al* 1993; Edwards 1994). Cultural adaptation ensures appropriateness to the context and lifestyle of the target population (Guillemin *et al* 1993).

The adaptation of a pre-existing measure to a new cultural context has several advantages. It provides a common measure for investigation within different contexts including international studies and allows comparison between national/cultural groups. It is also less costly and time consuming. Nevertheless, cross cultural adaptation of HRQOL also requires careful attention, involving numerous people and considerable time (Guillemin *et al* 1993).

4.4 Equivalence in translation

There are two approaches to translation. In symmetrical translation, the translated version stays loyal to the meaning of the original document. It should be conceptually equivalent to the original and employs the same expressions used in the target population so that there is an equal sense of familiarity in the source and target documents and cultural relevance is maintained (MAPI 2004).

Asymmetric translation (literal translation) remains loyal to one language (usually the source). The items will be translated into another language on a one-to-one correspondence between words. Therefore, the translated version may sound different from the original document (Werner and Campbell 1970). Thus, concerns of "functional equivalence" of words and concepts between the two languages may arise (MAPI 2004).

It is important to decide the level of equivalence before embarking on translation (Edwards 1994). If and how cross-cultural equivalence can be reached has been intensely debated with no clear consensus on how different types of equivalence should be defined and tested (Herdman *et al* 1998).

In an extensive review of equivalence in HRQOL cross-cultural adaptation, Herdman and colleagues (1997) resolved the confusion by developing a model of six types of equivalence (Table 4.1).

4.5 Conceptual equivalence

Conceptual equivalence concerns the way people in different cultures conceptualize health and QOL, the domains that are important to the concept in each culture and the relationship between them (Herdman *et al* 1998). It is established when the translated versions express the same meaning in the cultures concerned. At this level one has to determine whether the same construct can be used or whether modification is required (Herdman *et al* 1998).

Table 4.1 Definition of equivalence (Herdman *et al* 1998)

Type of equivalence	**Definition**
Conceptual	Ways in which different populations conceptualize health and quality of life (QOL) and the values they place on different domains of health and QOL.
Item	Concerns the way in which domains are sampled. Item equivalence exists when items estimate the same parameters of the trait being measured and when they are relevant and acceptable in both cultures.
Semantic	Concerned with the transfer of meaning across languages.
Operational	Refers to the use of similar questionnaire formats, instructions, mode of administration and measurement method (response format).
Measurement	Ensuring that different language versions of the same instrument achieve acceptable levels of psychometric properties.
Functional	The extent to which an instrument does what it is supposed to do equally well in two or more cultures.

Cultural differences may influence responses. For example, the construct 'gum diseases' would lack conceptual equivalence between two cultures if one group associated it with poor oral hygiene while the other group thinks witches are the causative factor. Thus,

the translators must recognise the concepts of "Etic" and "Emic" of a culture to ensure that translated versions are suitable. "Etic" means aspects of content are relevant to all cultures and "emic" refers to the content that is culture-specific (Campbell and Fiske 1959).

Thus, the concepts and events experienced by people in the target culture need to be explored even if items have equivalent semantic meaning. Semantic equivalence may not equate to conceptual equivalence (Guillemin *et al* 1993). For example, the term 'sister' and 'brother' may mean more than a first-degree family-relation in some cultures, they may also refer to larger social networks.

4.6 Item equivalence

Item equivalence concerns whether items are comparable cross cultures. Their relevance and acceptability may vary across cultures. Therefore, item equivalence involves reformulating items rather than adapting them (Guyatt 1993). Item equivalence occurs when 'items estimate the same parameters on the latent trait being measured and are equally relevant and acceptable in both cultures' (Herdman *et al* 1998). In other words, each item in the two instruments means the same thing to the two groups. Each item should be 'culturally appropriate' and 'culturally sensitive' (Hunt 1986).

4.7 Semantic equivalence

Semantic equivalence refers to vocabulary, idioms, grammar and syntax (Sechrest *et al* 1972). Idioms and colloquialisms are rarely translatable, so equivalent expressions must be found or items substituted. For example, the sentence 'I am feeling on edge' translated to Arabic will mean 'I am afraid' (Hunt 1986).

Researchers must acknowledge the important aspects of meaning to ensure the level of language used is appropriate to the target population (Herdman *et al* 1998; Mimura and Griffiths 2004). In order to achieve sematic equivalence, the translation procedures must consider both linguistic and cultural equivalencies and any item deemed as inappropriate by more than 20% of respondents should be amended (Yu *et al* 2003).

Herdman and colleagues (1998) suggested the use of expert judgment via an expert in the target culture.

4.8 Operational equivalence

Operational equivalence ensures that measurement methods in each version correspond (Guillemin *et al* 1993), using similar questionnaire and response formats, instructions and modes of administration. Equivalence will be attained when these elements do not affect the results (Herdman *et al* 1998). For example, the ability to complete a questionnaire may differ across countries, thus limiting the use of self-complete forms.

4.9 Measurement equivalence

Measurement equivalence examines whether a method yields interpretable results. It aims to ensure that different versions of the same instrument have acceptable psychometric properties especially; reliability, responsiveness and construct validity as well as discriminant, evaluative and predictive properties (Herdman *et al* 1998). Thus, the psychometric properties are tested to ensure the intended instrument conveys the intended ideas and retains what it was initially designed to measure (Fifer 1992).

4.10 Functional equivalence

Functional equivalence concerns whether an instrument does what it is supposed to do equally well in two or more cultures. If an instrument is to measure QOL, researchers must consider the way QOL is conceptualized in that particular culture (Herdman *et al* 1998). It concerns whether the translated questionnaire produces the same responses as the original which would ultimately lead to the obtaining of comparable data (Leplege and Verdier 1995). Herdman and colleagues (1998) suggest that 'functional equivalence' is achieved when other types of equivalence have also been achieved.

Assessment of functional equivalence ascertains if it is justifiable to compare and aggregate results across cultures. In some cases differences are systematic, which allows transformation of scores to make them comparable (Herdman *et al* 1998).

4.11 Different methods of achieving equivalence

Several approaches can be used for each class of equivalence (Herdman *et al* 1998). (Table 4.2);

Table 4.2 Methods of achieving equivalence

Equivalence	Method
Conceptual	Local literature - general ethnographies; publications on perception of health, well-being, illness and disease in the target community. Consultation with expert in the target culture - to obtain a broad picture of the cultural environments of the target community. Therefore consultation should includes i.e.; anthropologist, medical sociologists, linguist and QOL expert and health professional
Item	Interview the target population – their beliefs and behaviours regarding health and QOL
Semantic	Review literature – to review the available data e.g.; on habits or lifestyle patterns
Operational	Elicit expert judgment – e.g.; anthropologist or sociologist who is an expert in the target culture
Measurement	Interview the samples of target population – discuss the relevance of items to themselves and to people they know or rank the items in a particular domains
Functional	Forward-backward translation – to establish meanings of items, words or phrases Check by translator - who is not involved in the original processes of Translation Check by a lay panel – samples from the target population Pre-test questionnaire – on sample of the target population. Findings e.g.; literacy rate; cultural norm; time frame; or biases. These findings provide an indication of the possibilities of adopting the same methods of data collection; modify methods or modes of operation Assessing psychometric properties of the instrument Employ statistical packages to test the reliability; validity; responsiveness; discriminative values; factor analysis. Also to assess the degree of functional equivalence to achieve other types of equivalence

4.12 Assessing equivalence of HRQOL measures

The reliability and the validity of the translated version must be tested to ensure reproducibility of the instrument and it remains able to measure what it was initially designed to measure (Herdman *et al* 1997). More rigorous approaches use statistical packages to assess cross-cultural equivalence including regression (Hui and Triandis

1985), co-scoring methods (Hui and Triandis 1985), factor-analytic approaches (Irvin and Carroll 1980) and the application of item response theory (Van de Vijver and Poortinga 1982; Hui and Triandis 1985). Whilst carefully developed, these approaches are rarely used. Non-statistical approaches to assess equivalence include; 1) Decentering 2) Committee approaches 3) Back translation (Edwards 1994).

4.12.1 Decentering

Decentering is an interactive process, best used in situations when there is flexibility to develop or modify items if the source document is untranslatable or if words or phrases do not share similar meaning in both languages. This allows accurate translation to achieve linguistic and conceptual equivalence (Edwards 1994).

4.12.2 Committee assessment

Committee assessment involves bilingual translators translating the source document to ensure the target document achieves linguistic equivalence (Brislin 1970). This approach allows the mistakes of committee members to be caught by others (Edwards 1994). The committee will require skills and competence in the target language (Acquadro *et al* 1996).

4.12.3 Back translation

Back translation is a phase conducted as part of forward-backward translation procedures. Further discussion of BT will be in section 4.13.

4.13 Forward-Backward Translation (FBT)

The most common method is forward-backward translation (FBT), which involves items being translated from an original source language into the target language and then being retranslated back to the original language (Schmidt and Bullinger 2003). This research will adopt the FBT technique, therefore, the procedures are detailed in this section.

FBT is widely used (Hilton and Skrutowski 2002), strongly recommended (Kim and Lim 1999) and was considered to be the best within the strategies which were practically possible (Mimura and Griffiths 2004).

The method involves at least two independent bilingual translators (Hilton and Skrutowski 2002) who must be familiar with both languages and the cultural background of the alternative language (Mimura and Griffiths 2004). Mimura and Griffiths (2004) divided the procedures into four phases. Phase 1 translates from the original scale. Phase 2 produces a back-translated version. Phase 3 compares the equivalence of the original and the back-translated versions. Phase 4 repeat forward and backward translations until satisfactory equivalence are agreed.

The discussion below is based on Mimura and Griffiths (2004), IQOLA Projects (2006) and other researchers who have applied FBT techniques.

In forward translation, the translator emphasises conceptual equivalence rather than word-to-word translation (Mimura and Griffiths 2004). The wording must be clear and compatible with the reading level of the intended respondent (IQOLA Project 2006).

Back-translation (BT) enhances semantic, content and conceptual equivalence and again emphasises meaning rather than word-to-word translation (Mimura and Griffiths 2004) by comparing the original and translated versions in the same language (Brislin 1970; Flaherty *et al* 1988). As a quality control technique it is a pivotal procedure to check the quality of the translated document (Acquadro *et al* 2003). It must be done by someone who is blinded to the original document to reduce bias (Guillemin *et al* 1993).

As many back-translations are required to ensure the quality of the final version (Brislin 1970; Guillemin *et al* 1993), these processes also render researchers more familiar with word usage in their respective target populations (Sartorious and Kuyken 1995).

Phase four involves altering the parts found to be problematic. If substantial discrepancies occur between the original and the back translated versions, the researchers must assess the significance of these discrepancies and if necessary the translated version is modified to produce a more appropriate and adequate translation (Peters and Passchier 2006). The process continues until the original and the back

translated versions are equivalent, when the target version is assumed to be a good translation (Marin and Marin 1991). Further equivalence testing is also crucial to prevent the instrument from being biased toward the culture of its original version (Flaherty *et al* 1988).

Thereafter, a pre-test is essential to detect any discrepancies and to ensure the psychometric properties have achieved at a certain acceptable levels (Edwards 1994). A pilot version must be tested on a sample with similar social background to the participants in the main study, after which further modifications will be made if needed. This is important to verify the validity and reliability of the translated version. Equivalence will be supported further, if the original and the translated versions achieve similar psychometric properties (measurement equivalence) (Peters and Passchier 2006). However, the use of pre testing alone cannot establish equivalence between versions. Multiple techniques should be used in all cross-cultural research to ensure high quality translation of measures (Herdman *et al* 1998).

CHAPTER FIVE

MATERIALS AND METHODS

5.1 Overview

Prospective longitudinal clinical examination and self report questionnaire study.

5.2 Selection of populations

- The target population was school children, of Malay ethnicity, aged 12-13 years in Malaysia.
- The accessible population was children of this age attending schools in the district of Banting, Selangor.
- The intended sample was three hundred schoolchildren aged 12-13 years old from five schools in the district of Banting, Selangor, Malaysia who were involved in the School Dental Program, whose parents provided written consent. The children must have the ability to complete the questionnaire.

5.3 Exclusion criteria

- Children whose parents did not provide consent to participate in the School Dental Programme.
- Those who did not have written consent from their parents or guardian
- Those who did not have the ability to fill in the form.
- Medically compromised children - for e.g. childhood cancers, cardiac diseases, blood abnormalities and other chronic diseases such as liver diseases and those undergoing organ transplant (OHD, MOH 2004).

5.4 Recruitment criteria

Letters and information leaflets introducing the study together with consent forms and questionnaire PART A were handed over to their parents/guardians of sampled children. Only the schoolchildren who returned the consent form and the parental-questionnaire were recruited.

5.5 Sampling

Based on a power calculation of 20 participants per variable to detect a difference with 95% power at $P<0.05$, a sample of 300 hundred was required. Assuming a 25% loss to follow up during the 6 months study period and a 75% recruitment rate 532 children were approached with a consent letter and information leaflets.

The sampling technique was multistage probability sampling. The first sampling stratum consisted of all 16 secondary schools in the district of Banting, Selangor. Five schools were randomly selected. The final stage involved 453 students aged 12-13 years-old who were randomly selected to participate in the study.

Each student was assigned a number according to the class registration obtained from the Local School Authority. The final list was according to the 'even number' or 'odd number' alternately from class to class.

5.6 Permission and Liaison

- Ethical board approval was obtained from the University of Sheffield and the Economic Planning Unit, Prime Minister's Office, Government of Malaysia. A letter of permission to conduct a survey was obtained from the Educational Research and Policy Department, Ministry of Education, Malaysia and the Oral Health Division, Ministry of Health, Malaysia.

- The Public Service Department of the Prime Minister's Office, Government of Malaysia was informed of the date and duration of the data collection.

- Subsequently, administrative arrangements were made with the state and local school authorities. Liaison with the local Senior Dental Officer identified suitable schools, equipment and staff needed.

- All participants in need of restorative and periodontal treatment would receive care from the school dental service

5.7 Variables

Variables selected for measurement corresponded to the stages of Wilson and Cleary's (1995) model of patient outcomes (Figure 5.1).

5.8 Selection and development of measures.

5.8.1 Clinical factors

The clinical variables were dental caries, periodontal disease, filled teeth, malocclusion and traumatic dental injuries. These data were collected via oral examination using the normative indices for trauma, caries and periodontal disease of the WHO (1997). Malocclusion was graded using The Index of Orthodontic Treatment Need (IOTN) (Brook and Shaw 1989) (Refer appendix F and G).

To check for the consistency of the measurement, test retest reliability was conducted to assess intra-examiner reliability. This involved re-testing randomly, at least 20% of the sample that was initially examined. A Kappa statistic was calculated for the intra-examiner agreement. This same procedure was employed for IOTN, trauma status, periodontal status and filled teeth.

5.8.2 Environmental factors

Environmental factors were defined as parent's or the guardian's socioeconomic status including level of income, level of education and employment status. The data were collected from participants parents/guardians via a "PART A" questionnaires (Appendix B).

5.8.3 Individual factors

Individual factors included participants' SOC, self esteem, LOC and OHB and were collected using "PART B" and "PART C" questionnaires (Appendix C and D).

5.8.3.1 Sense of coherence

Sense of coherence (SOC) was measured by Antonovsky's Orientation to Life Questionnaire (Antonovsky 1987) short form (SOC-13) that consists of 13 statements on a 7-point Guttman-type scale ranging from 'Never' = "1" to 'Always' = "7". Pallant and Lae (2002) showed the short-form SOC-13 to be reliable and valid, with a Cronbach alpha coefficient of 0.84. The construct validity of the SOC-13 showed moderate correlations with the Self Esteem Scale (r = 0.61) and the Mastery Scale (r = 0.54).

5.8.3.2 Self esteem

Self esteem was measured using Rosenberg's (1965) Self Esteem Scale (RSES). The scale comprises a ten-item self-report of global self esteem answered on a 4-point Guttman scale ranged from "1" = 'strongly agree' to "4" = 'strongly disagree'. It is a widely used scale to measure self esteem and is well validated (Rosenberg *et al* 1995). In development of RSES in 5024 US high school students, showed high level of reproducibility = 0.92 and moderate scalability = 0.72 (Rosenberg 1965).

5.8.3.3 Children's health locus of control scale

Children's Health Locus of Control Scale (CHLC; Parcel and Meyer 1978) assessed children's beliefs about whether they felt responsible for what have happened to them. CHLC consists of 20 Yes/No items, scored "1" = Yes and "0" = No. CHLC had a high coefficient of internal consistency (Kuder-Richardson) at (r = 0.72 and 0.75) and the test-retest intraclass reliability was moderate (r = 0.62). Other evaluations show CHLC to be reliable and to have acceptable internal consistency and construct validity (Parcel and Meyer 1978)

5.8.3.4 Oral health beliefs questionnaire

The oral health beliefs questionnaire consists of 6 items on child dental beliefs regarding fluoride (fluoridated toothpaste and fluoridated water), diet, oral hygiene practices (use dental floss and keep teeth clean) and visiting the dentist (Broadbent *et al*

2006). One question also asked about beliefs in participating in the school dental program. The responses were made on 4-point Likert scale ranged from 'extremely important' = "1" to 'not at all important' = "4". Oral health beliefs were included as they may be one mechanism through which clinical variables may impact on symptom status, OHRQOL, health perceptions and overall well-being (Broadbent *et al* 2006.)

5.8.4 Subjective assessments

Data on subjective assessment of symptoms, functional status, general health perceptions and overall QOL were collected from "PART B" and "PART C" questionnaires (Appendix C and D)

5.8.4.1 Symptoms and functional status

Symptoms and functional status data were collected using the CPQ*11-14* (Jokovic *et al* 2002). The CPQ*11-14* is a self-completed questionnaire consisting of 37 questions organized into four health domains: (1) oral symptoms (2) functional limitations, (3) emotional well-being and (4) social well-being. All questions ask about the frequency of events in the previous 3 months in relation to the child's oral and orofacial condition. The response options rated and coded as: 'Never' = "0"; 'Once or twice' = "1"; 'Sometimes' = "2"; 'Often' = "3"; 'Everyday/almost every day' = "4". The CPQ*11-14* also contains a single question on global ratings of the child's oral health and the extent to which the oral and orofacial condition affected their overall well-being. These global ratings had a five-point response format ranging from 'Excellent' = 0 to 'Poor' = 4 for oral health and from 'Not at all' = 0 to 'Very much' = 4 for wellbeing, respectively.

CPQ*11-14* showed excellent psychometric properties (Jokovic *et al* 2002). Cronbach's alpha was 0.91, the domain coefficients ranged from 0.64 for symptoms to 0.86 for emotional well-being, indicating acceptable to good internal consistency reliability. The intra-class correlation coefficient (ICC) for the CPQ*11-14* was 0.90, while for the domains it ranged from 0.79 to 0.88.

5.8.4.1 General Health Perception

Perceived general health status was measured using questions from the SF36v2, (Malay version) (Ware *et al* 2000). SF36 is one of the most widely used, self-completion measures of health status. The Malay version of SF-36v2 has excellent psychometric properties in terms of sensitivity, construct validity and internal consistency and test-retest reliability (Sararaks *et al* 2005).

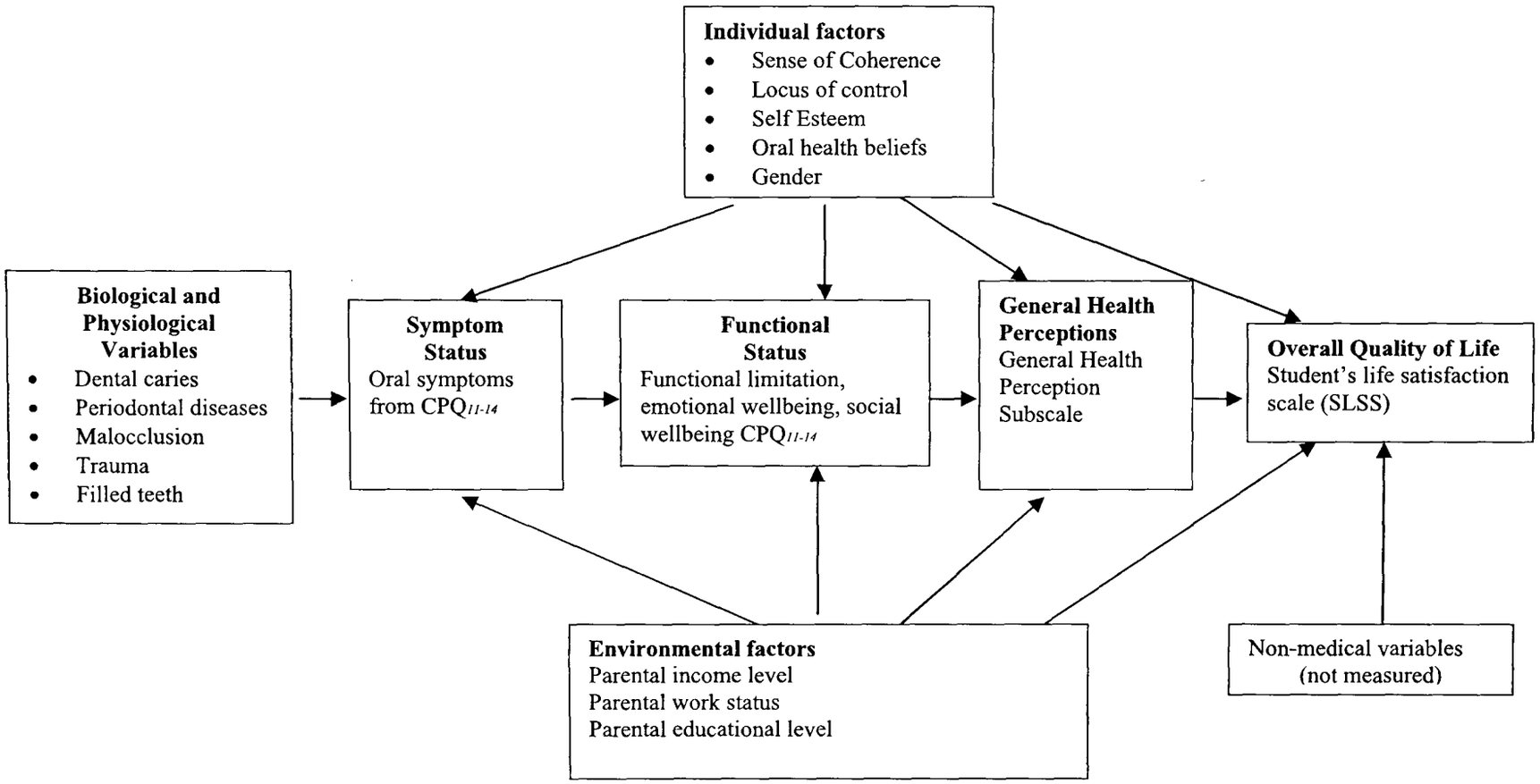
5.8.4.2 Overall Quality of life

The Student Life Satisfaction Scale (SLSS) was used to measure global life satisfaction in children. The scale was developed and validated by Huebner (1991). Individuals indicated their degree of agreement or disagreement on a 6-point Likert scale based on 7 life satisfaction statements. Items are rated and coded as: 1 = strongly disagree, 2, moderately disagree, 3 = mildly disagree, 4 = mildly agree, 5 = moderately agree and 6 = strongly agree. SLSS demonstrated adequate reliability and validity. Coefficient alpha was 0.82 and test–retest correlation coefficients of 0.74 after 2-weeks and 0.64 after 4 weeks (Huebner 1991).

5.9 Translation of measures

All questionnaires were forward-backward translated as section 4.13. To further improve the understandability to the sample group, two bilingual teachers and 4 bilingual students aged 12-14 years read the documents. Their suggestions were noted and minor modifications were made.

Figure 5.1 Summary of variables mapped to the Wilson and Cleary (1995) model.



5.10 Conduct of the study

5.10.1 Training and calibration

Whole mouth examination was carried out by the principal researcher who was calibrated by a WHO trained epidemiologist according to the survey criteria (WHO 1997). All recordings were made by a senior dental surgery assistant attached at the administrative Banting dental clinic, Selangor. She had been trained by the principal researcher.

5.10.2 Equipment

The clinical status examination only required minimal equipment with a high standard of infection control. The equipment required included a portable dental chair, a good source of light, mouth mirrors, tweezers, periodontal probe, examination trays, disposable gloves and sterilized gauze.

All non-disposable equipment was pre-wrapped and sterilized at the administrative main dental clinic which was located near the study area. The number of non-disposable instruments matched the children examined in a day to avoid reuse of the instruments and to avoid on-site sterilization in order to save time because the examination took place during school session. No surgical equipment was used because the study did not involve any treatment procedures.

All the instruments and materials were from the administrative dental clinic from Dental Clinic, Banting, Selangor, Malaysia.

5.10.3 Procedure

5.10.3.1 Data collection

Data were collected in five secondary schools in Banting, Malaysia, involving two time frames. The baseline data (T1) was conducted in January 2007 and the follow-up (T2) in July 2007.

At T1 parents/guardians were asked to answer the PART A questionnaire. PART B and C were answered by the young people before the oral examination.

At T2, parents/guardians did not have to take part. The children were required to answer the same questionnaires (PART B and C).

Detailed of procedures for handling questionnaires in PART B and PART C as below;

- The participants were called into the Aid Visual Room alternately class by class.

- Before distributing the questionnaire the researcher read aloud the 'Child Information Sheet' detailing all the things the children needed to do and what the questionnaire was about. The researcher asked the participants if they had any questions regarding the study. If any of them declined to participate then they were excused from taking part.

- The researcher gave out the questionnaires to all who agreed to participate. Only PART B was administered initially.

- The participants were required to answer all the questions and were reminded of that from time to time; they were asked not discuss the questions with their friends as the questions were not about their oral health but about the way they perceive themselves.

- After the participants finished answering PART B questionnaire. They were given a break, while the researcher checked them for completeness.

- After ten to fifteen minutes PART C was administered to the participants. They were asked to answer all the questions and were reminded from time to time that they were answering questions regarding their oral health over the previous three months. The answered questionnaires were checked for completeness.

- Once they had finished answering PART B and PART C, the researcher thanked all participants for taking part and reminded them about the clinical examination due in a short time. They were reassured that the clinical examination only involved an 'examination and diagnosis session' and that no treatment would be administered to them. This is an important message for the children because no treatment administered reduced their anxiety and avoided a higher rate of declined participation.

- They were dismissed with a reminder that they would be called again for the oral examination.

5.10.3.2 Data collection at baseline (T1) from clinical examination

The clinical examination was performed on participants who had written permission from their parents/guardians and were willing to be seated on the portable dental chair. The examination was carried out using sterilized dental instruments; plane mouth mirrors; straight probes; and CPITN probes which were for periodontal examination. To validate the consistency of the clinical examination, 20% of the sample was randomly re-examined at the end of each day. The same examiner was used for the first and second examination.

Detail of procedures on data collection from clinical examination as below;

- To perform clinical examination the study team set up a dental unit in the school dental clinic with strict infection control and a good source of lighting.

- Only one child was called to the unit at a time. A thorough oral examination was performed by the researcher and a senior dental assistant recorded the data on the form provided.

- The schoolchildren were examined lying down with the researcher sat at the 12 o'clock position. The examination started from right quadrant of the upper dental arch then onto the left quadrants before assessing the left then the right quadrants of the lower arch. The examination considered dental caries, filled teeth, periodontal diseases, trauma and finally malocclusion. Proper handling of oral examination concerned with participants feelings and sensitivity was used to gain full cooperation from the children.

- After each examination, cross infection control was performed.

- The researcher supervised the infection control procedures and ensured that complete data were charted (A clinical format and clinical examination protocol as attached in Appendix F and Appendix G)

5.10.3.3 Data collection at follow-up (T2) from the questionnaire

Time 2 (T2) data collection only involved the children. They answered the same set of questionnaires (PART B and PART C). Clinical examination and Part A questionnaire was not required at T2. A summary of data collection is represented in Table 5.1.

Table 5.1 List of variables in the study

Variables collect at Time 1	Variables collect at Time 2
Dental caries, Periodontal diseases Malocclusion, Trauma, Filled teeth	Not collected at Time 2
Parental income level Parental work status Parental educational level	Not collected at Time 2
Sense of Coherence Locus of control Self Esteem Oral health beliefs Gender	Sense of Coherence Locus of control Self Esteem Oral health beliefs
Symptom status Functional status General health perceptions Overall quality of life	Symptom status Functional status General health perceptions Overall quality of life

5.10.4 Pilot Study

A series of pre-tests of the data collection tools were performed. An initial pre-test was carried out in the original-English version to find out whether the items were suitable for the 12-13 year old children. The drafted Malay-version was given to 5 schoolchildren with similar ages to find the suitability of items in the Malay language, the time to answer the questionnaire, the language simplicity and ease of understanding. All suggestions were noted and implemented by the researcher.

The final pilot study was conducted two weeks before the intended study. It involved a sample from a similar group as the study sample. The purpose of the pilot study was to assess the consistency of the examiner in applying the clinical criteria and to familiarize the survey team with the conduct of the study. The identification of problems with data collection, recall systems and data transfer was also addressed during the pilot session. The pilot study was conducted within a two week period.

The Malay-drafted questionnaire was pre-tested among a group of 20 school children to check its reliability and validity. Their suggestions were noted on the feedback form attached.

The clinical session was piloted on the same sample. The consistency of the examiner was maintained between the first and the second examinations which were carried out among 20% of the sample at the end of the day. The findings from the pilot study were noted especially the time taken to complete the questionnaire, preliminary diagnosis of oral problems and clinical examination.

5.10.5 Data Transfer

The data were transferred by a research assistant and repeated by the principal researcher. Data management was handled with strict confidence and completeness. The cleaned data were coded and keyed by the researcher and was transferred to disk as back-up data. All the data transfer was done in Malaysia. The quality of data transfer was checked by a preliminary analysis of the data. Any consistencies were referred to the original data set.

5.10.6 Problems and Pitfalls

One problem faced by the team during the survey was in obtaining a valid consent form within the researcher's permissible time because of the time frame and the communication involving the distance between the two countries. Another anticipated problem was drop-out of participants within the six-month recall period.

To overcome these problems, only willing participants were recruited in the study. Frequent visits to the schools were carried out to ensure all the consent forms were collected by the teachers.

5.10.7 Data analysis

Analysis of data was conducted in three stages; 1) descriptive analysis 2) simple bivariate analysis between variables to look into significant trends of data and 3) principal analysis, which comprised multiple regression analyses to test the relationships hypothesized within the Wilson and Cleary Model (1995) (Figure 5.1). All analyses were conducted in SPSS (Version 14).

5.10.8 Data analysis management

The clinical data were treated as dichotomous variables since they were skewed. Caries was recorded as '0' = 'No caries' and '1' = 'Yes caries' (Code 1 to 2 ='1'). Malocclusions was recoded as; '0' = 'No need treatment' (Code of 1, 2 and 3) and '1'= 'Yes need treatment' (Code 4 and 5). Trauma was categorized as '1' = 'Yes trauma present' and '0' = 'No trauma present'. Periodontitis was recoded as; '0' = 'No periodontitis' and '1' = 'Yes Periodontitis' (Code 1 to 4). Filled teeth was recorded as '0' = 'No filled teeth' and '1'='Yes filled teeth'. Table 5.2 summarises this schema.

The environmental factor of socio-economic status was recorded by parental income, parental work status and parental educational level. SES data were not transformed (Appendix B)

For the individual factors, each measure was summed to generate total raw scores. For example in CHLC (Parcel and Meyer 1978), all 20 items are summed to generate a raw score of CHLC. High scores indicated I-LOC and low scores indicated E-LOC. This was similar with the oral health beliefs scoring method.

The scoring procedures for SOC-13 (Antonovsky 1975) on the other hand, involved reverse scoring of items 1, 2, 3, 7 and 10 before the computation of a total sum. The high scores of SOC indicated high SOC and low scores indicated low SOC. For the explanatory analyses of SOC-13, a total score of each of the SOC-13 subscales; manageability; comprehensibility and meaningfulness was calculated.

Self esteem (Rosenberg 1965) involved summation on all the 10 items after reverse scoring items numbered 3, 5, 8, 9 and 10. High score of self esteem indicate high level of self esteem and low scores indicate low self esteem (Refer Table 5.2).

Symptoms were from total scores of the symptoms subscale from CPQ*11-14* which comprised of 6 items. Functional status was assessed from the 3 sub scales of CPQ*11-14*: functional limitation (9 items); emotional wellbeing (8 items) and social wellbeing (12 items).

For further explanatory analysis, each subscale of CPQ*11-14* was summed individually to generate raw scores of symptom status; functional status; emotional wellbeing and social wellbeing.

Finally, all the 37 items of CPQ*11-14* were summed to represent raw scores of COHRQOL. The high score of each CPQ*11-14* subscales, represented greater level of impacts and low score, represented lesser impacts.

The GHP subscale (5 items) and a single item on reported health transition were derived from SF36v2 (Malay version). All the items of GHP were summed to generate raw scores (items 2, 4, 6 were reverse coded). High scores of HP subscale indicated better health perception and low score indicated poor health perception.

Overall QOL was assessed using the total of 10 items of SLSS with 2 items (3 and 4) were reverse scored. High scores of SLSS reflected better HP and low scores reflected lower HP.

In all cases, high values of scores can be taken to indicate high effects of the factor concerned.

Table 5.2 Summary of data management

Variables	**Scoring procedures**	**Code**
Clinical factors Caries	***Change to dichotomous;*** Code 0 = 0 Code 1 to 2 = Code 1	 '0' = 'No caries' '1' = 'Yes caries'
Malocclusion	Code 1, 2 and 3 = Code 0 Code 4 and 5 = Code 1	'0' = 'No need treatment' '1'= 'Yes need treatment'
Trauma	No trauma present = Code 0 Yes trauma present = Code 1	'0' = 'No trauma present' '1' = 'Yes trauma present'
Periodontal Status	Code 0 = 0 Code 1, 2, 3, 4 = Code 1	'0'='No periodontitis' '1'='Yes periodontitis'
Filled Teeth	Code 0=0,2,4,5,6,7 Code 2 = Code 1	'0'='No Filled Teeth' '1'='Yes Filled Teeth'
Part A Parent's SES	Level income, education Work status	Refer to Appendix 1
Part B SOC-13	13 items on a 7-point scale	Total all items to generate raw scores of SOC (1, 2, 3, 7 & 10 were reverse scored)
Self esteem	10 items on a 4-point scale	Total all items to generate raw scores of self esteem (3,5,8,9 & 10 were reverse scored)
CHLC	20 items on dichotomous scale	Total scores 20 items to generate raw general CHLC
General Health Perception	SF36v2 Malay version (5 items GHP subscale)	Total GHP subscales to generate raw scores for GHP (items 2, 4 & 6 were reverse scored)
Overall QOL	SLSS 7 items with 6-point scale	Total all items to generate raw scores for SLSS (3 & 4 were reverse scored)
Part C Symptoms status	A subscale of CPQ*11-14* with 6 items on a 5-point scale	Total scores of 6 items to generate raw scores for symptom status
Functional status	CPQ*11-14* subscales; FL (9 items), EWB (8 items) & SWB (12 items)	Total scores of these three subscales to generate raw sores for functional status
Oral health beliefs	OHB questionnaire consists of 7 items on 4-point scale	Total all items to generate raw scores of OHB
Exploratory analyses SOC	SOC comprises of 3 sub scales; Manageability (4 items) Comprehensibility (5 items) Meaningfulness (4 items)	Total of each subscales to generate scores of Manageability, Comprehensibility and Meaningfulness
CPQ*11-14*	Subscales of Symptom, FL, EWB & SWB	Total of each subscales to generate scores for Symptom, FL, EWB & SWB
COHRQOL	Inclusion of 4 subscales Symptom, FL, EWB & SWB (37 items with 5-point scale).	Total scores of 37 items to generate scores for OHRQOL

5.10.9 Missing data management

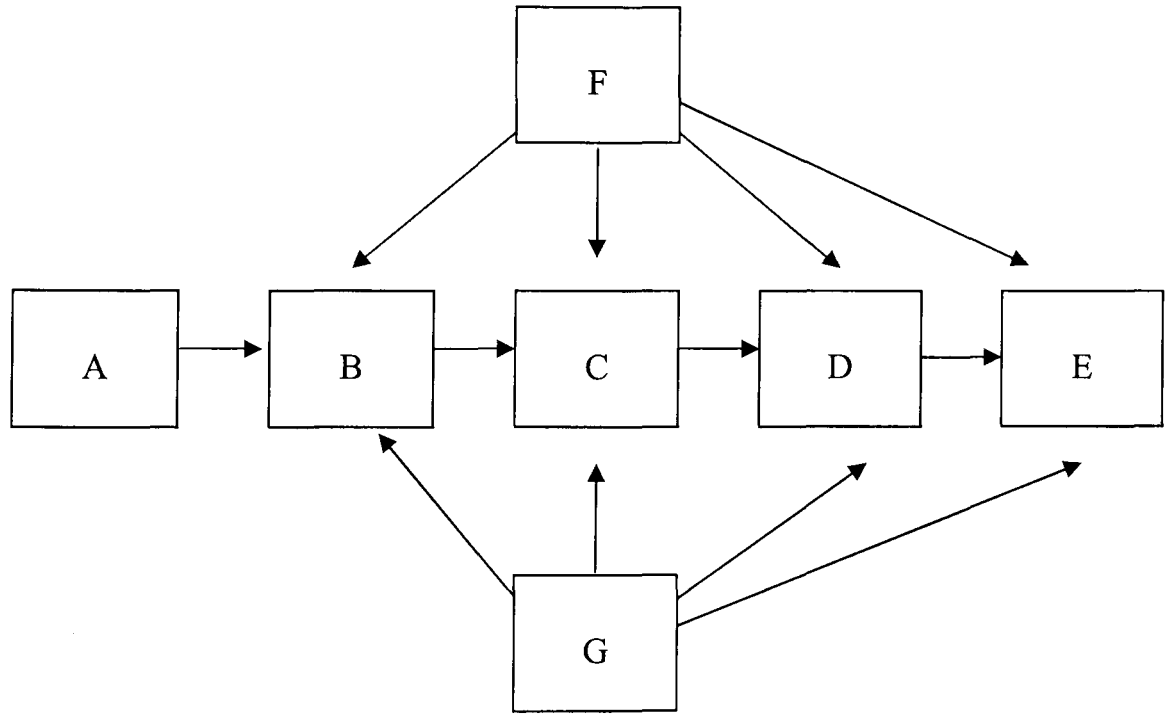
Subjects with missing values in the dataset were deleted. Thus, only all the subjects with complete data were included in the analysis.

5.10.10 Data analysis strategy

A lagged analysis is an analytical strategy for studies with many variables when data are collected at two points in time. The lagged analysis looks for longitudinal relationships between different combinations of the variables.

The Wilson and Cleary model can be arranged as below (Figure 5.2);

Figure 5.2 Data analysis strategy



The model hypothesises that B is predicted by A, F and G. In order to provide strong evidence of this relationship data should be longitudinal and account for baseline levels of the outcome variable, thus associations are tested between A, B, F and G at baseline with B at the follow up. However, the model also predicts that C is predicted by A, B, F and G. Again, longitudinal data are required, therefore associations are tested between A, B, F and G at baseline and C at follow up. The process can then be repeated for D and then E at follow–up, using all the preceding variables at baseline.

CHAPTER SIX

RESULTS

6.1 Introduction

A total of 453 students were given consent letters in January 2007 of whom 443 (98%) responded. Three parents did not provide baseline data, thus the incept sample was 440 students. Follow up in August 2007 involved 439 students. The loss was due to the death of one child in an accident.

The results in this chapter are presented in five main sections:-

Section 6.2 overviews the sample with regards to gender, age, parent socio-demographic status and clinical status. Descriptive data are presented for all study variables at both times (baseline and follow-up). The internal and test-retest reliability of the measures is presented in this section.

Section 6.3 reports the association between independent and dependent variables at baseline and follow-up. The hypothesis testing sections are divided according to the Wilson and Cleary (1995) model used to guide the study. This section reports the lagged analyses testing hypothesised relationships, first using bivariate analyses then followed by the primary analyses, using forward stepwise multiple regression models.

Section 6.4 reports on cross sectional analyses testing possible effects of individual and environmental factors on clinical status using bivariate analyses and forward stepwise multiple regression models. This section is inevitably cross-sectional as data on clinical status were collected only at baseline.

Section 6.5 reports exploratory analyses of the SOC subscales. The method of analyses follows the same approach as that used in Section 6.3.

Section 6.6 presents exploratory analyses of the CPQ$_{11\text{-}14}$ subscales. The method of analyses follows the same approach as that used in Section 6.3.

Section 6.7 presents subsequent analyses using total scores of CPQ*11-14*. The analyses follow the same approach as that used in Section 6.3.

These exploratory analyses were added because the Wilson and Cleary model separates symptom status from functional status, emotional wellbeing and social wellbeing (analyses done in section 6.6). However, the separate subscales of CPQ*11-14*, including both symptom status and functional status (social well-being and emotional well being) can be aggregated to create a single score for OHRQOL. This approach essentially aggregates these two stages of Wilson and Cleary model and allows comparison of a simplified model with the original one.

6.2 Descriptive analysis

6.2.1 Demographic data

The mean age of participants was 12.04 years (range 12-13 years). Most were female (58.3% n=256). Most had parents between the ages of 40-49 years (53.3%) and who had been educated up to secondary level (Table 6.1). Parental education attainment was classified into university graduates or professionals, upper secondary education or equivalent and lower secondary education or below. This classification was adopted from The National Schoolchildren Survey (1997) and National Oral Health Adult Survey (2000) (Table 6.1). Most parents or carers who answered Part A questionnaire were male (61%).

Table 6.1 Demographic profile of the 439 participants

Participants	%
Female	58.3
Male	41.7
Parental Age	
20-29	0.7
30-39	26.2
40-49	53.3
50+	19.8
Parental Sex	
Male	61.0
Female	39.0
Parent at work	
Yes	77.2
No	22.8
Parent household income	
<RM500	16.4
RM501-1000	34.2
RM1001-1500	15.3
RM1501-2000	12.8
>RM2001	21.6
Parental Education attainment	
No formal education	5.5
Primary school	17.3
Lower secondary or equivalent	14.8
SPM/STPM	43.8
Vocational	1.8
Institution	5.5
University/MARA	10.9
Other	0.9

6.2.2 Clinical data

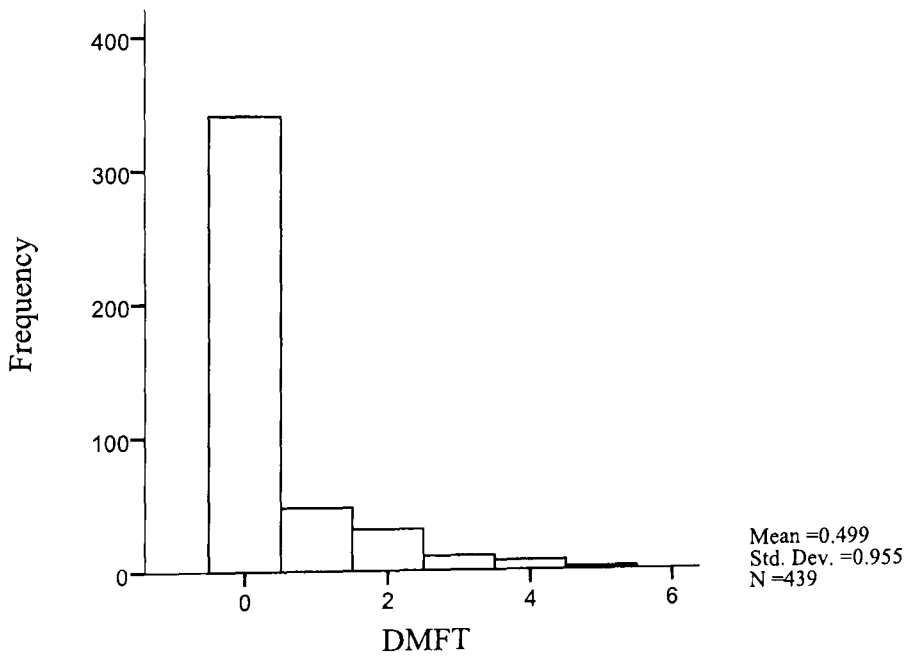
The clinical variables recorded during oral examination were caries, filled teeth, periodontal disease, malocclusion and traumatic dental injuries. The normative indices for trauma, caries and periodontal disease were based on the criteria published in the WHO Oral Health Survey Basic 4th edition (WHO 1997). Malocclusion was assessed according to the Index of Orthodontic Treatment Need (IOTN) (Brook and Shaw 1989).

Dental caries status was recorded via the DMFT index. Mean DMFT in the sample was 0.499 (SD=0.955) (Table 6.2). More than seventy two percent of the participants were caries free (DMFT=0) (Figure 6.1).

Table 6.2 Caries and treatment experience among the 439 participants

	Mean (SD)
DT	0.218 (0.628)
MT	0.006 (0.082)
FT	0.277 (0.683)
DMFT	0.499 (0.955)

Figure 6.1 Frequency distribution of DMFT



Periodontal status was recorded using the CPI index (Table 6.3). The vast majority (77.9%) had healthy gingivae.

Table 6.3 CPI status of 439 participants

CPI status	%
CPI = 0 (Healthy)	77.9
CPI >1	22.1

The criteria for traumatic injuries was adapted from WHO (1997) recording any trauma present as 'Less than one third' of the crown, 'Between one and two-thirds' or 'More than two-thirds affected'. The prevalence of traumatic injuries to anterior teeth was very low. Only 6 (1.4%) individuals displayed trauma to the anterior teeth (less<1/3) and no individuals had injuries greater than one third of the crown.

Orthodontic status was graded using the Index of Orthodontic Treatment Need (IOTN). Most children were in categories 1, 2 and 3 whom did not need orthodontic treatment (90%) (Table 6.4).

Table 6.4 Orthodontic Treatment need among 439 participants

Index of Treatment need	%
Does not need treatment (Grade 1)	43.7
Little need treatment (Grade 2)	31.9
Borderline need treatment (Grade 3)	14.6
Treatment required (Grade 4 & Grade 5)	10.3

6.2.3 Individual factors

6.2.3.1 Sense of coherence

Sense of Coherence was measured using on Antonovsky's SOC-13 (1987). Students responded to each question on a 7 point Likert scale (Possible scores ranged from 13 to 91). SOC scores were normally distributed at baseline and follow up. Mean (SD) scores were 56.341 (10.394) and 54.895 (10.044) respectively (Table 6.5). Cronbach's reliability coefficients at baseline and follow up were moderate at 0.698 and 0.743 respectively (Table 6.6). There was a positive correlation between SOC at the baseline and follow up ($r= 0.456$, $p<0.01$) (Table 6.6).

6.2.3.2 Self esteem

Self esteem was measured using Rosenberg's (1965) Self Esteem Scale (RSES). Students responded to each question on a 4 point Likert scale with a possible score of '1'= 'strongly agree' to '4' = 'strongly disagree' for each item (Possible total score ranged from 10-40). RSES scores were normally distributed at baseline and follow up. Mean (SD) scores were 28.642 (3.327) and 28.640 (SD=3.372) respectively (Table 6.5). Cronbach's reliability coefficients at baseline and follow up were moderate at 0.538 and 0.571 respectively (Table 6.6). Self esteem at the baseline and follow up were positively correlated ($r= 0.434$, $p<0.01$) (Table 6.6).

6.2.3.3 Health Locus of control

Health Locus of Control (HLOC) was measured using the Child Health Locus of Control measures (CHLC) by Parcel and Meyer (1978). Students responded to each question using dichotomous 'Yes' or 'No' responses (Possible scores ranged from 20 to 40). Health locus of control scores were normally distributed at baseline and follow up. Mean (SD) scores were 31.226 (2.934) and 32.077 (2.870) respectively (Table 6.5). Cronbach's reliability coefficients at baseline and follow up were moderate at 0.582 and 0.590 (Table 6.6). There was a positive correlation between HLOC at the baseline and follow up ($r= 0.462$, $p<0.01$) (Table 6.6).

Table 6.5 Descriptive data for the study variables

Variables	Measures	Baseline Mean (SD)	Follow-up Mean (SD)
Sense of coherence	SOC	56.341 (10.364)	54.895 (10.444)
Self esteem	RSES	28.642 (3.327)	28.640 (3.372)
Health locus of control	HLOC	31.226 (2.934)	32.077 (2.870)
Oral health beliefs	OHB	23.605 (2.758)	24.400 (2.777)
Symptom status	CPQ*11-14*	6.990 (3.266)	6.520 (3.145)
Function limitation	CPQ*11-14*	29.050 (14.799)	24.430 (14.346)
Health perception	SF36	16.710 (2.810)	16.888 (2.804)
Quality of life*	SLSS	25.555 (4.405)	25.810 (4.401)

**Logged transformations of QOL data did not affect the findings. Therefore, raw data are used throughout the analyses).*

Table 6.6 Internal reliability and test-retest correlation of the variables

Variables	Measures	Cronbach's reliability coefficient Baseline	Cronbach's reliability coefficient Follow-up	Test-retest correlation
Sense of coherence	SOC	0.698	0.743	0.456**
Self esteem	RSES	0.538	0.571	0.434**
Health locus of control	HLOC	0.582	0.590	0.462**
Oral health beliefs	OHB	0.593	0.641	0.276**
Symptom status	CPQ*11-14*	0.657	0.650	0.426**
Function limitation	CPQ*11-14*	0.902	0.904	0.500**
Health perception	SF36	0.565	0.607	0.397**
Quality of life	SLSS	0.427	0.382	0.331**

***Correlation is significant at the 0.01 level (2-tailed).*

6.2.3.4 Oral Health Beliefs

Oral health beliefs (OHB) were measured using six items on children's dental beliefs regarding fluoride (2 items), diet (1 item), oral hygiene practices (2 items) and visiting the dentist (1 item) (Broadbent *et al* 2006). One additional question asked about the child's beliefs about participating in the school dental program. The responses were made on a 4-point Likert scale ranged from 'extremely important' to 'not at all important' (Possible scores ranged from 7 to 28). Mean (SD) scores were 23.605 (2.758) and 24.400 (2.777) respectively (Table 6.5). Cronbach's reliability coefficients at baseline and follow up were moderate at 0.593 and 0.641 respectively (Table 6.6). There was a moderate positive correlation between OHB at baseline and follow up ($r=0.276$, $p<0.01$) (Table 6.6).

6.2.4 Dependent variables

6.2.4.1 Symptom status

Data on children's perceptions of their symptoms were collected using the symptom sub scale of CPQ*11-14*, scaled from '0'='never' to '4'= 'everyday or almost everyday' with a total possible scores ranged from 0 to 24. Symptoms CPQ*11-14* scores were normally distributed at baseline and follow up. Mean (SD) scores were 6.990 (3.266) and 6.520 (3.145) respectively (Table 6.5). Cronbach's reliability coefficients at baseline and follow up were moderate at 0.657 and 0.650 respectively (Table 6.6). There was a moderate positive correlation between the baseline and follow up symptoms status ($r=0.426$, $p<0.01$) (Table 6.6).

6.2.4.2 Functional status

Children's perceptions of their functional limitation (FL) were collected using the functional limitation, social wellbeing (SWB) and emotional wellbeing (EWB) subscales of CPQ*11-14*. The measures scaled from '0'='never' to '4'='everyday and almost everyday' with total possible scores ranged from 0 to 124. Function CPQ*11-14* scores were normally distributed at baseline and follow up. Mean (SD) scores were 29.050 (14.799) and 24.430 (14.346) respectively (Table 6.5). Cronbach's reliability

coefficients at baseline and follow up were high at 0.902 and 0.904 respectively (Table 6.6). There was a moderate positive correlation between functional limitation status at the baseline and follow up (r= 0.500, p<0.01) (Table 6.6).

6.2.4.3 General health perception

Perceived general health (GHP) status was measured using the Malay version of SF36v2 (Ware *et al* 2000). Students responded to each question on a 5 point Likert scale ranged from '1'='definitely true' to '5'='definitely false'. (Possible scores ranged from 5 to 25). GHP scores were normally distributed at baseline and follow up. Mean (SD) scores were 16.710 (2.810) and 16.888 (2.804) respectively (Table 6.5). Cronbach's reliability coefficients at baseline and follow up were moderate at 0.565 and 0.607 respectively (Table 6.6). There was a moderate positive correlation between GHP at baseline and follow up (r= 0.397, p<0.01) (Table 6.6).

6.2.4.4 Overall Quality of life

Overall QOL was measured based on Student Life Satisfaction Scale (SLSS) by Huebner (1991) which offered 6 responses on Likert scale. Items scores scaled from '1'='strongly disagree' to '6'='strongly agree' (Possible scores ranged from 7 to 42). Mean (SD) scores were 25.555 (4.405) and 25.810 (4.401) respectively (Table 6.5). Cronbach's reliability coefficients at baseline and follow up were lower to moderate at 0.427 and 0.382 respectively (Table 6.6). There was a moderate positive correlation between SLSS at baseline and follow up (r=0.331, p<0.01) (Table 6.6).

6.3 Bivariate analyses

Preliminary assessments of lagged associations between study variables at baseline and follow-up were made using appropriate bivariate analyses (Tables 6.7 – 6.14). Cross sectional analyses were also conducted between clinical status, environmental factors and individual factors at baseline (Table 6.15). A summary of the analysis conducted is as follows;

1. T-tests were used to identify differences in clinical status (caries status, filled teeth, periodontal diseases, malocclusion and trauma) at baseline and dependent variables (symptom, function limitation, general health perception and overall QOL) at follow-up.
2. Pearson's correlation was used to test the associations between baseline independent variables (individual factors and environmental factors) with dependent variables (symptom, function limitation, general health perception and overall QOL) at follow-up.

6.3.1 Relationships between individual differences, environmental factors and symptom status

Tables 6.7 and 6.8 present the lagged analyses between clinical status, individual factors, environmental factors and symptom status at baseline and symptom status at follow-up. There were significant correlations between symptoms, individual factors and environmental factors. Children who reported higher symptoms at follow-up were those who at baseline had higher symptoms, lower SOC, lower self esteem and their parents were less educated. However, there were no significant differences associated with clinical status (Table 6.8).

Table 6.7 Relationships between independent variables and symptoms status in lagged analyses

Independent variables (Baseline)	r-value
<u>Individual factors</u>	
Gender	-0.007
Sense of coherence	-0.246**
Self esteem	-0.113*
Health locus of control	0.002
Oral health beliefs	-0.062
<u>Environmental factors</u>	
Parent education	-0.101*
Parent income	-0.055
Parent work	0.004
<u>Baseline</u>	
Symptom status	0.426**

** *Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6.8 Symptoms at follow-up by clinical status at baseline

Clinical Status	Mean (SD)
Caries Status	
DT = 0	6.461 (3.131)
DT > 0	6.883 (3.237)
Filled teeth	
FT = 0	6.427 (3.103
FT > 0	6.907 (3.356)
Periodontal Diseases	
CPI = 0	6.514 (3.026)
CPI > 0	6.536 (3.542)
Malocclusion	
IOTN = 0	6.515 (3.135)
IOTN > 0	6.555 (3.272)
Trauma	
No	6.525 (3.126)
Yes	5.000 (3.633)

6.3.2 Relationship between clinical status, individual factors, environmental factors, symptoms and functional limitation.

Tables 6.9 and 6.10 present the correlations between independent variables (clinical status, individual factors, environmental factors, symptoms and functional limitation) at baseline and functional limitation at follow-up. There were significant correlations between functional limitation, individual factors and environmental factors. Functional limitations at follow-up were felt most by children who experienced more symptoms, high functional limitations, had lower SOC and lower self esteem at baseline. Also, FL was greater if parents were working, had less income and were less educated. Similar trends were noted, with those who had more caries at baseline (p-value = 0.056) (Table 6.10).

Table 6.9 Relationships between independent variables and functional limitation in lagged analyses.

Independent variables (Baseline)	r-value
Individual factors	
Gender	0.078
Sense of coherence	-0.317**
Self esteem	-0.135**
Health locus of control	-0.033
Oral health beliefs	-0.049
Environmental factors	
Parent education	-0.157**
Parent income	-0.093*
Parent work	0.117*
Baseline	
Symptom	0.329**
Function limitation	0.500**

** *Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6.10 Functional limitation at follow-up by clinical status at baseline

Clinical Status	Means (SD)
Caries Status	
DT = 0	23.910 (14.433) +
DT > 0	27.716 (13.433) +
Filled teeth	
FT = 0	24.252 (14.200)
FT > 0	25.460 (15.190)
Periodontal Diseases	
CPI = 0	24.146 (14.268)
CPI > 0	25.422 (14.649)
Malocclusion	
IOTN = 0	24.370 (13.997)
IOTN > 0	24.955 (17.278)
Trauma	
No	24.467 (14.408)
Yes	22.000 (11.261)

+p-value = 0.056, t-test

6.3.3 Relationships between clinical status, individual factors, environmental factors, symptoms, functional limitation and GHP.

Tables 6.11 and 6.12 present the correlations between independent variables (clinical status, individual factors, environmental factors, symptoms, FL and GHP) at baseline and GHP at follow-up. Children who reported better GHP at follow-up were those who had better GHP, high SOC, high self esteem and experienced less FL at baseline. Similar trends were also noted with those who come from a well educated family (p-value = 0.097). However, no associations were detected between GHP and clinical status (Table 6.12).

6.3.4 Relationships between clinical status, individual factors, environmental factors, symptoms, functional limitation, general health perceptions and QOL

Tables 6.13 and 6.14 present the correlations between independent variables (clinical status, symptoms, individual factors, environmental factors, functional limitation, GHP and QOL) at baseline and QOL at follow-up. Children, who reported better QOL at follow-up, had better QOL, high SOC, high self esteem, filled teeth and high OHB at baseline. They also come from high income families. Similar trends also well noted with those who had more educated parents (p-value = 0.054).

Table 6.11 Relationships between independent variables and GHP in lagged analyses.

Independent variables (Baseline)	r-value
Individual factors	
Gender	0.001
Sense of coherence	0.205**
Self esteem	0.186**
Health locus of control	0.035
Oral health beliefs	0.035
Environmental factors	
Parent education	0.079
Parent income	-0.061
Parent work	-0.025
Baseline	
General health perception	0.398**
Functional limitation	-0.199*

** *Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6.12 General health perception at follow-up by clinical status at baseline

Clinical Status	Means (SD)
Caries Status	
DT = 0	16.888 (2.711)
DT > 0	16.883 (3.360)
Filled teeth	
FT = 0	16.850 (2.761)
FT > 0	17.118 (3.024)
Periodontal Diseases	
CPI = 0	16.862 (2.813)
CPI > 0	16.979 (2.784)
Malocclusion	
IOTN = 0	16.868 (2.744)
IOTN > 0	17.066 (3.313)
Trauma	
No	16.888 (2.813)
Yes	16.833 (2.563)

Table 6.13 Relationships between independent variables and overall QOL in lagged analyses.

Independent variables (Baseline)	r-value
Individual factors	
Gender	0.073
Sense of coherence	0.257**
Self esteem	0.160**
Health locus of control	0.001
Oral health beliefs	0.114*
Environmental factors	
Parent education	0.092
Parent income	0.113*
Parent work	-0.006
Baseline	
Quality of life	0.331**
General health perception	0.072

** *Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6.14 Overall quality of life at follow-up by clinical status at baseline

Clinical Status	Means (SD)
Caries Status	
DT = 0	25.715 (4.445)
DT > 0	26.416 (4.093)
Filled teeth	
FT = 0	25.566 (4.385)*
FT > 0	26.815 (4.350)*
Periodontal Diseases	
CPI = 0	25.730 (4.591)
CPI > 0	26.092 (3.660)
Malocclusion	
IOTN = 0	25.751 (4.361)
IOTN > 0	26.331 (4.753)
Trauma	
No	25.805 (4.403)
Yes	25.666 (4.885)

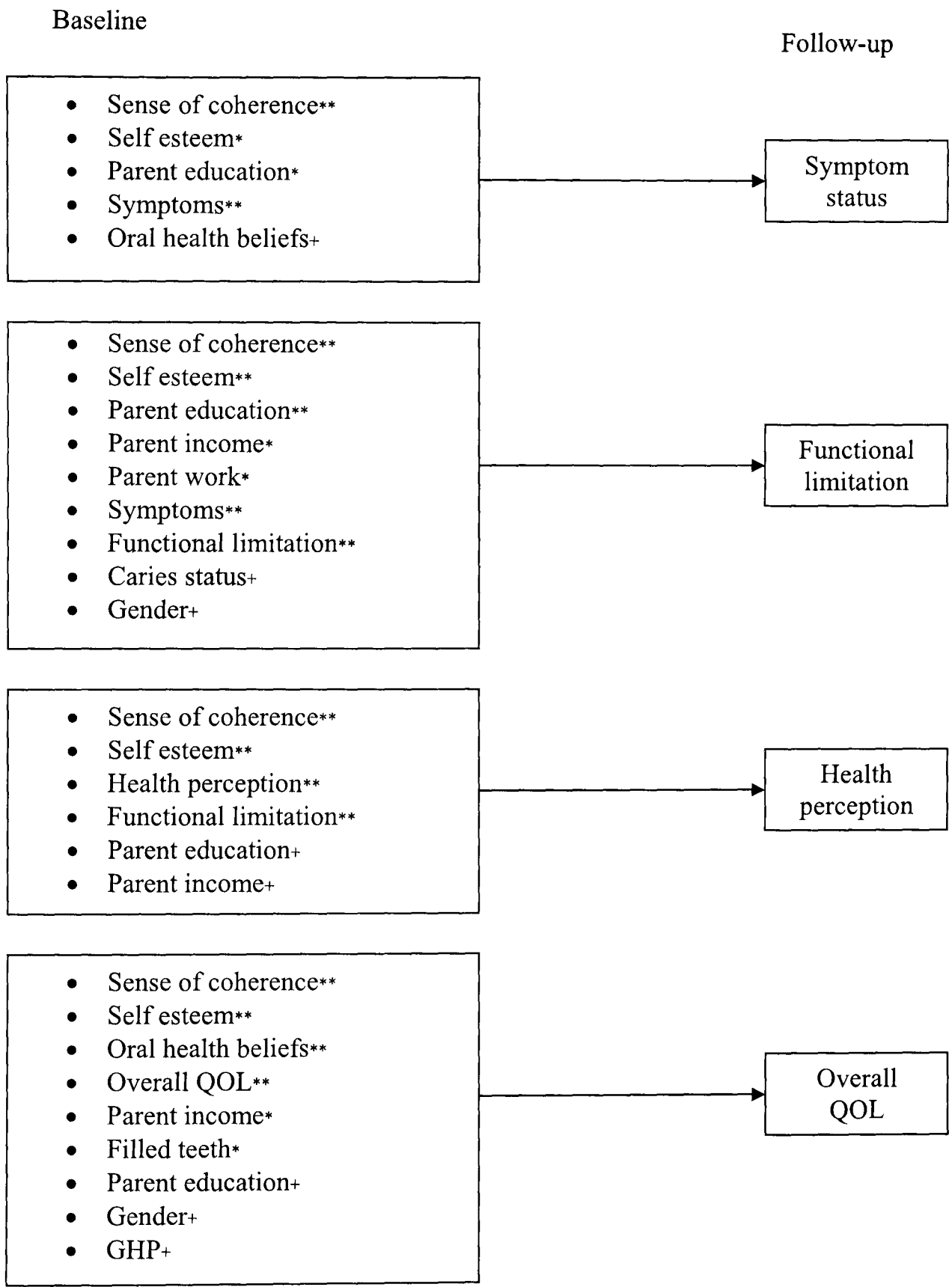
**Correlation is significant at the 0.05 level (2-tailed).*

6.3.5 Summary of key relationships of symptoms, FL, GHP and overall QOL

Figure 6.2 summarises the significant relationships found in the bivariate analyses. Symptom status at follow-up was associated with SOC, self esteem, parent's education and symptoms status at baseline. Functional limitation at follow-up was associated with SOC, self esteem, parent education, parent incomes, parent works, symptoms and functional limitation at baseline. Similar trends also noted with those who had caries. General health perceptions at follow up were associated with SOC, self esteem, GHP and functional limitation at baseline. Similar trends were noted with parent's education. Overall QOL at follow up was associated with overall QOL, SOC, self esteem, OHB, filled teeth and parent's income. Similar trends also noted with parent's education.

These variables are tested in forward stepwise multiple regression models using lagged analysis in the next section. In order to ensure that the models are comprehensive, any bivariate relationships that had *p*-values of less than 0.2 are tested in the multiple regression models.

Figure 6.2 Summary of key relationships significant in bivariate analyses



*** Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*
+ Correlation < 0.2 (2-tailed)

6.3.6 Regression analyses between clinical status, individual factors, environmental factors and dependent variables (symptom status, FL, GHP and overall QOL) at follow-up.

To identify the predictors of follow-up dependent variables (symptoms, FL, GHP and QOL), a series of lagged analyses were conducted using forward stepwise multiple regression model. Only baseline independent variables that correlated with follow-up dependent variables with a *p*-value less than 0.2 in the bivariate analyses were entered in the models.

Table 6.15 presents the best regression model for predictors of symptom status at follow-up. As can be seen, children who reported higher symptoms at follow-up were those who had higher symptoms and lower SOC at baseline. This model accounted for 20.8% of the variation in symptoms status scores at follow-up. Other putative predictors, parent education, self esteem and OHB were tested in the model but were not significant.

Table 6.15 Best forward stepwise regression model for symptoms status at follow-up

Significant predictors	β	*F*	R^2	R^2 Adjusted	R^2 change
1. Symptoms (Baseline)	0.392**	96.795	0.181	0.179	0.181
2. Sense of coherence	-0.165**	57.104	0.208	0.204	0.026
Excluded variables; Parent education, self esteem, OHB					

***Correlation is significant at the 0.01 level (2-tailed).*

Table 6.16 presents the best forward stepwise multiple regression model for predictors of functional limitation. Children who reported higher FL at follow-up, were those who had more FL, low SOC and caries at baseline. This model accounted for 28.1% of the variation in FL at follow-up. Several predictors; baseline symptoms, baseline self esteem, gender, parent income, parent education and parent work were tested in the model but were excluded.

Table 6.16 Best forward stepwise regression model for functional limitation at follow-up

Significant predictors	β	*F*	R^2	R^2 adjusted	R^2 change
1. Function (Baseline)	0.422**	145.738	0.250	0.248	0.250
2. Sense of coherence	-0.162**	81.302	0.272	0.268	0.022
4. Caries status	0.098*	56.726	0.281	0.276	0.010
Excluded variables; Symptoms, self esteem, gender, parent education, parent income and parent work.					

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6.17 presents the best forward stepwise multiple regression model for predictors of GHP. Children who reported better GHP at follow-up were more likely to have had better GHP and experienced less FL at baseline. This model accounted for 16.7% of the variation in GHP at follow-up. The other predictors tested but excluded were SOC, self esteem, parent income and parent education.

Table 6.17 Best forward stepwise regression model for GHP at follow-up

Significant predictors	β	*F*	R^2	R^2 Adjusted	R^2 change
1. GHP (Baseline)	0.370**	81.595	0.157	0.155	0.157
2. Functional limitation (Baseline)	-0.100*	43.574	0.167	0.163	0.009
Excluded variables; SOC, self esteem, parent income and parent education					

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6.18 presents the best forward stepwise multiple regression model for predictors of overall QOL. Children who experienced better QOL at follow-up were those who had better QOL, high SOC and filled teeth at baseline. This model accounted for 14.1% of the variation in overall QOL. The excluded predictors were GHP, self esteem, OHB, gender, parent's education, parent's income and caries status.

Table 6.18 Best forward stepwise regression model for overall quality of life at follow-up

Significant predictors	β	*F*	R^2	R^2 Adjusted	R^2 change
1. Quality of life (Baseline)	0.266**	53.783	0.110	0.108	0.110
2. Sense of coherence	0.153**	32.434	0.130	0.126	0.020
3. Filled teeth	0.109*	23.879	0.141	0.135	0.012
Excluded variables; OHB, self esteem, GHP, gender, parent education, parent income and caries status					

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

6.4 Relationships of cross sectional data between individual factors and environmental factors to predict clinical status

To assess whether there were any differences in clinical status associated with environmental factors (parent education, parent income and parent work) and individual factors (SOC, Self esteem, HLOC, OHB and gender) at baseline, a series of independent t-test were carried out.

There were significant differences between the 'caries' and 'no caries' groups in parent income. Those who had 'no caries' tended to have higher parental income.

There was also a difference in periodontal and caries groups with HLOC. Those with no caries and no periodontal problem had higher (i.e. more internal) HLOC. There were no other significant differences between groups (Table 6.19)

Table 6.19 Cross-sectional relationships between clinical status and environmental and individual factors at baseline

Independent variables (Baseline)	Caries		Periodontal		Filled Teeth		Trauma		Malocclusion	
	DT = 0	DT > 0	CPI = 0	CPI > 0	FT = 0	FT > 0	No	Yes	IOTN = 0	IOTN > 0
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean(SD)	Mean (SD)
Sense of coherence	56.171 (10.477)	57.416 (9.869)	56.160 (10.480)	56..979 (10.114)	56.155 (10.189)	57.657 (11.272)	56.377 (10.435)	55.333 (7.737)	56.360 (10.513)	56.1739 (9.391)
Self esteem	28.564 (3.369)	29.133 (3.028)	28.640 (3.452)	28.649 (2.863)	28.688 (3.277)	28.394 (3.582)	28.587 (3.318)	31.167 (3.724)	28.64 (3.362)	28.666 (3.045)
Health locus of control	31.422** (2.893)	29.983** (2..908)	31.432** (2.972)	30.494** (2.685)	31.327 (2.938)	30.697 (2.852)	31.243 (2.912)	28.833 (2.639)	31.243 (2.911)	31.066 (3.158)
Oral health beliefs	23.614 (2.715)	23.550 (3.039)	23.725 (2.660)	23.185 (3.056)	23.647 (2.682)	23.381 (3.145)	23.597 (2.767)	24.166 (2.401)	23.609 (2.778)	23.577 (2.598)
Gender	1.583 (0.494)	1.583 (0.497)	1.581 (0.494)	1.587 (0.495)	1.586 (0.493)	1.586 (0.501)	1.590 (0.492)	1.167 (0.408)	1.586 (0.493)	1.555 (0.503)
Parent education	3.873 (1.631)	3.516 (1.557)	3.883 (1.669)	3.618 (1.447)	3.830 (1.639)	3.710 (1.504)	3.812 (1.629)	4.333 (1.366)	3.800 (1.641)	4.022 (3.80)
Parent income	2.949* (1.401)	2.550* (1.395)	2.961 (1.406)	2.659 (1.384)	2.937 (1.418)	2.684 (1.319)	2.877 (1.403)	4.000 (1.265)	2.857 (1.409)	3.222 (1.347)
Parent work	1.226 (0.419)	1.233 (0.427)	1.226 (0.422)	1.216 (0.414)	1.230 (0.422)	1.223 (0.419)	1.229 (0.421)	1.167 (0.408)	1.233 (0.424)	1.177 (0.387)

Note: *t-test significant at the 0.05 level (2-tailed)

6.4.1 Regression analyses of cross sectional data between individual factors and environmental factors to predict clinical status

To determine whether individual and environmental factors predicted caries and periodontal status at baseline, a regression analysis was conducted. Children with caries and periodontal problems were those who had lower HLOC. This variable accounted for 2.8% of the variation in caries and 1.8% in periodontal status (Table 6.20).

Table 6.20 Best forward stepwise regression model for independent and dependent variables at cross sectional

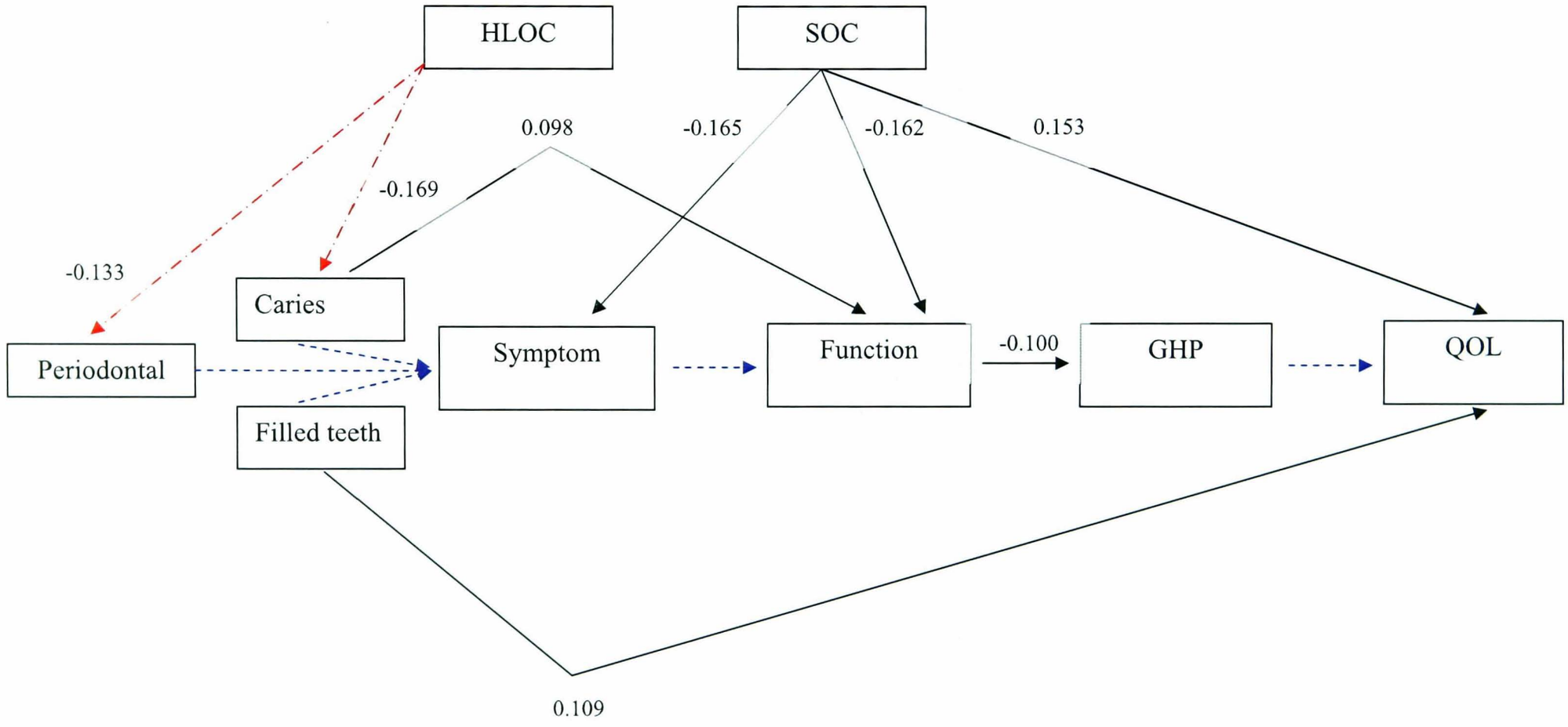
Significant predictors	β	*F*	R^2	R^2adjusted	R^2change
Caries status					
Health locus of control	-0.169**	12.792	0.028	0.026	0.028
Excluded;					
Parent income					
Periodontal status					
Health locus of control	-0.133**	7.842	0.018	0.015	0.018
Excluded;					
Parent income and OHB					

*Note: **Correlation is significant at the 0.01 level (2-tailed).*

6.4.2 Summary of significant predictors of symptom status, functional limitation, GHP and overall QOL

Figure 6.3 summarises the relationships identified in the regression models. The predictors for symptom status at follow-up were symptom and SOC at baseline. The predictors for FL at follow-up were FL, SOC and caries status at baseline. The predictors for GHP at follow-up were GHP and FL at baseline. The best predictors for overall QOL were overall QOL, SOC and filled teeth at baseline. At cross-sectional relationships, HLOC was found related to caries and periodontal status. However, no other variables were significant. Thus, clinical status and individual factors were related to subjective-experiences.

Figure 6.3 Summary of significant relationships in Wilson and Cleary model



Note: ——▶ *Relationship found to be significant, P < 0.05*

- - - ▶ *Relationship predicted by the model but not significant in this analysis, P > 0.05.*

– · – ▶ *Cross sectional analysis*

Values are the standardised estimates from the regression analysis between baseline and follow-up

6.5 Exploratory analyses of Sense of coherence

6.5.1 Bivariate relationships between SOC subscales, symptom, FL, GHP and QOL.

Antonovsky's SOC has 3 subscales: meaningfulness, comprehensibility and manageability. To assess in more detail the relationships between the SOC subscales and symptoms, FL, GHP, overall QOL and clinical status, a series of analyses were conducted as in Section 6.3 (see Table 6.21 – 6. 22).

In the bivariate analyses described in Table 6.21, children who experienced more symptoms and FL at follow-up were those who had a lower sense of meaningfulness, comprehensibility and manageability at baseline. Children who experienced better GHP and overall QOL were those who had a higher sense of meaningfulness, comprehensibility and manageability at baseline. However, none of the subscales of SOC showed significant relationships with clinical status (Table 6.22).

Table 6.21 Relationships between subscales SOC and symptom status, functional limitation, GHP and overall QOL at follow-up

Subscales SOC Baseline	Symptom Follow-up	Function Follow-up	GHP Follow-up	Overall QOL Follow-up
Meaningfulness	-0.140**	-0.225**	0.135**	0.202**
Comprehensibility	-0.212**	-0.249**	0.166**	0.205**
Manageability	-0.218**	-0.269**	0.177**	0.198**

***Correlation is significant at the 0.01 level (2-tailed)*

Table 6.22 Relationships between clinical status and subscales of SOC at baseline

Clinical Status	Meaningfulness Means (SD)	Comprehensibility Means (SD)	Manageability Means (SD)
Caries Status			
DT = 0	18.666 (3.875)	20.928 (4.920)	16.580 (4.450)
DT > 0	18.650 (4.294)	21.583 (4.770)	17.183 (4.131)
Periodontal			
CPI = 0	18.713 (3.887)	20.847 (4.853)	16.599 (4.511)
CPI > 0	18.747 (4.093)	21.618 (5.042)	16.866 (4.036)
Filled Teeth			
FT = 0	18.630 (3.796)	20.916 (4.869)	16.608 (4.406)
FT > 0	18.881 (4.546)	21.710 (4.961)	17.068 (4.413)
Malocclusion			
IOTN = 0	18.738 (3.952)	21.038 (4.937)	16.583 (4.414)
IOTN > 0	17.977 (3.702)	20.844 (4.612)	17.355 (4.344)
Trauma			
No	18.648 (3.928)	21.060 (4.896)	16.668 (4.422)
Yes	19.833 (4.579)	18.500 (5.206)	17.000 (3.406)

6.5.2 Regression analyses using the SOC subscales

To determine which subscales of SOC best predicted clinical status, symptom status, FL, GHP and overall QOL, a lagged analysis via forward stepwise multiple regression was performed. Only baseline subscales of SOC that correlated with symptom status, FL, GHP and overall QOL with coefficients of less than 0.2 were tested in the model.

Table 6.23 presents the best forward stepwise multiple regression model for the subscales SOC predicting symptom status, FL, GHP and overall QOL. Children who experienced higher symptoms at follow-up were those who had lower sense of manageability and comprehensibility at baseline. The model accounted for 6% of the variation in symptom status. Children with more FL at follow-up were those who had lower sense of meaningfulness, comprehensibility and manageability. The model accounted for 10.1% of the variation in FL. Children with better GHP at follow-up were those who had high sense of manageability. The model accounted for 3.1% of the variation in GHP. Children with better overall QOL at follow-up were those who had higher sense of meaningfulness and comprehensibility at baseline. This model accounted for 6.2% of the variation in overall QOL. However, subscales of SOC were unrelated to clinical variables.

Table 6.23 Best forward stepwise models for SOC subscales at baseline with symptom status, functional limitation, GHP and overall QOL at follow-up in lagged analyses

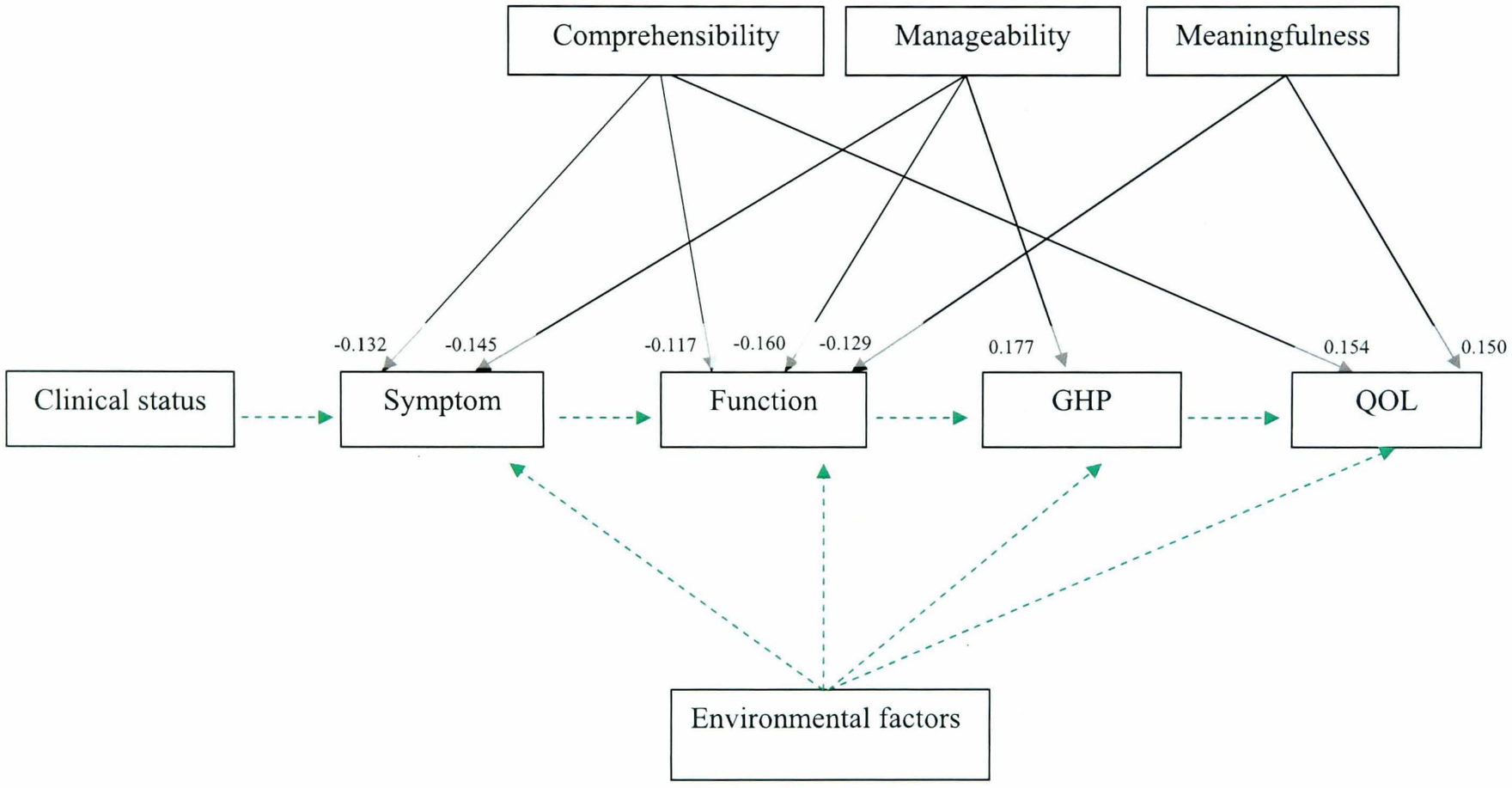
Predictors (Baseline)	B	*F*	R^2	R^2 Adjusted	R^2 Change
Symptoms					
1. Manageability	-0.145**	21.848	0.048	0.045	0.048
2. Comprehensibility	-0.132**	13.866	0.060	0.055	0.012
Functional limitation					
1. Manageability	-0.160**	34.798	0.073	0.070	0.073
2. Meaningfulness	-0.129**	21.802	0.092	0.088	0.020
3. Comprehensibility	-0.117**	16.557	0.101	0.095	0.009
General health perception					
1. Manageability	0.177**	14.174	0.031	0.029	0.031
Overall QOL					
1. Comprehensibility	0.154**	19.197	0.042	0.040	0.042
2. Meaningfulness	0.150**	14.362	0.062	0.058	0.020

****Correlation is significant at the 0.01 level (2-tailed).*

6.5.3 Summary of key significant relationships of the SOC subscales

SOC subscales at baseline explained variation in symptom status, FL, GHP and overall QOL at follow-up but were not related to clinical variables. Symptom status was predicted by sense of manageability and comprehensibility. Functional limitation was predicted by manageability, meaningfulness and comprehensibility. GHP was only predicted by manageability. Overall QOL was determined by the sense of meaningfulness and comprehensibility (Figure 6.4).

Figure 6.4 Summary of significant relationships with the SOC subscales in the Wilson and Cleary model



Note: —— *Relationship found to be significant, P < 0.05*

- - -▶ *Relationship not tested in this section*

Values are the standardised estimates from the regression analysis between baseline and follow-up

6.6 Exploratory analyses of Child Perception Questionnaire (CPQ*11-14*)

6.6.1 Bivariate relationships between of CPQ*11-14* subscales, individual factors environmental factors and clinical status

CPQ*11-14* has four subscales; symptom status, FL, EWB and SWB. The validity of the model were treating each scale separately, was tested using the statistical analyses adopted in section 6.3.

The analysis for symptoms was reported in section 6.3.1 (Tables 6.7 and 6.8). Children who reported higher follow-up symptoms were those who had higher symptoms and lower SOC, lower self esteem, whose parents were less educated at baseline. There was no association detected between clinical status and symptoms.

In bivariate analyses, children with higher scores on the FL subscale of CPQ*11-14* at follow-up were those who had experienced higher symptoms, FL, EWB and SWB at baseline. They also had lower SOC and lower self esteem. Similar trends were also noted with boys (p-value = 0.084) and those whose parents were less educated (p-values = 0.064) and working at baseline (p-value = 0.060) (Table 6.24). However, no significant association was detected between FL and other aspects of clinical status. (Table 6.25)

Table 6.24 Relationships between FL at follow up (CPQ*11-14* subscale) individual and environmental factors in lagged bivariate analyses.

Independent variables (Baseline)	r-value
Individual factors	
Gender	0.084
Sense of coherence	-0.191**
Self esteem	-0.097*
Health locus of control	0.020
Oral health beliefs	-0.031
Environmental factors	
Parent education	-0.088
Parent income	-0.046
Parent work	0.090
Baseline	
Symptom status (CPQ*11-14* subscales)	0.281**
FL (CPQ*11-14* subscales)	0.359**
EWB (CPQ*11-14* subscales)	0.278**
Social wellbeing (CPQ*11-14* subscales)	0.289**

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed)*

Table 6.25 FL (CPQ*11-14* subscales) at follow-up by clinical status at baseline

Clinical Status	Means (SD)
Caries Status	
DT = 0	4.894 (4.088)
DT > 0	5.150 (4.693)
Periodontal Diseases	
CPI = 0	4.836 (4.052)
CPI > 0	5.268 (4.572)
Filled Teeth	
FT = 0	4.936 (4.129)
FT > 0	5.013 (4.411)
Malocclusion	
IOTN = 0	4.863 (4.079)
IOTN > 0	5.755 (4.881)
Trauma	
No	4.960 (4.165)
Yes	3.666 (4.633)

Children who reported higher EWB scores at follow-up were more likely to be boys who had higher baseline EWB, symptoms, functional limitation, SWB, lower SOC, low and self esteem and who came from less educated families (Table 6.26). Similar trends were also noted among those who had working parents (p-value= 0.051). No significant associations were detected between EWB at follow-up and baseline clinical status (Table 6.27).

Table 6.26 Relationships between EWB (CPQ*11-14* subscales), individual and environmental factors in lagged analyses

Independent variables (Baseline)	r-value
Individual factors	
Gender	0.162**
Sense of coherence	-0.345**
Self esteem	-0.167**
Health locus of control	-0.006
Oral health beliefs	-0.028
Environmental factors	
Parent education	-0 .121*
Parent income	-0.051
Parent work	0.093
Baseline	
Symptom status (CPQ*11-14* subscales)	0.289**
FL (CPQ*11-14* subscales)	0.351**
EWB (CPQ*11-14* subscales)	0.459**
Social wellbeing (CPQ*11-14* subscales)	0.371**

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed)*

Table 6.27 EWB (CPQ*11-14* subscales) at follow-up by clinical status at baseline

Clinical Status	Means (SD)
Caries Status	
DT = 0	9.767 (5.907)
DT > 0	10.816 (5.271)
Periodontal Diseases	
CPI = 0	9.801 (5.747)
CPI > 0	10.268 (6.313)
Filled Teeth	
FT = 0	9.861 (5.773)
FT > 0	10.131 (6.178)
Malocclusion	
IOTN = 0	9.903 (5.798)
IOTN > 0	9.977 (6.170)
Trauma	
No	9.946 (5.852)
Yes	7.000 (3.742)

Children who reported higher SWB at follow-up were those who experienced higher baseline SWB, EWB, functional limitation and symptoms and lower SOC. They were likely to be less educated, low income and working parents (Table 6.28). They also had caries (Table 6.29). Similar trends were also noted among children who had low HLOC *p*-value = 0.095) and low self esteem (*p*-value = 0.076) (Table 6.28).

Table 6.28 Relationships between SWB (CPQ*11-14* subscale), individual and environmental factors in lagged analyses

Independent variables (Baseline)	r-value
Individual factors	
Gender	-0.027
Sense of coherence	-0.262**
Self esteem	-0.085
Health locus of control	-0.080
Oral health beliefs	-0.065
Environmental factors	
Parent education	-0.177**
Parent income	-0.128**
Parent work	0.115*
Baseline	
Symptom status (CPQ*11-14* subscales)	0.282**
FL (CPQ*11-14* subscales)	0.314**
EWB (CPQ*11-14* subscales)	0.347**
Social wellbeing (CPQ*11-14* subscales)	0 463**

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

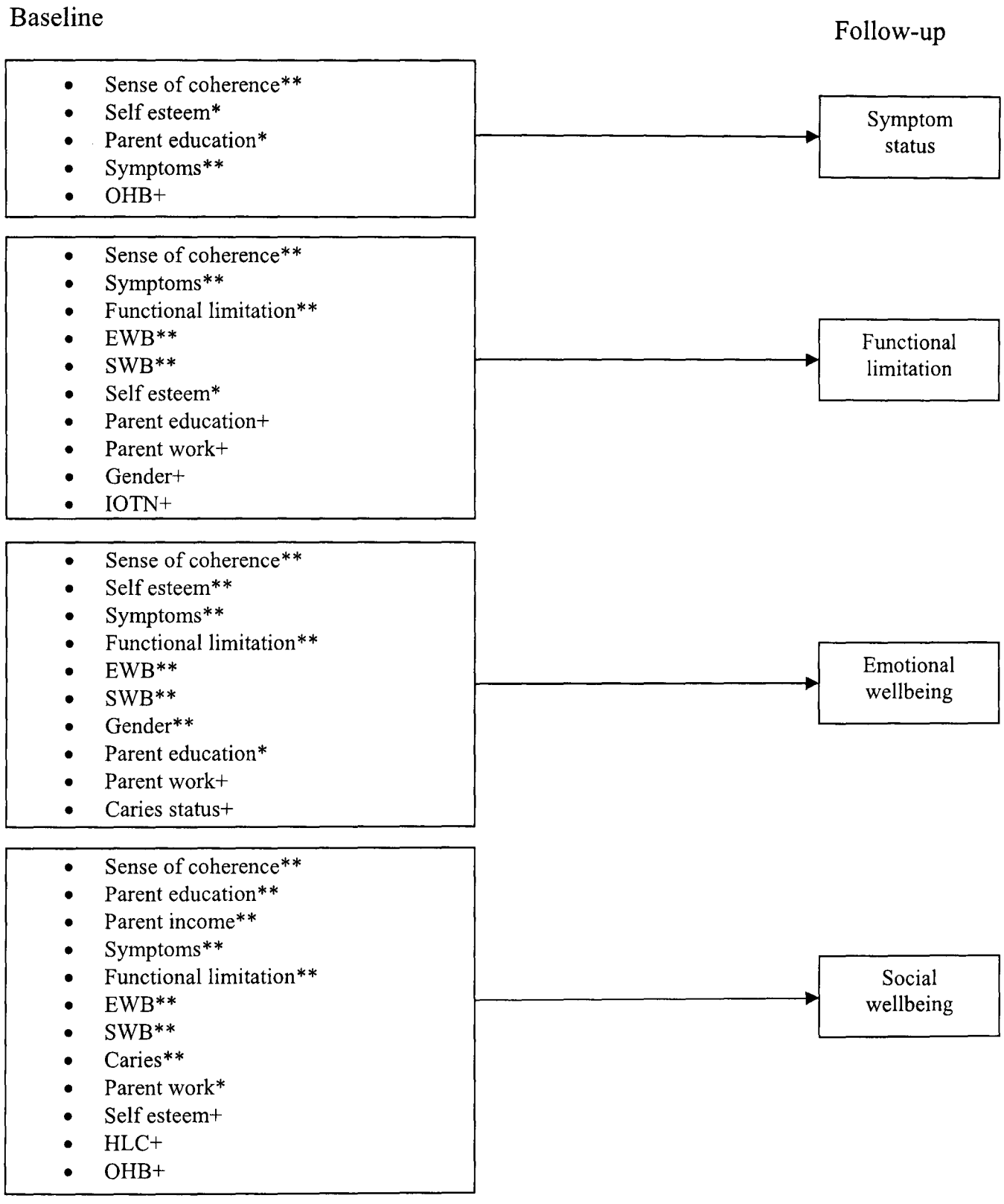
Table 6.29 SWB (CPQ*11-14* subscales) at follow-up by clinical status at baseline

Clinical Status	Means (SD)
Caries Status	
DT = 0	9.245 (6.578)**
DT > 0	11.750 (6.511)**
Periodontal Diseases	
CPI = 0	9.502 (6.727)
CPI > 0	9.886 (6.243)
Filled Teeth	
FT = 0	9.455 (6.565)
FT > 0	10.315 (6.875)
Malocclusion	
IOTN = 0	9.629 (6.526)
IOTN > 0	9.222 (7.440)
Trauma	
No	9.562 (6.621)
Yes	11.333 (7.312)

6.6.2 Summary of key relationships of CPQ*11-14* subscales in bivariate analyses

In bivariate analysis, symptom status at follow-up was associated with SOC, self esteem, parent education, symptom status at baseline (Figure 6.5). Functional limitation at follow-up was associated with SOC, self esteem, symptom status, FL, EWB and SWB at baseline. Similar trends were noted with parent work, parent education and gender. Emotional wellbeing at follow-up was associated with gender, SOC, self esteem, parent education, EWB, SWB, FL and symptoms at baseline. Similar trends were noted with parent work. Social wellbeing at follow-up was associated with caries, SOC, parent education, parent work status, parent income, SWB, EWB, FL and symptoms at baseline. Similar trends noted with HLOC and self esteem. These variables are tested in multiple regression models in the next section.

Figure 6.5 Summary of key significant relationships with subscales of CPQ*11-14*



** *Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*
+ Correlation < 0.2 (2-tailed)

6.6.3 Regression analyses using subscales of CPQ*11-14*

To better determine the potential value of the subscales of CPQ*11-14*, lagged analyses via forward stepwise multiple regression models were performed. Only baseline independent variables that correlated with subscales of CPQ*11-14* at follow-up with a *p*-value less 0.2 in the bivariate analyses were tested in the models.

Table 6.30 presents the best regression model for predictors of symptom status at follow-up. Children who reported higher symptoms at follow-up were those who had higher symptoms and lower SOC at baseline. This model accounted for 20.8% of the variation in symptoms status at follow-up. Parent education, self esteem and OHB were tested in the model but were not significant. (Table 6.30 is the same as 6.15)

Table 6.30 Best forward stepwise regression model for symptoms (CPQ*11-14* subscales) at follow-up

Significant predictors	B	*F*	R^2	R^2 Adjusted	R^2 change
1. Symptoms (Baseline)	0.392**	96.795	0.181	0.179	0.181
2. Sense of coherence	-0.165**	57.104	0.208	0.204	0.026
Excluded variables; Parent education, self esteem, OHB					

***Correlation is significant at the 0.01 level (2-tailed).*

Table 6.31 presents the best forward stepwise multiple regression model for predictors of the FL subscale. Children who experienced higher FL at follow-up were those who had high IOTN need, low SOC, high symptoms and FL at baseline. This model accounted for 16.4% of the variation in the follow-up FL. The excluded predictors were EWB, SWB, self esteem, parent education, parent work and gender.

Table 6.31 Best forward stepwise regression models for function (CPQ_{11-14} subscales) at follow-up

Significant predictors	B	*F*	R^2	R^2 adjusted	R^2 Change
1. FL (Baseline)	0.292**	68.142	0.135	0.133	0.135
2. Sense of coherence	-0.098**	37.338	0.146	0.142	0.011
3. IOTN	0.100**	26.692	0.155	0.150	0.009
4. Symptoms (Baseline)	0.113**	21.362	0.164	0.157	0.009
Excluded variables; EWB, SWB, self esteem, Parent education, Parent work and Gender					

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6.32 presents the best forward stepwise multiple regression model for predictors of the EWB. Children who experienced higher EWB at follow-up were more likely to be boys and have higher EWB, higher functional limitation and low SOC at baseline. This model accounted for 27.6% of the variation in the follow-up EWB. The excluded predictors were baseline self esteem, symptoms, SWB, parental education, parent work and caries status.

Table 6.32 Best forward stepwise regression models for EWB (CPQ_{11-14} subscales) at follow-up

Significant predictors	β	*F*	R^2	R^2 Adjusted	R^2 change
1. EWB (Baseline)	0.295**	116.441	0.210	0.209	0.210
2. Sense of coherence	-0.207**	73.177	0.251	0.248	0.041
3. Functional limitation (Baseline)	0.146**	52.013	0.264	0.259	0.013
4. Gender	0.113**	41.452	0.276	0.270	0.012
Excluded variables; Self esteem, symptoms, SWB, parent education, parent work and caries.					

***Correlation is significant at the 0.01 level (2-tailed).*

Table 6.33 presents the best forward stepwise multiple regression models for predictors of SWB. Children who had high impact of SWB at follow-up were those who had high impact of SWB, higher symptoms, low SOC, came from less educated families and had more caries at baseline. This model accounted for 25.9% of the variation in the follow-up SWB. The excluded predictors were parent work status, parent income, self esteem, HCL and OHB at baseline.

Table 6.33 Best forward stepwise regression models for SWB (CPQ*11-14* subscales) at follow-up

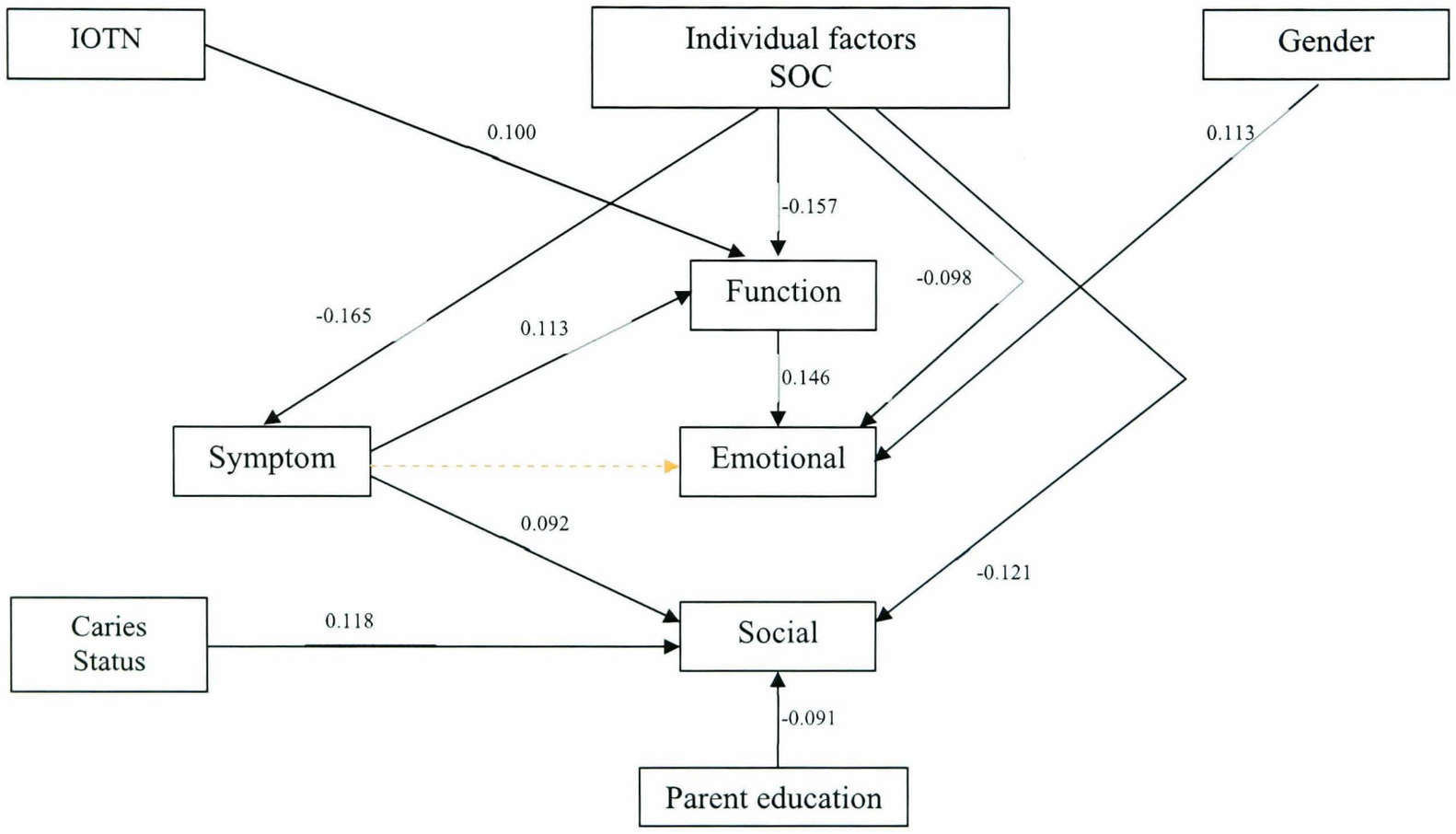
Significant predictors	B	*F*	R^2	R^2 Adjusted	R^2 Change
1. SWB (Baseline)	0.367**	118.990	0.214	0.212	0214
2. Caries status	0.118**	64.598	0.229	0.225	0.015
3. Sense of coherence	-0.121**	46.751	0.244	0.239	0.015
4. Parent education	-0.091**	36.539	0.252	0.245	0.008
5. Symptoms (Baseline)	0.092**	30.238	0.259	0.250	0.007
Excluded variables; Parent income, FL, EWB, parent work, self esteem, HCL and OHB					

***Correlation is significant at the 0.01 level (2-tailed).*

6.6.4 Summary of significant predictors of subscales CPQ*11-14*

Symptoms at follow-up were predicted by symptoms and SOC at baseline. Functional limitation at follow-up was predicted by FL, symptoms, SOC, IOTN at baseline. Emotional wellbeing was predicted by EWB, SOC, FL and gender at baseline. Social well being was predicted by caries status, SOC, parent education, symptoms and SWB at baseline (Figure 6.6).

Figure 6.6 Summary of relationships between CPQ*11-14* subscale, individual, environmental factors and clinical factors.



Note: ***Relationship found to be significant, P < 0.05***
Relationship predicted by the model but not significant in this analysis, P > 0.05.
Values are the standardised estimates from the regression analysis between baseline and follow-up

6.7 Relationships between OHRQOL (Total CPQ*11-14*), clinical factors, individual factors, environmental factors at baseline influencing OHRQOL, GHP and overall QOL at follow-up

The Wilson and Cleary model is derived from theory, it separates symptom status from functional status. However, the separate subscales of CPQ*11-14*, including both symptom status and FL (include of FL, EWB and SWB) can be aggregated to create a single score for OHRQOL. This approach essentially aggregates these two stages of the Wilson and Cleary (1995) model.

To test the validity of this simplified model, that is whether clinical factors, individual and environmental factors influenced OHRQOL and then whether OHRQOL predicted GHP and overall QOL at follow-up, the earlier analytic strategy was adopted, but using total CPQ*11-14*.

6.7.1 Relationship between clinical factors, individual and environmental factors at baseline influencing OHRQOL (Total CPQ*11-14*) at follow-up

Tables 6.34 and 6.35 present the correlations between independent variables (clinical status, individual factors, environmental factors and OHRQOL) at baseline and OHRQOL at follow-up. Children who experienced lower OHRQOL at follow-up were those who had low OHRQOL, low SOC, low self esteem, parents that worked and were less educated at baseline. Similar trends were also noted with parental income (p-value = 0.053) and caries status p-values = 0.063). No significant associations were detected between OHRQOL at follow-up and clinical status (Table 6.35).

6.7.2 Relationship between clinical factors, individual factors, environmental factors and OHRQOL at baseline (Total CPQ*11-14*) influencing GHP at follow-up.

Tables 6.36 and 6.37 present the correlations between independent variables at baseline and GHP at follow-up. Children who reported better GHP at follow-up had better GHP, better OHRQOL, high SOC, high self esteem at baseline. Similar trends also noted with those who came from higher educated families (p-value = 0.097). No associations were detected between GHP and clinical status (Table 37).

Table 6.34 Relationships between independent variables and OHRQOL (Total CPQ$_{11-14}$) in lagged analyses.

Independent variables (Baseline)	r-value
Individual factors	
Gender	0.067
Sense of coherence	-0.325**
Self esteem	-0.140**
Health locus of control	-0.029
Oral health beliefs	-0.056
Environmental factors	
Parent education	-0.157**
Parent income	-0.092
Parent work	0.103*
Baseline	
OHRQOL (Total CPQ$_{11-14}$)	0.512**

** *Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6.35 OHRQOL (Total CPQ$_{11-14}$) at follow-up by clinical status at baseline

Clinical Status	Mean (SD)
Caries Status	
DT = 0	30.372 (16.460)
DT > 0	34.600 (15.539)
Periodontal Diseases	
CPI = 0	30.663 (16.197)
CPI > 0	31.958 (17.081)
Filled Teeth	
FT = 0	30.680 (16.222)
FT > 0	32.378 (17.353)
Malocclusion	
IOTN = 0	30.885 (15.974)
IOTN > 0	31.511 (19.824)
Trauma	
No	30.995 (16.434)
Yes	27.000 (14.670)

Table 6.36 Relationships between GHP at follow-up with individual factors, environmental factors, GHP and OHRQOL (Total CPQ$_{11-14}$) at baseline in lagged analyses

Independent variables (Baseline)	r-value
Individual factors	
Gender	0.001
Sense of coherence	0.205**
Self esteem	0.186**
Health locus of control	0.035
Oral health beliefs	0.035
Environmental factors	
Parent education	0.079
Parent income	0.061
Parent work	-0.025
Baseline	
GHP	0.397**
OHRQOL (Total CPQ$_{11-14}$)	-0.208**

***Correlation is significant at the 0.01 level (2-tailed).*

Table 6.37 General health perception at follow-up by clinical status at baseline

Clinical Status	Mean (SD)
Caries Status	
DT = 0	16.889 (2.711)
DT > 0	16.883 (3.360)
Filled teeth	
FT = 0	16.850 (2.761)
FT > 0	17.118 (3.024)
Periodontal Diseases	
CPI = 0	16.862 (2.813)
CPI > 0	16.979 (2.784)
Malocclusion	
IOTN = 0	16.868 (2.744)
IOTN > 0	17.066 (3.313)
Trauma	
No	16.886 (2.813)
Yes	16.833 (2.563)

6.7.3 Relationship between clinical, individual and environmental factors and OHRQOL (Total CPQ*11-14*) at baseline influencing overall QOL at follow-up.

Tables 6.38 and 6.39 present the correlations between independent variables at baseline and overall QOL at follow-up. Children who reported better overall QOL at follow-up were those with high SOC, high self esteem, better overall QOL, better OHRQOL, more FT, came from high income families and had high OHB at baseline. Similar trends were noted with parental education level (*p*-value = 0.054) (Table 6.38).

Table 6.38 Relationships between overall QOL at follow-up with individual factors, environmental factors and OHRQOL (Total CPQ*11-14*) at baseline in lagged analyses

Independent variables (Baseline)	r-value
Individual factors	
Gender	0.073
Sense of coherence	0.257**
Self esteem	0.160**
Health locus of control	0.001
Oral health beliefs	0.114*
Environmental factors	
Parent education	0.092
Parent income	0.113*
Parent work	-0.006
Baseline	
Quality of life	0.331**
General health perception	0.072
OHRQOL (Total CPQ *11-14*)	0.145**

*** Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

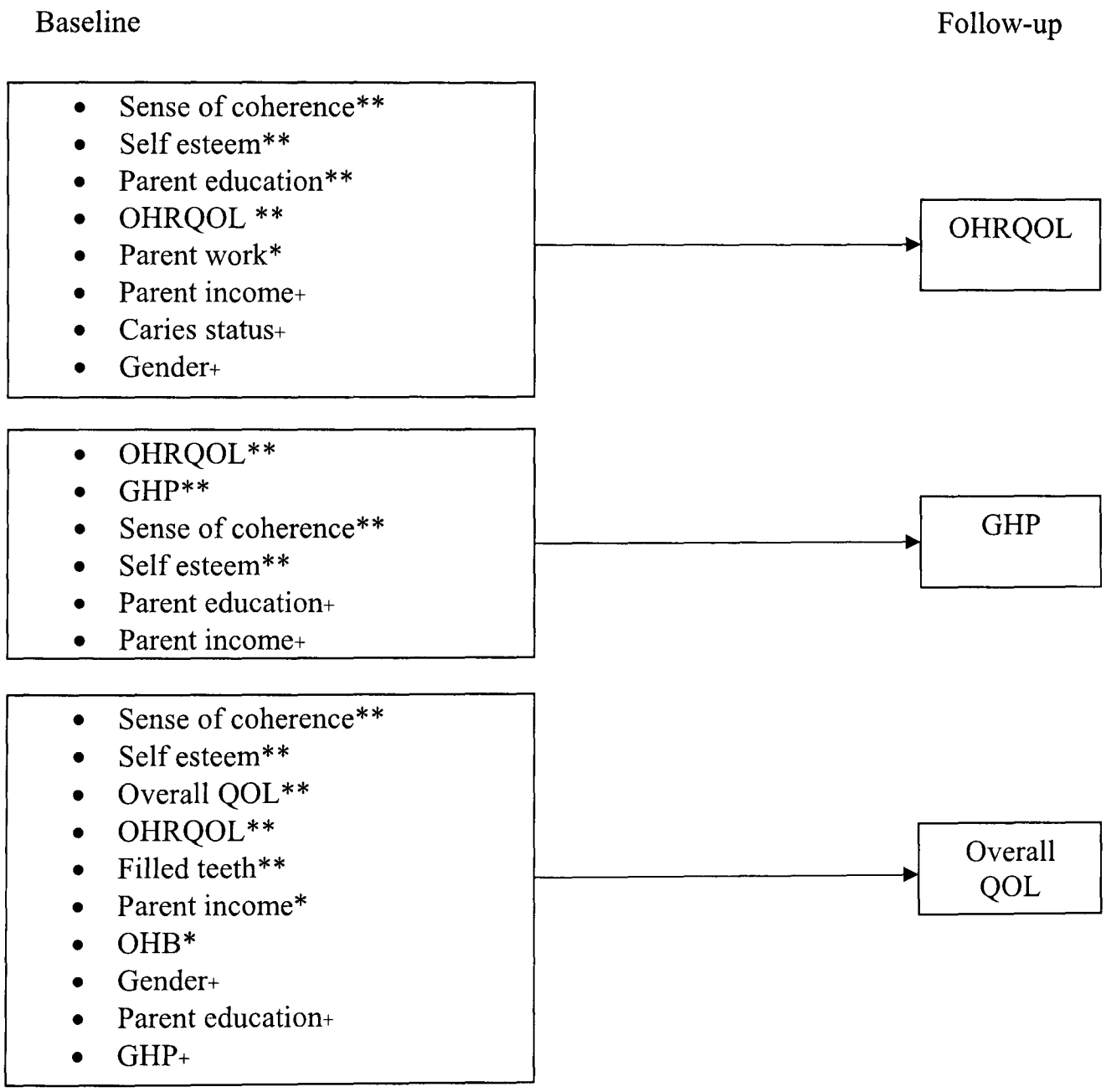
Table 6.39 Overall QOL at follow-up by clinical status at baseline

Clinical Status	Mean (SD)
Caries Status	
DT = 0	25.715 (4.445)
DT > 0	26.416 (4.093)
Filled teeth	
FT = 0	25.57 (4.385)*
FT > 0	26.815 (4.350)*
Periodontal Diseases	
CPI = 0	25.730 (4.591)
CPI > 0	26.092 (3.660)
Malocclusion	
IOTN = 0	25.751 (4.361)
IOTN > 0	26.333 (4.753)
Trauma	
No	25.805 (4.403)
Yes	25.666 (4.885)

6.7.4 Summary of key relationship of OHRQOL (Total CPQ$_{11-14}$)

In bivariate analyses, OHRQOL at follow-up was associated with OHRQOL, SOC, self esteem, parent education, parent work at baseline. GHP at follow-up was associated with OHRQOL, GHP, SOC and self esteem. Overall QOL was associated with SOC, self esteem, Overall QOL, OHRQOL, FT, parent income and OHB. Thus OHRQOL at follow-up was associated with OHRQOL, GHP and overall QOL at baseline.

Figure 6.7 Summary of key relationships significant in bivariate analyses of OHRQOL



*** Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*
+ Correlation < 0.2 (2-tailed)

6.7.5 Regression analyses between clinical status, individual factors, environmental factors and OHRQOL (Total CPQ$_{11-14}$) at baseline with OHRQOL (Total CPQ$_{11-14}$) at follow-up.

To determine the potential association of OHRQOL with clinical status, health perception, overall QOL, individual factors and environmental factors, lagged analyses via forward stepwise regression models were performed. Table 6.40 presents the best predictors of OHRQOL. Only baseline independent variables that correlated with follow-up dependent variables with *p*-values less than 0.2 in the bivariate analyses were entered in the models.

Children who experienced lower OHRQOL at follow-up were those who had lower OHRQOL, lower SOC and have had caries. This model accounted for 29.4% of the variation in the follow-up OHRQOL. The excluded predictors were parent education, parent work, parent income, self esteem and gender.

Table 6.40 Best forward stepwise regression models for OHRQOL (Total CPQ$_{11-14}$) at follow-up

Significant predictors	B	*F*	R^2	R^2 Adjusted	R^2 change
1. Baseline OHRQOL	0.451**	155.059	0.262	0.260	0.262
2. Sense of coherence	-0.167**	86.893	0.285	0.282	0.023
3. Caries status	0.092**	60.245	0.294	0.289	0.009
Excluded variables; Parent income, parent education parent work, self esteem and gender					

*** Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

6.7.6 Regression analyses of GHP at follow-up with OHRQOL (Total CPQ$_{11-14}$) at baseline

Table 6.41 presents the best forward stepwise multiple regression models for predictors of GHP. General health perception at follow-up was predicted by OHRQOL (Total CPQ$_{11-14}$) and GHP at baseline. This model accounted for 16.9% of the variation in the follow-up GHP. The excluded predictors were parent education, parent income, self esteem and SOC.

Table 6.41 Best forward stepwise regression models for GHP at follow-up

Significant predictors	β	*F*	R^2	R^2 Adjusted	R^2 change
1. GHP (Baseline)	0.367**	81.595	0.157	0.155	0.157
2. OHRQOL	-0.110*	44.183	0.169	0.165	0.011
Excluded variables; Parent income, parent education, SOC and self esteem.					

*** Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

6.7.6 Regression analyses of overall QOL at follow-up with OHRQOL (Total CPQ$_{11-14}$) at baseline

Table 6.42 presents the best forward stepwise multiple regression models for predictors of Overall QOL. Children who reported better overall QOL at follow-up, were those with better overall QOL, high SOC and filled teeth at baseline. This model accounted for 14.1% of the variation in the follow-up overall QOL. The excluded predictors were OHRQOL, GHP, self esteem, OHB, gender, parent education and parent income.

Table 6.42 Best forward stepwise regression model for overall quality of life at follow-up

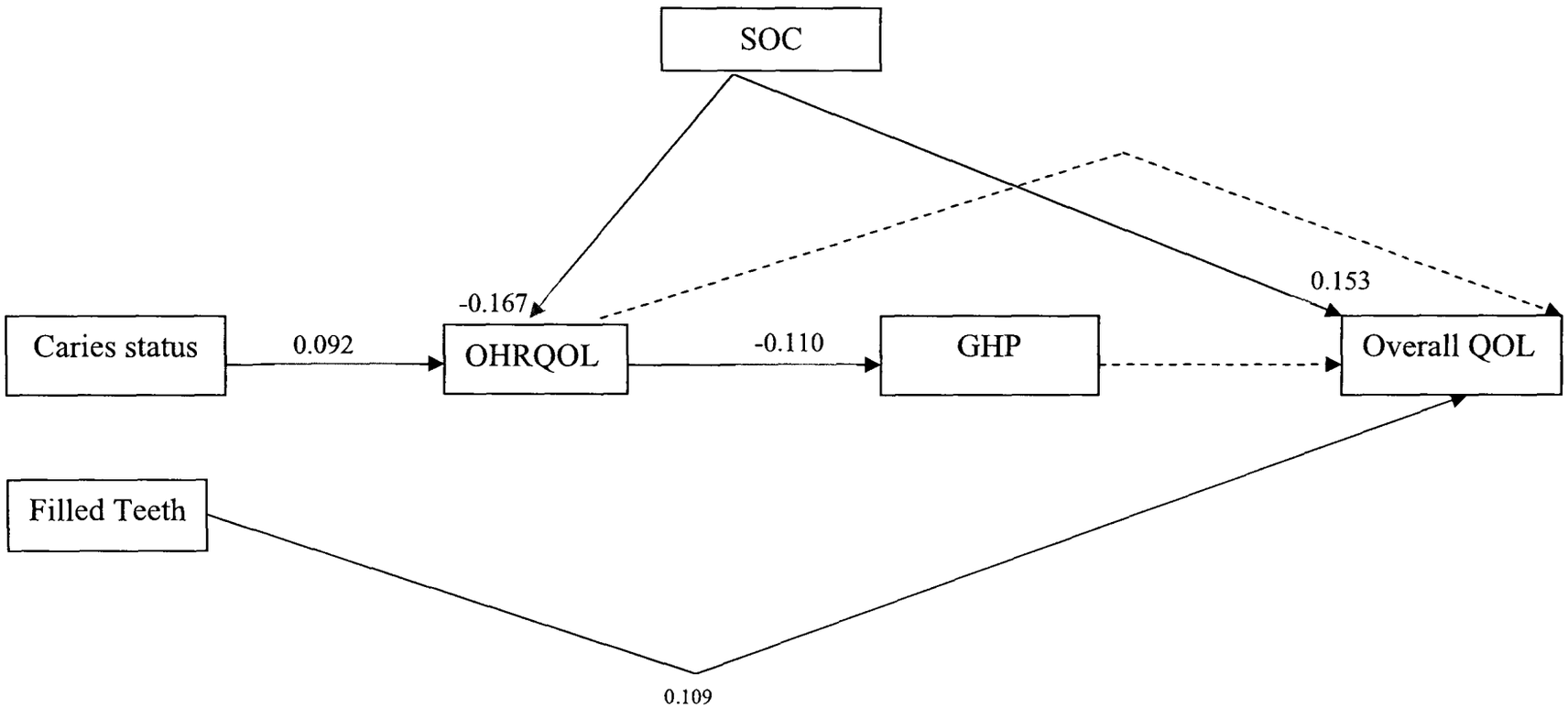
Significant predictors	B	*F*	R^2	R^2 Adjusted	R^2 change
1. Quality of life (Baseline)	0.266**	53.783	0.110	0.108	0.110
2. Sense of coherence	0.153**	32.434	0.130	0.126	0.020
3. Filled Teeth	0.109*	23.879	0.141	0.135	0.012
Excluded variables; OHRQOL, GHP, self esteem, OHB, gender, parent education and parent income					

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

6.7.7 Summary of significant predictors of OHRQOL (Total CPQ$_{11-14}$)

From exploratory analyses the findings suggest that individual factors and clinical status influenced children's OHRQOL (Figure 6.8). The OHRQOL at follow-up was predicted by OHRQOL, caries status and SOC at baseline. The GHP at follow-up was predicted by GHP and OHRQOL at baseline. Overall QOL at follow up was predicted by QOL, SOC and filled teeth at baseline.

Figure 6.8 Overall summary of key relationships in Wilson and Cleary model



Note: ——— ***Relationship found to be significant, P < 0.05***

..... ***Relationship predicted by the model but not significant in this analysis, P > 0.05.***

CHAPTER SEVEN

DISCUSSION

7.1 Introduction

This research examined the determinants of children's OHRQOL using the Wilson and Cleary (1995) model as the principle guide and lagged forward stepwise multiple regression modelling. The aim of the research was to test prospectively the relationships between clinical factors, symptom status, functioning, general health perceptions and overall well-being and to examine whether environmental and individual factors influence children's OHRQOL and the key relationships identified within the Wilson and Cleary (1995) model.

The findings did not strongly support the main tenets of the model. That is, clinical factors did not predict symptoms, symptoms did not predict functional status; functional status did predict general health perceptions but general health perception did not predict overall QOL. The data did support Wilson and Cleary's hypotheses that individual factors would influence individual subjective feelings. Specifically, SOC predicted symptoms, functional limitation and overall QOL. The exploratory analyses using the total CPQ$_{11\text{-}14}$ also revealed SOC was a predictor of OHRQOL. There were also relationships between caries and functional status and between filled teeth and overall QOL that deserve further clarification. In cross-sectional analysis, HLOC was the only factor that predicted clinical status.

The discussion of these findings is divided into five parts; Section 7.2 considers relationships between clinical and non-clinical factors as hypothesised within the Wilson and Cleary model. Section 7.3 discusses the individual and environmental factors influences on children's OHRQOL and key relationships identified within the model. Section 7.4 will includes a brief discussion of factors found not to play a significant role in the study (self esteem, HLOC, OHB, gender, parent income, parent education and parent work status). Section 7.5 briefly noted the overall conclusion. Section 7.6 considers the methodological issues and possible limitations of the research. A subsequent chapter

summarises the conclusions and recommendations arising from these findings, concerning their use in policy and future research.

7.2 The relationship between clinical factors with symptoms, functional limitation, GHP and overall QOL.

The current study aimed to test relationships between clinical variables, symptoms status, functional limitation, GHP and overall QOL as hypothesised within the Wilson and Cleary (1995) model of patient outcomes.

This study found that the direct linear relationships, between clinical factors, symptoms, functional status, GHP and overall QOL were broadly unsubstantiated. There were however, relationships, including caries with functional limitation, filled teeth with overall QOL and as predicted between FL and GHP.

The relationship, in which less functional limitation predicted better GHP was hypothesised by the model. One appropriate explanation of this apparent relationship maybe the good quality measures for FL and GHP which were valid and reliable. The exploratory analysis also provided similar findings, whereby OHRQOL (the total scores of CPQ$_{11-14}$ that included all the subscales) was associated with GHP. It may be that the excellent qualities of these measures permitted these expected relationships to be detected.

The lack of other apparent linear relationships support the distinction between clinical status and subjective oral health outcomes (SOHO) (in this section subjective oral health outcomes include symptoms, functional limitation, GHP and overall QOL, whereas symptoms and functional limitation are referred to as OHRQOL since exploratory analyses also combined the scores of both symptoms and functional subscales derived from CPQ$_{11-14}$). Other previous research shares similar findings; at best some showed weak associations between clinical and subjective outcomes in children or adults (Locker and Slade 1994; Slade *et al* 1996; Foster-Page *et al* 2005; Robinson *et al* 2005).

The lack of apparent association between clinical status and subjective factors may be explained in several ways. These include the low prevalence of disease; the types of

diseases tested in the model which were not life-threatening; the model used was not suitable for a general population, rather it was a disease model; the study's exclusion criteria; the differences of concepts; the impacts of other factors, for example individual and environmental factors and finally, measurement error could also obscure possible relationships in the model. The method of analysis employed and children's understanding could also mask any relationship. Detailed discussion concerning these related issues follows.

Prevalence of disease

One explanation for the lack of relationship between clinical factors and subjective oral health outcomes is the 'low' disease levels in the present study. The distribution of dental diseases was skewed with the vast majority of the participant caries free (72%). They were a clinically healthy population. The level of dental disease (DMFT=0.499) is considered low according to the WHO standard (Petersen 2003). Such a low disease level will limit the impacts within the Wilson and Cleary (1995) model. Thus, the potential influence of clinical factors on subjective oral health outcomes would be limited.

The clinical status of participants is in accordance with the declining trends of dental diseases in Malaysia. The contributing factors for the decline pattern include extensive water fluoridation (NOHSS 1997) whereby almost 74% of the Malaysian community have received fluoridated water since 1972 (OHD MOH 1997). In Selangor, a large majority (99.9%) of the population receives fluoridated water supply (Norain and Norlida 2009). There is also widespread use of fluoridated dentifrice in Malaysia since the late 1970s, which could have further contributed to the decline of dental caries.

The low level of disease experienced in the community may also be due to the school dental program (SDS). SDS was introduced in 1985 and involves all school children in Malaysia. The principle thrust is the incremental dental care programme (ICDP) for schoolchildren through an integrated network with the health care facilities throughout the country. It incorporates the outreach programme operated by mobile dental team to ensure access to dental care. This programme focuses on oral health promotion and prevention of

oral diseases. Thus, a comprehensive fissure sealant program was introduced in 1999 (OHD MOH 2005). The topical fluoride application was highly recommended to the high risk children. Treatment was also provided for the children with dental diseases. Hence, the active disease levels are now low throughout Peninsular Malaysia (D=0.4 NOHSS 1997 and D=0.499 in this study). There are pockets of very low disease. For example, a recent study conducted in Kota Tinggi, Johor, the overall annual caries increment was very low at 0.19 among 12 year-old schoolchildren (Tan *et al* 2006).

There are grounds for concern though that the low diseases detected in the current study could be due to the study criteria, which may have excluded children with disease. The inclusion criteria favoured those who can read and understand the questionnaire, thereby excluding children with low literacy. Low literacy was found directly linked to poor health in developed nations. Low literacy (poor comprehension and inability to read) was associated with adverse health effects and associated to negative health outcomes (Gazmararian *et al* 1999). In Malaysia, low SES (measured by literacy and occupation status) is associated with poorer health among elderly regardless of ethnicity (Wu and Rudkin 2000). The same concern has been found with oral health in Scotland (Jones *et al* 2007). There are no studies that have associated oral health status with low literacy available locally as yet. Therefore, this possible concern is based on an assumption only.

Several studies from other countries have also investigated relationships between clinical factors and subjective oral health outcomes involving low disease populations of 12 year-olds. For example, studies in Brazil (Barbosa *et al* 2009), Thailand (Gururatana 2008) and the UK (Marshman *et al* 2005) found no relationship. In contrast, Robinson and colleagues (2005) did detect a weak association between caries and fluorosis status on OHRQOL despite a mean DMFT of only 0.68 among Ugandan children. It is possible that a larger sample would have generated significant relationships in the present study. Foster-Page and colleagues (2005) used a larger sample in New Zealand but found only weak associations. This could also be because there were higher disease levels in New Zealand whereby almost three-quarters of the sample had caries experience (DMFS >0). This is similar to the situation in Canada (Jokovic *et al* 2002) where an association was found in a high diseased

population (53% had untreated caries) of children attending a specialist clinic, some of whom had chronic conditions and severe dental disease.

A local study conducted by Jaafar (1999) also confirmed that clinical status predicts impact. Children whom were rendered orally fit were less likely to have symptoms than those with diseases ('Oral fitness' was defined as the state of oral health in which the oral cavity exhibit freedom from active oral diseases, maintaining the maximum number of teeth from the entry point of the incremental dental care program and maintain good oral hygiene).

With the arguments offered above, it might be concluded that the lack of association between clinical and subjective oral health outcomes was at least partly due to the low disease prevalence in the sample.

Type of oral diseases and model tested in the study

A second explanation that could further obscure any linear relationships between clinical factors and subjective oral health outcomes is that the oral conditions were not severe or life threatening and may not have triggered symptoms. Mild oral conditions could have immeasurably low impacts on a person. Such low prevalence and severity of diseases will create low variation of symptoms which will have low influences on functional limitation, GHP and overall QOL. In this way a less severe condition will diminish any linear tenets of the Wilson and Cleary (1995) model and in turn, highlight the significant associations between individual and environmental factors.

Furthermore, the Wilson and Cleary (1995) model is a model of disease. Not surprisingly, therefore it was not supported. Other studies using the model with chronic conditions such as heart diseases or AIDS have supported it (Sousa *et al.* 1999; Heo *et al* 2005). The severity of these diseases might trigger negative impacts and greatly influence patients' psychosocial domains. Indeed, this has been found with chronic oral health conditions (Baker *et al* 2007; Baker *et al* 2008).

Differences of measures and concepts

A third explanation could be the distinction between clinical factors and SOHO which are conceptualised as different things in life, each providing different information. Clinical status is measured by indices such as DMFT and IOTN. On the other hand, subjective health is person-centred information which provides insights into symptoms, functional ability and psychosocial well-being (Allen 2003). These measures focus on patient's perspective on their complex feelings and behaviour therefore, interplay with numerous social-environmental system and psychological factors such as their norms and cultures (Wilson and Cleary 1995). Therefore, clinical factors and SOHO are different, use different types of measures and are determined by two different aspects of people, thus it will not be easy to determine a causal relationship (Locker and Slade 1994).

Even though our findings did not strongly support the relationship between clinical factors and SOHO, that does not deny the importance of both concepts. Clinical information ignores the patient's perspective of needs and used alone does not express benefits of improved oral health status and social-psychological well-being (Sheiham *et al* 1982; Locker 1988). These highlight the inadequacies of clinical information and indicate the need for complementary subjective assessments. Thus, SOHO assessment provides important and valid adjuncts to clinical indicators to complement traditional methods. In this way, a comprehensive assessment of oral diseases impacts on patients' wellbeing can be obtained.

The interaction of other factors

A fourth explanation could be that other factors played a role in mediating relationships between clinical factors and SOHO. Previous research which had found associations between clinical factors and subjective oral health assessments had implied that such relationships were not simple and linear. For example, individuals with low diseases might report higher impacts (Jaafar 1999; Gherunpong *et al* 2004). On the other hand, individuals with high diseases might report otherwise. The possible factors mediating these differences

could included exposure to environmental factors such as culture, social and material deprivation (Locker 1992). Individual factors also play important roles and these factors include optimism, self esteem, SOC, coping and personal control (Taylor and Seeman 1999; Savolainen *et al* 2005a; Locker 2009). Self esteem has been shown to explain these variations in children's subjective oral health outcomes (Humphris *et al* 2005; Locker 2007). Gregory and colleagues (2005) found that the 'relevance' of oral health interacted between clinical status and impacts. Savolainen and colleagues (2005a) found SOC was a determinant of adults' OHRQOL. This study found SOC was the significant determinant of the children's subjective oral health outcomes.

These factors could be of importance especially in the local scenario in Malaysia, where it is common for the younger generation to be caries-free. However, the 16 year-old and adult groups have higher diseases status (NOHSS 1997). The maintenance of oral health is not salient once they leave the school system. There could be other factors that need to be considered to ensure skills and knowledge about oral health are maintained throughout their life. The likely factors are the individual factors and environmental exposures. These factors will be discussed in greater detail in the next section.

Measurement error

A fifth explanation is that, type II errors suggesting no linear relationships between clinical factors and subjective oral health outcomes could be due to measurement errors, which could undermine the analysis and interpretation of the data. However, this is not likely to be a major explanation for the present findings because the current study had taken several steps to ensure measurement error was removed or reduced.

Measurement errors may occur as misclassification in the clinical examination. As in much epidemiology, clinical data provided in survey conditions are not totally accurate. It is accepted that radiographs may improve diagnosis, but their use in population surveys is impractical and ethically unacceptable (Jaafar 1999).

To improve accuracy, the researcher took several steps to minimise misclassification. A robust procedure was employed to ensure the reliability of the clinical data. The examinations were only performed by the principle researcher who was responsible for assessing the clinical status in order to eliminate inter-examiner disagreement. The principle researcher was calibrated by a WHO epidemiologist before the oral examination. Further steps included checks on the test retest reliability of caries diagnoses of at least 20% of the sample examined in a day. The kappa values reached an acceptable level of 0.89%. Similar procedures were taken for IOTN, trauma status, periodontal status and filled teeth.

The low clinical status in the present study is reflected in the declining trends of dental diseases in Malaysia (NOHSS 1997). It was noted that from 1970/71, mean DMFT declined from 3.7 to 2.37 (1988) and 1.6 (1997) in Peninsular Malaysia. In particular, Selangor experienced low disease incidence whereby the DMFT was up to 1 (NOHSS 1997). However, there was no district level data in Selangor to compare to the current study. Regarding other conditions such as periodontal status, 94.4% of the children aged 12 year-old had healthy gingivae which was similar to the current study (95%). Trauma of the anterior teeth (1.4%) was slightly lower than NOHSS (1997) (2.4%). However, these data are not directly comparable because NOHSS (1997) profiled the national data involving 4,854 12 year-olds from multiple study areas and was conducted twelve years ago. The current study is limited to a single area. Recent unpublished data recorded the DMFT of 12-13 year-olds from Banting district as 1.7 (HMIS 2007) but this represents schoolchildren from the whole district of Banting, Selangor and involved all ethnic groups rather than the one ethnic group in the current study. In other states of Malaysia, a recent study conducted in Kota Tinggi, Johor, found a mean DMFT was between 0.65 and 1.50. The overall annual caries increment was very low at 0.19 among 12 year-old schoolchildren (Tan *et al.* 2006).

The techniques used to minimise measurement error and these comparable data support the quality of the data in the current study.

Subjective measures

The subjective measures (oral health outcomes and individual factors) were translated from English to the Malay language. Translating and adapting a questionnaire developed in one country for use in another is not always successful. Semantics differ, as well as expectations and norms (Touzé *et al* 2006).

To ensure the subjective measures were adequate for use in Malay, robust translation procedures were adopted. First, the measures were widely used in cross cultural studies; CPQ*11-14*, self esteem, sense of coherence and HLOC have been used in other settings (details of this are discussed in the section on methodological issues). Second, the translation procedures strictly followed the guidelines as recommended by (Herdman *et al* 1998). The use of language was simple and according to the children's understanding. A series of comprehensive back-translations were conducted until a high quality version was achieved. Third, validation procedures were used to achieve adequate psychometric properties in the translated versions. The face and content validity were checked by the principal researcher and further improved by two linguistic lecturers and four schoolchildren with similar education and understanding to the participants. The measures were checked for reliability using test-retest correlation statistics and internal reliability coefficients (Cronbach Alpha). Pre-tests were conducted before the study and modifications were made to ensure a high quality and cultural adaptable translated version to the Malay population obtained.

The validation and reliability analyses showed most of the translated measures achieved moderate Cronbach Alphas between 0.743 and 0.384 (Table 6.6). One measure CPQ*11-14*, (α=0.902) achieved high reliability. According to Nunnally (1978) Cronbach alpha below 0.7, is regarded as low, although according to some social behavioural scientists, alphas greater than 0.5 are still acceptable (Bowling 1997). In fact, only one measure, SLSS, achieved a Cronbach Alpha below 0.5. According to Pallant (2001), it is common to find low values of alpha with measures that have less then ten items. Practically, the validity of the measures was supported because most of these measures were found to be correlated

with individual and environmental factors. This also indicates that the translated measures had satisfactory validity and internal consistency reliability, supporting their appropriateness for use among school children in Malaysia. These relationships reduce the likelihood that low reliability of the translated measures was entirely responsible for the lack of apparent linear relationships of the model.

The most highly reliable measure, the Malay version CPQ*11-14* which had alphas from 0.679 to 0.911 did not detect relationships between symptoms and FL and the linear tenets of the Wilson and Cleary (1995) model although FL was related to both caries and GHP. To some authors, CPQ*11-14* may not work well among healthy populations (Marshman 2007). Thus, this could be the reason why CPQ*11-14* did not differentiate impacts in the current study. However, CPQ*11-14* was able to distinguish the non-linear relationships of the Wilson and Cleary (1995) model in this healthy population. Such relationships suggest CPQ*11-14* was valid and reliable to differentiate the subjective components.

At the moment though there is still no measure of OHRQOL that is suitable for general populations which is age specific. It is may be necessary to develop new measures which are more suitable for a general population sample. Further studies using CPQ*11-14* with general populations may further confirm its reliability and validity.

Taken together, these arguments suggest that the use of translated measures was unlikely to obscure the linear relationships in the model.

Nevertheless, this is preliminary research and currently, the first study among children that tested the Wilson and Cleary (1995) model using translated measures. Future work should further test the translation and validation of the measures cross-culturally. This could provide answers regarding their face and cultural validity.

Children's understanding

Another explanation for the lack of relationships between clinical factors and subjective oral health outcomes could be because the children gave inaccurate information, thus masking the relationships, especially a study with so many variables. However, this is unlikely to be the explanation. Children can give valid and reliable information (Ceci *et al* 1987) to explain the impact of oral diseases on their life overall. Thus, the best way to get information about oral health is directly from them.

Children have a unique way of viewing life and health (Juniper *et al* 1996; Eiser and Morse 2001). They prioritise and interpret events differently from adults (Eiser *et al* 2000). This suggests children's views on health must be taken seriously. Even at the age of 11 or 12, they are already capable viewing health as a multidimensional concept. Therefore, they should be allowed to participate to provide information to shape their life events. According to Marshman and colleagues (2007) putting children in the centre of enquiries will maximise the information to reach understanding of children's own perspectives.

There are, however, many different factors that may influence children's subjective feelings, so they are not solely dependent on clinical factors. Psychological factors and environmental exposures could play a role in mediating children's perceptions and should be considered when researching with children (Locker 2007).

Method of analysis

The final explanation for the apparent lack of linear relationship is the lagged approach in the principal analyses. Some authors have critiqued drawing causal inferences using lagged analysis (Soelberg 1967; Rogosa 1980). However, longitudinal data are compelling in determining the direction of causal relationships. Moreover, the lagged technique allowed longitudinal analysis of the four steps of the model very efficiently.

Lagged analyses can obscure associations which control for baseline variables to predict follow-up outcomes (Soelberg 1967). Allied to this is the treatment of the baseline value of the dependent variable in regression models. This approach is analysis of covariance (ANCOVA). Assman and colleagues (2000) have considered the use of ANCOVA in longitudinal data analysis and argue that if a baseline factor strongly influences the outcome then it should be entered as a covariate in ANCOVA. This is exactly the situation here, where the baseline value of the dependent variable was always the strongest predictor of its follow up value (Tables 6.15 – 6.18). This is therefore an accepted approach and is unlikely to have masked other significant relationships.

Conclusion

With all the arguments offered above, it seems likely that the conceptual differences between clinical status and SOHO, coupled with low disease levels were the main reasons why the linear tenets of the Wilson and Cleary (1995) model were not strongly supported. However, none of the explanations are mutually exclusive and all may be partially true and cumulative. For further understanding, this research should be repeated with different groups of children, especially those with high disease and might include a wider range of clinical markers which might yield different findings and stronger predictions (Newton *et al* 2002)

As has been discussed, subjective outcomes are not entirely determined by clinical factors. Individual and environmental factors could also mediate and modify subjective oral health outcomes such as the experience of symptoms, daily functioning and subjective well-being. Thus, it is suggested that these are important in all stages of the model tested. The findings of the present study support these ideas and are considered later in the discussions.

7.2.1 Idiosyncratic relationships in the Wilson and Cleary (1995) model

The data reveal some idiosyncratic relationships between caries and functional limitation; filled teeth and overall QOL. Higher caries indicated higher functional limitation and more

filled teeth indicated better overall QOL. These relationships are indirect, as neither was relationships mediated by symptoms as predicted in the Wilson and Cleary (1995) model.

Furthermore, the exploratory analyses revealed the association between caries and FL was only evident with the social wellbeing subscale of CPQ$_{11\text{-}14}$, rather than the FL subscales. The association detected with OHRQOL (total CPQ$_{11\text{-}14}$) and FL was largely due to this relationship with SWB subscale. Although Wilson and Cleary (1995) predicted indirect relationships within the model, a single relationship between dental caries and social wellbeing is not easy to explain. At the low level of the diseases seen in this study the vast majority of disease is likely to be on posterior teeth (Batchelor and Sheiham 2004) and might not explain impacts on FL, GHP and overall QOL in the absence of symptoms. With hypothesis tests in this study, some relationships are likely to appear by the play of chance. This may be one of them. The relationship between the presence of filled teeth and overall QOL may also be a type 1 error.

7.3 The influence of individual factors

The current study examined whether environmental and individual factors might influence children's OHRQOL and the key relationships within the Wilson and Cleary (1995) model.

Our findings found individual factors were related to children's SOHO. Specifically SOC predicted symptoms, functional limitation and overall QOL. This factor was significant even when baseline scores of the outcome variables were controlled for. That is, SOC accounted for 15.3% to 16.5% of variance in the outcome variable.

7.3.1 The role of SOC in relation to subjective oral health outcomes

There were substantial and consistent relationships linking SOC with symptoms, functional limitation (OHRQOL) and overall QOL. SOC predicted the socio-psychological well-being of individuals consistent with Antonovsky's conceptualization of SOC as a generalized resistance resource in maintaining health (GRRs). Generalized resistance resources are the combination of internal (i.e individual factors such as coping) or external factors (i.e.

environmental factors such as financial assets and social support). The extent to which these are available is said to be a major determinant in the development of a strong or weak SOC. On the other hand, strong SOC equates to a person having a major element of internal resource to cope with stressors and stay healthy.

One particular study by Weismann and Hannich (2008) investigated relationships between subjective wellbeing, SOC and general resistance resources such as age, education, physical health, social support and personality variables (self esteem and self efficacy). Their findings confirmed that SOC mediated the relationship between mobilising resources and wellbeing. Thus, these data support the salutogenic idea that SOC, with the availability of other resources, plays an important role in psychological outcomes.

In relation to health, SOC has been related to good health behaviours and practices, fewer subjective complaints and symptoms (Eriksonn and Lindstrom, 2006). A longitudinal study (Suominen *et al* 2001) revealed SOC to be a good predictor of subjective health. SOC was equated with promoting self reliance and positive health outcomes in this Finnish population. This was similar to Drageset and colleagues (2009) findings, whereby, SOC was associated with all SF-36 subscales. They concluded that SOC was a crucial factor for better HRQOL. These were similar to our findings, whereby, SOC was a predictor to SOHO. The explanatory analyses, further supported the relationships, in which, all the SOC subscales were related to symptoms, FL, GHP and overall QOL. Even the exploratory analyses using the total $CPQ_{11\text{-}14}$, indicating similar findings; SOC predicted OHRQOL.

The finding that SOC is important in OHRQOL is compatible with a growing body of knowledge that SOC can predict oral clinical status (Freire *et al* 2001), oral health related behaviour (Freire *et al* 2001; Savolainen *et al* 2005b) and oral health outcomes (Savolainen *et al.* 2005a). Previous studies in Finland, (Savolainen *et al* 2005a) showed SOC was a determinant of OHRQOL among adults. They also found low SOC was associated with poor oral hygiene and less frequency in tooth brushing behaviour (Savolainen *et al* 2005b). In a chronic condition, SOC was related to functional limitation among patients that received surgical treatment for oral or pharyngeal cancer (Langius *et al* 1994). Adolescents

with higher SOC were less likely to visit dentist when they have oral health problems and they also experienced less anterior caries (Freire *et al* 2001). Significant inverse associations were also found between mothers' SOC and children's levels of dental caries and gingival bleeding (Freire *et al* 2002).

All these studies however, have a number of potential limitations that restrict the generalisability of their findings. Firstly, the study with adolescents (Freire *et al* 2001) involved a highly diseased population of whom 87.8% had caries experience. The other studies consisted of maternal SOC in relation to children's clinical factors, oral health and oral health promoting behaviour (Freire *et al* 2002). Savolainen and colleagues (2005a) only included adults and so their findings cannot be generalised to children. Adults and children, those including high disease samples cannot be compared to our sample population.

In addition, these previous studies were cross sectional and so cannot determine the direction of the relationships (Geyer 1997). Thus, the pattern of how SOC might mediate oral health outcomes is not captured in these studies. It may also have been that the relationships between self-reported measures and SOC were artifacts since the SOC measures share reactivity or operational similarity to health outcomes measures (Geyer 1997). To resolve this problem, longitudinal research was warranted.

Related to this, cross-sectional studies do not address the question of stability in SOC over time. In the wider literature, there is debate regarding the stability of SOC over time and whether it changes due to intervention. The current study addressed this issue although the stability of SOC is only recorded within 6 months of follow-up. There was fluctuation between both times indicated by a test-retest reliability of 0.456 (Table 6.6). However, any instability of SOC among adolescents could be of importance, especially among those with low SOC. The fluctuation suggests that SOC is unstable and might be increased in response to interventions (Antonovsky and Sagy 1986). Therefore, SOC could be a potential tool to apply in the oral health field in promoting oral health behaviors and beliefs. For example, Wainwright and colleagues (2007) demonstrated that individual differences in SOC are

associated with healthy lifestyle choices independent of social class and education and proposed its feasibility as an aid in the design of health promotion interventions. However, so far there have been no intervention studies to test the usefulness of SOC in oral health. Furthermore, how to promote SOC also need further investigation. A starting point is to consider how SOC maintains health.

7.3.2.1 SOC pathways in maintaining health

SOC has long been associated with health. SOC is seen as a salutogenetic approach that might play an important role in developing adolescent understanding of health (Bronikowski and Bronikowska 2009). For example, SOC was a predictor of health related activities (e.g. physical exercise) and was associated with physiological outcomes (e.g. improved cardio-respiratory fitness). SOC was also associated with subjective health and HRQOL (Suominen *et al* 2001; Drageset *et al* 2009). Only recently has SOC been seen as an important construct that could be applied to oral health. The mechanisms whereby SOC plays a role could be through pathways as proposed by Antonovsky (1987; 1992).

Antonovsky (1987; 1992) proposed three distinct pathways of how SOC could contribute to health. SOC pathways can be either independent or indirect through different channels such as through an individual's socio-economic status, social environment, or perceived values (Savolainen *et al* 2005a; Savolainen 2005c). The discussion of these pathways will give an indication of how SOC could play a role in oral health.

SOC as a physiological, health-maintaining pathway

Firstly, SOC might have direct physiological consequences. SOC is believed to be associated with physiological, health-maintaining pathways that might enhance individual ability to make stimuli comprehensible, predictable and meaningful (Antonovsky 1992).

The exploratory analyses revealed that the SOC subscales (manageability, meaningfulness or comprehensibility) were significant in almost every level of analysis. Low

manageability predicted higher symptoms, higher functional limitation and worse general health perception. Low comprehensibility predicted higher symptoms, higher functional limitation and worse overall QOL. Low meaningfulness predicted higher FL lower overall QOL. Hence, SOC has wide-ranging impacts on individual's SOHO. The findings suggest SOC as an intervention tool to improve OHRQOL and other SOHOs.

The data are in accordance with the SOC theory that understands health and illness is not separate but a continuum. An individual could be healthy or ill, but the condition they are in is not static, it is constantly in flux and flow. If a person is ill the body will react towards self healing to regain health and the resources contributing to this are as salutogenic. Therefore, an individual can be seen as more or less healthy or more or less ill (Antonovsky 1987).

Within this pathway, the impact of disease onset or progression will be halted by activating the brain to give commands to other organs to maintain homeostasis (Antonovsky 1987). SOC could affect individuals' psychological and/or physiological responses to buffer the negative influence on life events (Suominen *et al* 2005), moderate symptoms and functional limitation (Langius *et al* 1994). There is also a bidirectional pathway between SOC and general resources. SOC could be a potential pathway to direct a person in seeking resources to maintain health or the availability of resources on the other hand could promote SOC to maintain health (Suominen *et al* 1999). According to Antonovsky's theory (1979; 1987) the availability of resources (education or economic) can increases SOC. But in certain circumstances, levels of resources do not necessarily coincide with the strength of SOC (Suominen *et al* 2001). However, people with strong SOC are advantaged in having the ability to find and utilize resources more efficiently, even when they are scarce (Antonovsky 1979; 1987; Suominen *et al* 2001).

SOC and the selection of health-promoting behaviours

The second pathway is the selection of health-promoting behaviours as a result of comprehending stimuli that could adversely affect health. This pathway associates SOC

with identifying risk factors and changing individual's health behaviors (Silva *et al.* 2008). So far few studies have investigated SOC and oral health related behaviors. Those that have, suggest that SOC could be a prominent factor in oral health, Freire and colleagues (2001; 2002) and Savolainen and colleagues (2005b) all associated SOC with dental attendance patterns and tooth brushing behaviour among adults. Thus, SOC may be an internal resource to direct a person to adopt strategies toward a successful oral health resolution.

In general health, SOC has been related to health promoting behaviours, whereby people with higher SOC were more likely to do physical exercise compared to low SOC individuals (Kuuppelomaki and Utriainen (2003). SOC was also associated with developing individual responsibility in adopting a health related physical activity in adolescents (Bronikowski and Bronikowska 2009) and with healthy lifestyle choices independent of social class or education (Wainwright *et al* 2007). Dantas and colleagues (2002) also suggest developing SOC can improve the quality of life of patients who grow up with a chronic disease. Strengthening the SOC may direct a person to be more selective in adopting health related activity as to improve health and HRQOL.

SOC and coping mechanisms

The third pathway relating SOC to health relates to how individuals cope with stressors (Antonovsky 1987). These pathways influence individuals with strong SOC to mobilize cognitive, affective intra-and interpersonal and material resources to cope with stressors to prevent damage. They will maybe be more motivated, more likely to seek treatment, to follow professional guidance, to seek information relevant to health and maintain good health behaviours. They are able to accurately assess problems (stressors) and bring appropriate resources to manage the situation (Antonovsky *et al* 1990). In a way, this capacity is achieved by the interaction between people and the structures of society they live in which focuses on resources to maintain and improves the movement towards health.

This could be one reason why SOC was such a strong predictor in our study. The children had recently changed from primary to secondary school and the new environment (new schools, colleagues and teachers) may have been stressful. Greater adaptation resources (Torsheim *et al* 2001) in this situation could be an important personal resource to maintain oral health among these individuals. According to Pallant and Lea (2002), SOC is an individual's general life orientation towards having internal resources, more self reliance or self confidence, to enable them to face challenges and deal with problems.

It can be seen that the relationship between SOC and oral health is complex. This is the first study to explore SOC as a determinant of subjective oral health outcomes in children longitudinally. Our results suggest that, subjective oral health outcomes are of much broader scope than has been shown so far and that the introduction of SOC into this context is useful and needs further clarification.

7.3.2.2 SOC as a framework for oral health promotion

Silva and colleagues (2008) proposed SOC as a theoretical framework for oral health promotion. The objective was to promote SOC as part of developing personal skills and developing supportive environments. More personal resources could be used to maintain good oral health, develop personal control, adheres to good oral health practices and healthier lifestyle choices (Silva *et al* 2008; Wainwright *et al* 2007). Thus, greater SOC could create better opportunities, greater ability to select the best available resources, an active role in shaping health outcomes (Fok *et al* 2005) and greater ability to avoid threats. SOC could therefore be use in oral health promotion to develop personal skills. Such skills might be used individually or applied at a community level.

Conclusion

These findings support a strong and consistent role for SOC to influence subjective oral health outcomes. They also highlight the potential value of SOC as a framework for promoting oral health.

7.4 Variables with lack of association in the model

The environmental factors; parental income, parental work status and education level and individual factors; baseline self esteem, health locus of control, oral health beliefs and gender were not significant predictors of children's SOHO.

Environmental factors

This study defined environmental factors as income, work status and education level. These are common SES proxies, frequently used in health studies (Lynch and Kaplan 2006), have long been prime predictive variables in oral health studies (Locker 2000; 2009) and were expected to be related to children's subjective oral health outcomes.

The findings in this study were not consistent with earlier work. Thus, income and education deserve further exploration to clarify the potential SES-SOHO relationships. However, it is best to test these variables with more sophisticated analyses to infer if potential reverse or causal relationship existed. According to Bernabe and colleagues (2009), psychosocial factors could be one factor that may influence individuals to engage in activities that are health-promoting or to avoid health threats. SES may indirectly play a role in this association. However, their findings also give limited support for SOC in their relationship between SES and oral health-related behaviours.

Many previous studies have reported significant associations between SES and oral health. For example, in Brazil, Peres and colleagues (2005) found maternal educational level was a good predictor to oral diseases. Income and education was also related to oral health related behaviour in Sweden (Savolainen *et al* 2005a). In Malaysia, NOHSS (1997) had found that there was a significant difference between parental education level and caries prevalence and severity. Children from highly educated family have had lower diseases status compared to children come from lower educated family. There was also evidence that SES has an impact subjective on oral health outcomes. In New Zealand, subjects of higher SES tend to be more satisfied with their oral health than lower SES counterparts (Chen and

Hunter, 1996). Locker (2007) found that Canadian children from low-income families have poorer OHRQOL.

However, these reports are based on occurrence at one time point and give no indication of the sequence of events. According to Kahn and Fazio (2005) the effects of SES on health are dynamic and can be cumulative. To better understand the SES–SOHO relationship, researchers need to employ causally sensitive research designs and more sophisticated analytic approaches that take advantage of variations of the times of measurement and the experiences.

Furthermore, Reisine (2001) suggests that defining SES it is not straightforward. It is a complex and abstract construct that is present differently in different societies and may not apply to every person. Therefore, if SES was applied incorrectly in the study, it could have masked some relationships between SES and health or other outcomes. For example, there could have been inconsistencies in reporting of household income. The fathers (61%) who answered Part A questionnaire could have reported only their individual income. There also could be some discrepancies between family income and the level of education if the mothers who completed the forms were in a low level of education group and did not have any income.

Shavers (2007) also identified methodological and analytical issues related to SES and health. Those that could have related to this study include the 1) lack of precision and reliability of measures and 2) difficulty with the collection of individual SES data. For example, SES variables to represent levels of work status, a dichotomous variable such as 'yes or no' may be less informative for individual working at home. Shavers (2007) further suggested, if the study is to determine the effect of specific levels of SES measure on a certain group of people, it is imperative that the measure is appropriately constructed so that the study groups are distributed among the different levels of the variable.

In conclusion, SES did not predict children's SOHO in this study and this may be due to problems with measurement. Furthermore, if the effect of SES or SOHO is partially mediated through clinical status it may not be evident in this low disease sample.

Further understanding of relationships between SES and oral health among children would contribute to a wider body of knowledge of the social foundation of children's subjective oral health outcomes. Importantly, such findings could clarify the importance of additional efforts to reducing the variability of SES as an adjunct to clinical efforts to improve oral health.

Individual factors

The individual factors; gender, self esteem, CHLC and oral health beliefs were not predictors in the current study. Other research has found associations between oral health and self esteem (Regis *et al* 1994; Macgregor *et al* 1997; Kneckt *et al* 2001; Locker 2009) and locus of control (Wolfe *et al* 1991; Regis *et al* 1994; Macgregor *et al* 1997). The role of these variables in this study deserves further exploration.

One possible explanation for the lack of prediction could be the lagged analysis to examine the interrelationships between baseline and follow-up. The sequence of events could have diminished the relationships. Both self esteem and locus of control are known to fluctuate within a person over time. The 6-months follow-up could have allowed changes, thus masking associations. Most studies that have shown positive associations were cross sectional and so were not robust enough to infer 'cause and effect', but allowed the detection of immediate relationships.

Another possible explanation is the quality of the measures. Self esteem (Rosenberg 1965), OHB and CHLC (Parcel and Meyer 1978) may not be appropriate constructs or may be inadequate measures to be used in this kind of research. CHLC (Parcel and Mayer 1978) for example, failed to detect any associations at any stages of the model. The dichotomous nature of the responses in CHLC could lead to loss of efficiency of the instrument and a

reduction in its correlation with other measures (Streiner and Norman 2003). Similarly OHB was adapted from Broadbent and colleagues (2006). Further work could establish better measures of OHB.

Self esteem (Rosenberg 1965) was strongly correlated almost at every level of the Wilson and Cleary (1995) model in bivariate analyses but disappeared in the regressions. It may be that self esteem confounds with other powerful predictors such as SOC. In the *ad hoc* analysis, SOC and self esteem were moderately correlated (0.339) indicating that they were both measuring related constructs. Thus, in multiple regression models, self esteem disappeared as it was confounded by sense of coherence.

According to previous studies, self esteem has been associated with grooming (Hodge *et al* 1982)), dental self-care (Kneckt *et al* 2001) and preventive behaviour ((Regis *et al* 1994). Self esteem also was associated with appearance (Onyeaso 2003). Locker (2009) found self esteem to be associated with OHRQOL among elderly people in Canada. Among children, there is evidence that self esteem plays a role in influencing OHRQOL (Humphris *et al* 2005) using $CPQ_{8\text{-}10}$. Similary, low self esteem showed significant variance with $CPQ_{11\text{-}14}$ scores (Agou *et al* 2008). The authors suggest that self esteem is a salient determinant of OHRQOL in children to seek treatment. However, these studies did not test other variables, including SOC and so were susceptible to hidden confounders.

Even though, our findings do not support a strong independent relationship between self esteem and SOHO, self esteem may still have the potential to be adopted in oral health, to enhance a 'personal dynamic of change' as a pivotal factor in helping to foster good oral health decision making. For example, self esteem could be used in health education tools and interventions to change personal risk-avoiding and preventive behaviours among children and adolescents (Cast and Burke 2002). Repeated systematic reviews study have not found powerful effects on health status from dental health education, however health education (for example for oral hygiene) has rarely been informed by this type of psychological theory (Renz *et al* 2007).

This study provides a limited picture of impacts on SOHO by gender. This is a consistent finding (Pallant and Lea 2002; Marshman *et al* 2005; Newton *et al* 2005). According to Vlassoff (1994), gender differences could play an important role in health inequalities. Studying conditions in relation to gender differences might provide useful information and will provide support to plan for interventions, identifying priorities and to develop appropriate strategies for oral health promotion. They provide direction to where these could be best targeted.

In sum, most of the variables mentioned above were not consistently related to SOHO. Moreover, some measures may not have been appropriate, whereas self esteem may have been confounded by SOC.

7.5 Overall conclusion

Determinants of subjective oral health outcomes are complex. The relative contribution of clinical factors to subjective oral health outcomes is at best weak, vague and difficult to explain. Yet, if the improvement of oral health is a primary goal, the causal relationships between significant factors, especially SOC, should be taken into consideration as possible health promotion approaches. No matter whether SOC is a state or a dispositional characteristic, its possible mechanism in actively processing the interaction with other factors could be of importance in influencing children's oral health and oral health outcomes, motivational level or behavioural changes. Investing in personal resources in this way is appropriate, especially when healthcare resources are scarce. Furthermore, it is more sustainable in the long term compared to clinical interventions alone. Understanding the mechanisms and intervention strategy to enhance SOC to promote oral health is important. Thus, this knowledge will lead to a careful application and appropriate strategy for health promotion.

This present study contributes important findings towards oral health knowledge in support of the role of SOC on children's oral health outcomes by demonstrating direct relationships

between variables longitudinally. This suggests that they may be appropriate factors to be used for health promotion with among children.

7.6 Methodological limitations of the present research.

Some limitations must be expressed regarding the methods of this study. Firstly, most of the measures used were constructed in the west and translated into the Malay language. Translated versions of measures developed in other cultures could lead to inaccurate measurement. Being two different worlds, 'East' and 'West' pose a question whether certain items asked were important and structured in the same domain but maybe not in other countries. For example, the word 'sore' or 'top of the mouth' in CPQ*11-14* was not relevant if translated directly to the Malay language. Instead the word 'pain' and 'palate' was used. Inadequate translation could also lead to severe misclassification. Especially, the perception of oral health and individual factors are a subjective component which may vary between cultures (Gift *et al* 1997). This study however largely used valid and reliable translated measures.

Most of the measures have been widely used in cross cultural studies, with the exception of oral health beliefs, adapted from Broadbent and colleagues (2006). SOC for example, was introduced 25 years ago and there are 500 publications in the public health database (Lindstrom and Eriksson 2006). The SOC questionnaire has been used in at least 33 languages in 32 countries including Thailand, China, Japan and South Africa. The construct is acceptable cross culturally (Eriksson and Lindstrom 2005). Rosenberg's (1965) self esteem is also widely used worldwide and was translated into 28 languages and administered to 16,998 participants across 53 nations (Schmitt and Allik 2005). SLSS had been translated in Portuguese (Marques *et al* 2007) and Hebrew (Ullman and Tatar 2001). CPQ*11-14* is widely used and translated, although developed just 6 years ago. Most importantly of all, SOC was consistently associated with these variables throughout the study, lending support to their validity. Thus, the measures and the translation procedures appear to be valid and reliable.

Individuals may have detailed perceptions and ideas about certain issues in life that are not captured in 'yes' or 'no' categorical responses and this may reduce instrument efficiency (Streiner and Norman 2003). This could at least partly explain the reason why CHLC was not associated with other variables in most of the analyses.

The use of self reported structured questionnaires might introduce limitations such as reporting bias. According to Kroeger (1983) reporting bias is frequently encountered in children who give socially desirable answers and also lack recall (Kroeger 1983). Thus, the proportion of children reporting poor oral health may have been underestimated if social desirability meant that children were reluctant to express negative opinions and attitudes. Furthermore, this study involved many questionnaires, which could burden the children. They may have answered the questions only to meet the requirements and their answers may not reflect their true feelings. However, during the onsite interaction and in the pilot study, it was the researcher's impression that many of the children who agreed to participate were coping well with the questions. They apparently found the questions easy to understand and less taxing than examination questions. The same impressions were gained during the follow-up session when almost 98% of the children who answered the questionnaires at baseline were eager to participate at follow-up.

Contrasting with concerns about response bias and burden, there are now progressive ideas that children's voices and opinions should be heard. Children provide views and experiences that are 'unique' and do not necessarily share similar views with adults. They must also be allowed to participate in decision-making pertaining to their care. The information derived may improve communication between patients, parents and the health team (Weintraub 1998). It also can provide greater understanding of the consequences and salience of oral health states in children's lives and the lives of their families (Holt 2001). Thus, their participation in research is much more appreciated now in order to seek their views and experiences (Marshman *et al* 2007).

The clinical variables in this study were based on common oral conditions representing public health problems experienced among children of this age. The inclusion of high

severity cases could have provided different findings. Thus, it is recommended to repeat this study among other populations with higher levels of diseases.

We followed our sample over a 6 month period. It is possible that longer follow-up might provide different effects between independent and dependent variables as individual factors during this time (child to adolescent) change rapidly. These findings however, provided a more than preliminary 'snapshot' data of children's characteristics at 12-13 years of age. In other words, the study provides important findings to indicate key variables that may be useful in predicting longitudinal changes in oral health outcomes which could be useful in oral health interventions. Longer periods of follow-up will be useful to provide information about factors according to stages of development. For example, between 12 and 13 (early adolescence) SOC is important, but it remains to be seen whether it would be so pertinent in older adolescents (14 and above). Obtaining such data would be important to plan or implement appropriate interventions suitable for certain age-groups.

Third, the participants were 12-13 years old whose personality is still under development and the variables we tested were individual factors (personality characteristics) (Antonovsky 1979). Children develop intellectually, emotionally and socially on their way to becoming adults. According to Piaget (1929) at this age they can comprehend logic, exchange ideas, understand view point of others and understand hypothetical questions. But the stages of children's development may overlap as they move from one stage to another. Therefore, some children may perform at the pre-operational level, with others exceeding the level in some situations. It is questionable then whether this group of children were answering questions reflecting their level of understanding. They also may have answered the questions out of the responsibility that 'they have to answer all the questions'. Furthermore, the study only involved children of the Malay ethnicity and in a single district. Thus, generalisation to other age and ethnic groups may be limited. Therefore, interpretation of the findings must be undertaken with caution. Separate studies involving children of other races, ages and cultures are therefore suggested.

There is also a limitation in the method of analysis employed in the study. The use of multiple regressions only identified predictive relationships but did not test causal relationships or bidirectional or feedback loops. The more sophisticated structural equation technique (Baker *et al* 2007) may inform these concerns. Nevertheless, this study was a robust, longitudinal study, with lagged analyses which controlled for baseline variables to explain follow up variables. The relationships were strong considering that the factors were analysed overtime.

Despite these limitations, this study has made contributions to oral health research by providing strong evidence that SOC is an important determinant of oral health outcomes among children. It will be worthwhile to further study the ability of individual factors and social adversity to define the oral health outcomes among other groups. Future studies will consider whether the same findings detected among different age-groups, with different patterns of diseases and longer periods of follow-up.

CHAPTER EIGHT

CONCLUSIONS AND RECOMMENDATIONS

In order to identify the determinants of oral health related quality of life in children, this study:

1. tested the relationships between clinical variables, symptom status, functioning, general health perceptions and overall well-being as hypothesized within Wilson and Cleary's model of patient outcomes.

2. examined whether socio-demographic and individual difference factors influence children's OHRQOL and the key relationships identified within Wilson and Cleary model.

3. explored the analyses for different configurations of SOC, Children's OHRQOL and the Wilson and Cleary (1995) model.

The method was a prospective longitudinal study with 6-months follow-up. A theoretical model was chosen to guide the research. Variables tested were in accordance with the model; independent variables were clinical factors, gender, oral health beliefs, health locus of control, self esteem and sense of coherence. Dependent variables were symptom status, functional limitation, GHP and overall QOL. The principle analysis used lagged regression modelling.

The study has made a substantial new contribution to oral health knowledge since there are few data that have addressed so comprehensively, psychosocial aspects in this field using an explicit theoretical model and a longitudinal design.

This chapter summarises the findings and recommendation arises from this study;

8.1 Summary of the findings

- Clinical factors were not strongly related to subjective oral health outcomes (SOHO). Subjective information is not entirely determined by clinical factors. Individual and environmental factors could also be the predictors to subjective oral health outcomes such as the experience of symptoms, daily functioning and subjective well-being.

- The lack of relationships between clinical status and subjective oral health outcomes may be explained by a combination of the conceptual differences between clinical status and SOHO and the very low disease levels in the existing study.

- SOC, was an important determinant of children's OHRQOL. SOC predicted symptoms, functional limitation or OHRQOL and overall QOL. Further exploratory analyses using SOC subscales (manageability, meaningfulness or comprehensibility) showed relationships at every level of analysis. SOC had a wide-ranging impact on individual's SOHO.

- Other individual factors tested in the model; self esteem, locus of control, oral health beliefs and gender differences did not predict SOHO. Self esteem was a consistent factor strongly correlated at every level of the model in bivariate analyses but disappeared in the regression models. Self esteem could have been confounded with other powerful predictors such as SOC.

- Environmental factors specifically SES as indicated by parental income, parental work status and parental education were unrelated to children's symptoms, functional limitation or OHRQOL, GHP and overall QOL.

- Overall, SOC maybe an important determinant of children's SOHO and OHRQOL.

8.2 Recommendation

Several recommendations can be made from the current research;

8.2.1 Recommendations for policy

- SOC can serve as a theoretical foundation in formulating frameworks of health-promotion to ensure effective opportunities to generate good oral health beliefs. SOC can act as an internal resource to able a person to be more confident and feel mastery about their own health, thus, facilitating the learning process and simultaneously promoting oral health. Enhancing SOC may be important for individuals to increase the protective and promoting factors within them. SOC warrants exploration to develop personal health skills.

8.2.2 Recommendations for research

- SOC needs further exploration as a possible framework for oral health promotion.

- This research should be repeated among high disease population in order to look for different phenomena behind these conceptual ideas.

- Future research is required to demonstrate SOC as a personal asset in oral health promotion especially its usefulness in oral health interventions.

- Further analysis of the data with advanced modeling techniques to identify the direction and magnitude of the relationships between variables.

- More research involving other individual/personality factors to provide more information how psychological factors influences a person oral health and oral health outcomes.

- Longer follow-up of the study is needed to ascertain the stability of SOC and SOC predictability in relation to children's SOHO

In conclusion, the study reported in this thesis found SOC was an important factor in children's perceptions of their SOHO and OHRQOL. In this low disease population, clinical factors had little apparent influence in children's SOHO and OHRQOL but individual factors especially SOC played important roles. Thus, more research is needed to confirm and extend these findings and their usefulness in oral health promotion.

CHAPTER NINE

REFERENCES

ACAM (2004). (Australian Centre for Asthma Monitoring). Measuring the impact of asthma on quality of life in the Australian population. AIHW cat. no. ACM 3. Available at: <www.asthmamonitoring.org>. Canberra: Australian Institute of Health and Welfare.

Acquadro C, Jambon B, Ellis D, Marquis P (1996). Language and translation issues. *In Quality of life and Pharmacoeconomics in clinical trials:*575-585.

Acquadro C, Lafortune L, Mear I (2003). Quality of life in multiple sclerosis: translation in French Canadian of the MSQoL-54. *Health and Quality of Life Outcomes* 1:70.

Adler Nancy E, Ostrove Joan M (1999). Socioeconomic Status and Health: What We Know and What We Don't. *Annals of the New York Academy of Sciences* 896:3-15.

Adulyanon S, Sheiham A (1997). Oral Impacts on Daily Performances. In: Measuring Oral Health and Quality of Life (Edited by: Slade) Chapel Hill: University of North Carolina: Dental Ecology. p.151.

Ago S, Locker D, Strainer DL, Thompson B (2008). Impact of self esteem on the oral-health-related quality of life of children with malocclusion. *American Journal of Orthodontics and Dentofacial Orthopaedics* 134(4):484-489.

Ahmed PI, Coelho GV, Volker A (1979). Toward a new definition of health: psychosocial dimensions / edited by Paul I. Ahmed and George V. Coelho, with the assistance of Eliza Kolker Plenum Press, New York: Rv. By Patricia A. Book PhD. Northern Alaska Health Resource Association Fairbanks.

Al Shamrany M (2006). Oral health-related quality of life: a broader perspective. *East Mediterr Health J* 12(6):894-901.

Albino JEN, Lawrence SD, Tedesco LA (1994). Psychological and social effects of orthodontic treatment. *Journal of Behavioral Medicine* 17(1):81-98.

Allen PF, McMillan AS, Locker D (2001). An assessment of sensitivity to change of the Oral Health Impact Profile in a clinical trial. *Community Dentistry and Oral Epidemiology* 29(3):175-182.

Allen PF (2003). Assessment of oral health related quality of life. *Health Qual Life Outcomes* 1:40.

Andersen RM, Davidson PL (1997). Ethnicity, aging and oral health outcomes: a conceptual framework. *Adv Dent Res* 11(2):203-9.

Andrews FM (1974). Social indicators of perceived life quality. *Social Indicators Research* 1(3):279-299.

Antonovsky A (1979). Health, stress and coping. San Francisco: Jossey-Bass

Antonovsky H, Sagy S (1986). The development of a sense of coherence and its impact on responses to stress situations. *J Soc Psychol* 126(2):213-25.

Antonovsky A (1987). Unravelling the Mystery of Health – How People Manage Stress and Stay Well. London: Jossey-Bass Publishers. p.15-32.

Antonovsky A, Sagy S, Adler I, Visel R (1990). Attitudes toward Retirement in an Israeli Cohort. *International Journal of Aging & Human Development* 31(1):57-77.

Apajasalo M, Sintonen H, Holmberg C, Sinkkonen J, Aalberg V, Pihko H, *et al.* (1996). Quality of life in early adolescence: A sixteen-dimensional health-related measure (16D). *Quality of Life Research* 5(2):205-211.

Ashing-Giwa KT (2005). The contextual model of HRQoL: A paradigm for expanding the HRQoL framework. *Quality of Life Research* 14(2):297-307.

Assmann SF, Pocock SJ, Enos LE, Kasten LE (2000). Subgroup analysis and other (mis)uses of baseline data in clinical trials. *The Lancet* 355(9209):1064-1069.

Atchison KA, Dolan TA (1990). Development of the Geriatric Oral Health Assessment Index. *J Dent Educ* 54(11):680-7.

Atchison KA, Gift HC (1997). Perceived oral health in a diverse sample. *Adv Dent Res* 11(2):272-80.

Attwood D, West P, Blinkhorn AS (1993). Factors associated with the dental visiting habits of adolescents in the west of Scotland. *Community Dent Health* 10(4):365-73.

Baker SR, Pankhurst CL, Robinson PG (2007). Testing relationships between clinical and non-clinical variables in xerostomia: A structural equation model of oral health-related quality of life. *Quality of Life Research* 16(2):297-308.

Baker SR, Pearson NK, Robinson PG (2008). Testing the applicability of a conceptual model of oral health in housebound edentulous older people. *Community Dentistry and Oral Epidemiology* 36:237-248.

Baldwin SA, Hoffmann JP (2002). The dynamics of self esteem: A growth-curve analysis. *Journal of Youth and Adolescence* 31(2):101-113.

Bandura A (2006). Adolescent development from an agentic perspective. In F. Pajares & T. Urdan (Eds.). Self-efficacy beliefs of adolescents, (Vol. 5.pp.1-43). Greenwich, CT: Information Age Publishing.

Barbosa T, Tureli M, Gaviao M (2009). Validity and reliability of the Child Perceptions Questionnaires applied in Brazilian children. *BMC Oral Health* 9(1):13.

Barenthin I (1975). A review and discussion of goals in community dentistry. *Community Dent Oral Epidemiol* 3(2):45-51.

Barry A, Yuill C (2002). Understanding health: a sociological introduction. London:Sage.

Batchelor PA, Sheiham A (2004). Grouping of tooth surfaces by susceptibility to caries: a study in 5-16 year-old children. *BMC* 4(1):2.

Baumeister RF, Campbell JD, Krueger JI, Vohs KD (2003). Does high self esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science:*1-44.

Beckie TM, Hayduk LA (1997). Measuring Quality of Life. *Social Indicators Research* 42(1):21-39.

Bee H (1998). Lifespan Development. 2nd edn. New York, NY, USA: Addison Wesley Longman.

Bernabé E, Watt RG, Sheiham A, Suominen-Taipale AL, Nordblad A, Savolainen J, *et al.* (2009). The influence of sense of coherence on the relationship between childhood socioeconomic status and adult oral health-related behaviours. *Community Dentistry and Oral Epidemiology* 37(4):357-365.

Berry SL, Hayford JR, Ross CK, Pachman LM, Lavigne JV (1993). Conceptions of Illness by Children with Juvenile Rheumatoid-Arthritis - a Cognitive Developmental-Approach. *Journal of Pediatric Psychology* 18(1):83-97.

Bernabe′ E, Tsakos G, Sheiham A (2007). Intensity and extent of Oral Impacts on Daily Performances by type of self-perceived oral problems. *Eur J Oral Sci* 115: 111–116.

Bibace R, Walsh ME (1980). Development of children's concepts of illness. *Pediatrics* 66(6):912-7.

Bjorner JL, Kristensen TS, Orth-Gomer K, Tibblin G, Sullivan M, Westerholm P (1996). Self-rated health: A useful concept in research, prevention and clinical medicine. Stockholm: Forskningsradsnamnden. CF: Ferrans CE, Zerwic JJ, Wilbur JE, Larson JL (2005). Conceptual model of health-related quality of life. Journal of Nursing Scholarship 37(4):336-342.

Bok S (2004). Rethinking the WHO Definition of Health. Working Paper Series. In: Harvard Center for Population and Development Studies.

Borkowska ED, Watts TLP, Weinman J (1998). The relationship of health beliefs and psychological mood to patient adherence to oral hygiene behaviour. *Journal of Clinical Periodontology* 25(3):187-193.

Borrell-Carrio F, Suchman AL, Epstein RM (2004). The biopsychosocial model 25 years later: Principles, practice and scientific inquiry. *Annals of Family Medicine* 2(6):576-582.

Bowling A (1991). Measuring Health. Open University Press, Philadelphia.

Bowling A (2001). Measuring Disease. 2nd Edition Chapter 1. Buckingham: Open University Press

Bowling A (2005a). Measuring health. A review of quality of health of life measurement scales. 3rd. edn. Open University Press, McGraw-Hill Edu. Berkshire, England p.1-18.

Bowling A (2005b). Just one question: If one question works, why ask several? *Journal of Epidemiology and Community Health* 59(5):342-345.

Bowling A (1997). Measuring Health; a Review of Quality of Life Measurement Scales (2nd ed.). Buckingham: Open University Press.

Bradley C (2001). Importance of differentiating health status from quality of life. *Lancet* 357(9249):7-8.

Bretz WA, Corby PM, Schork NJ, Robinson MT, Coelho M, Costa S, *et al.* (2005). Longitudinal analysis of heritability for dental caries traits. *Journal of Dental Research* 84(11):1047-1051.

Brislin RW (1970). Back-Translation for Cross-Cultural Research. *Journal of Cross-Cultural Psychology* 1(3):185-216.

Broadbent JM, Thomson WM, Poulton R (2006). Oral health beliefs in adolescence and oral health in young adulthood. *Journal of Dental Research* 85(4):339-343.

Bronikowski M, Bronikowska M (2009). Salutogenesis as a framework for improving health resources of adolescent boys. *Scandinavian Journal of Public Health* 37(5):525-531.

Butler RJ, Gasson SL (2005). Self Esteem/Self Concept Scales for Children and Adolescents: A Review. *Child and Adolescent Mental Health* 10(4):190-201.

Calman KC (1984). Quality of life in cancer patients--a hypothesis. *Journal of Medical Ethics* 10(3):124-127.

Campbell D, Fiske D (1959). Convergent and Discriminant validity by the multitrait-multimethod matrix. *Psych Bull.* 56:81-105

Capra F (1982). The turning point science, society and the rising culture: New York, Bantam Books.

Carlisle-frank P (1991). Examining Personal Control Beliefs as a Mediating Variable in the Health-Damaging Behavior of Substance Use - an Alternative Approach. *Journal of Psychology* 125(4):381-397.

Cast AD, Burke PJ (2002). A theory of self esteem. *Social Forces* 80(3):1041-1068.

Castro R, Cortes M, Leao A, Portela M, Souza I, Tsakos G, et al. (2008). Child-OIDP index in Brazil: Cross-cultural adaptation and validation. *Health and Quality of Life Outcomes* 6(1):68.

Ceci SJ, Ross DF, Toglia MP (1987). Suggestibility of Childrens Memory - Psycholegal Implications. *Journal of Experimental Psychology-General* 116(1):38-49.

Chen M-S, Tatsuoka M (1984). The relationship between American women's preventive dental behavior and dental health beliefs. *Social Science & Medicine* 19(9):971-978.

Chen S (1986). Children's preventive dental behavior in relation to their mothers' socioeconomic status, health beliefs and dental behaviors. *ASDC J Dent Child* 53(2):105-109.

Chen MS, Hunter P (1996). Oral health and quality of life in New Zealand: A social perspective. *Social Science & Medicine* 43(8):1213-1222.

Chick N (1985). The idea of health: Defining the concept. in Health Perspectives and Practice. Ed. Julie Boddy and Verna Rice. 2nd. The Dunmore Press. p.13-25.

Cleary PD, Fowler FJ, Weissman J, Massagli MP, Wilson I, Seage GR, et al. (1993). Health-Related Quality-of-Life in Persons with Acquired-Immune-Deficiency-Syndrome. *Medical Care* 31(7):569-580.

Cohen LK, Jago JD (1976). Toward Formulation of Sociodental Indicators. *International Journal of Health Services* 6(4):681-701.

Coons SJ, Rao S, Keininger DL, Hays RD (2000). A comparative review of generic quality-of-life instruments. *Pharmacoeconomics* 17(1):13-35.

Coopersmith S (1967). The Antecedents of Self Esteem. Freeman: San Francisco.

Cox CL (2003). Online exclusive: a model of health behavior to guide studies of childhood cancer survivors. *Once Knurs Forum* 30(5):E92-9.

Crocker J, Wolfe CT (2001). Contingencies of self-worth. *Psychol Rev* 108(3):593-623.

Cromwell R, Butterfield E, Bayfield F, Curry J (1977). Acute Myocardial Infarction. St. Louis, MO: C.V. Mosby.

Culver J (1983). In J. Curler, ed., Health Indicators: An International Study for the European Science Foundation. Oxford: Martin Robinson.

Cummins RA (1995). On the trail of the gold standard for subjective well-being. *Social Indicators Research* 35(2):179-200.

Cushing IS, Sheiham A, Maize's J (1986). Developing socio-dental indicators--the social impact of dental disease. *Community Dent Health* 3(1):3-17.

Dantas RAS, Motzer SA, Ciol MA (2002). The relationship between quality of life, sense of coherence and self esteem in persons after coronary artery bypass graft surgery. *International Journal of Nursing Studies* 39(7):745-755.

David J, Astros A, Wang N (2006). Prevalence and correlates of self-reported state of teeth among schoolchildren in Kerala, India. *BMC Oral Health* 6(1):10.

Davis P (1976). Compliance Structures and Delivery of Health-Care - Case of Dentistry. *Social Science & Medicine* 10(6):329-337.

de Oliveira CM, Sheiham A (2004). Orthodontic treatment and its impact on oral health-related quality of life in Brazilian adolescents. *J Orthop* 31(1):20-27

Deep P (1999). Biological and biopsychosocial models of health and disease in dentistry. *J Can Dent Assoc* 65(9):496-7.

Designers D, Fortes M, Minot G (2004). The fractal dynamics of self esteem and physical self. *Nonlinear Dynamics Psychol Life Sci* 8(4):479-510.

Do LG, Spencer A (2007). Oral Health-Related Quality of Life of Children by Dental Caries and Fluorosis Experience. *Journal of Public Health Dentistry* 67(3):132-139.

Dragster J, Niggard HA, Edie GE, Bedevil M, Nerved MW, Native GK (2008). Sense of coherence as a resource in relation to health-related quality of life among mentally intact nursing home residents – a questionnaire study. *Health and Quality of Life Outcomes* 6:85 doi:10.1186/1477-7525-6-85.

Dubos R (1959). Mirage of Health: Utopias, Progress and Biological Change: NewYork: Harper & Row.

Dweck CS (2008). Can Personality Be Changed? The Role of Beliefs in Personality and Change. *Current Directions in Psychological Science* 17(6):391-394.

Eccles JS, Midgley C, Wigfield A, Buchanan CM, Reuman D, Flanagan C, et al. (1993). Development during adolescence. The impact of stage-environment fit on young adolescents' experiences in schools and in families. *Am Psychol* 48(2):90-101.

Edwards NC (1994). Translating Written Material for Community-Health Research and Service Delivery - Guidelines to Enhance the Process. *Canadian Journal of Public Health-Revue Canadienne De Sante Publique* 85(1):67-70.

Eiser C, Mohay H, Morse R (2000). The measurement of quality of life in young children. *Child Care Health and Development* 26(5):401-413.

Eiser C, Morse R (2001). Quality-of-life measures in chronic diseases of childhood. *Health Technol Assess* 5(4):1-157.

Eiser C (1995). Choices in measuring quality of life in children with cancer: A comment. 4(2):121-131.

Engel GL (1977). Need for a New Medical Model - Challenge for Biomedicine. *Science* 196(4286):129-136.

Engel GL (1980). The Clinical-Application of the Biopsychosocial Model. *American Journal of Psychiatry* 137(5):535-544.

Eriksson M, Lindström B (2005). Validity of Antonovsky's sense of coherence scale: a systematic review. *J. Epidemiol. Community Health.* 59:460-466.

Eriksson M, Lindstrom B (2006). Antonovsky's sense of coherence scale and the relation with health: a systematic review. *J Epidemiol Community Health* 60(5):376-81.

Ettinger RL (1987). Oral disease and its effect on the quality of life. *Gerodontics* 3(3):103-6.

Eyler AE, Wilcox S, Matson-Koffman D, Evenson KR, Sanderson B, Thompson J, et al. (2002). Correlates of physical activity among women from diverse racial/ethnic groups. *Journal of Womens Health & Gender-Based Medicine* 11(3):239-253.

Fawcett J, Downs F (1992). The Relationship of Theory and Research, 2nd edn. FA Davis, Philadelphia.

Fayers P, Machin D (2000). Quality of life: Assessment, analysis and Interpretation: John Wiley & Sons Ltd. Baffins Lane, Chichester, London. p.3-8.

Feldman BM, Grundland B, McCullough L, Wright V (2000). Distinction of quality of life, health related quality of life and health status in children referred for rheumatologic care. *Journal of Rheumatology* 27(1):226-233.

Feldt T, Leskinen E, Kinnunen U, Ruoppila I (2003). The stability of sense of coherence: comparing two age groups in a 5-year follow-up study. *Personality and Individual Differences* 35(5):1151-1165.

Ferrans CE, Zerwic JJ, Wilbur JE, Larson JL (2005). Conceptual model of health-related quality of life. *Journal of Nursing Scholarship* 37(4):336-342.

Fifer S (1992). Translating quality of life questionnaires. *Pharm. Outcomes News* 1:1-2.

Fitzpatrick R, Fletcher A, Gore S, Jones D, Spiegelhalter D, Cox D (1992). Quality-of-Life Measures in Health-Care .1. Applications and Issues in Assessment. *British Medical Journal* 305(6861):1074-1077.

Flaherty JA, Gaviria FM, Pathak D, Mitchell T, Wintrob R, Richman JA, et al. (1988). Developing Instruments for Cross-Cultural Psychiatric Research. *Journal of Nervous and Mental Disease* 176(5):257-263.

Fok SK, Chair SY, Lopez V (2005). Sense of coherence, coping and quality of life following a critical illness. *Journal of Advanced Nursing* 49(2):173-181.

Foster Page LA, Thomson WM, Jokovic A, Locker D (2005). Validation of the Child Perceptions Questionnaire (CPQ 11-14). *J Dent Res* 84(7):649-52.

Fowler F, Fowler H (1996). The Pocket Oxford Dictionary. University Press, Oxford. p.760.

Freire MC, Sheiham A, Hardy R (2001). Adolescents' sense of coherence, oral health status and oral health-related behaviours. *Community Dent Oral Epidemiol* 29(3):204-12.

Freire M, Hardy R, Sheiham A (2002). Mothers' sense of coherence and their adolescent children's oral health status and behaviours. *Community Dent Health* 19(1):24-31.

Galgut PN, Waite IM, Todd-Pokropek A, Barnby GJ (1987). The relationship between the multidimensional health locus of control and the performance of subjects on a preventive periodontal programme. *J Clin Periodontol* 14(3):171-5.

Gazmararian JA, Baker DW, Williams MV, Parker RM, Scott TL, Green DC, et al. (1999). Health literacy among Medicare enrollees in a managed care organization. *Jama* 281(6):545-51.

Geyer S (1997). Some conceptual considerations on the sense of coherence. *Soc Sci Med* 44(12):1771-9.

Gherunpong S, Tsakos G, Sheiham A (2004). Developing and evaluating an oral health-related quality of life index for children; the CHILD-OIDP. *Community Dent Health* 21(2):161-9.

Gherunpong S, Tsakos G, Sheiham A (2006). A sociodental approach to assessing dental needs of children: concept and models. *Int J Paediatr Dent* 16(2):81-8.

Gift HC, Reisine ST, Larach DC (1992). The social impact of dental problems and visits. *Am J Public Health* 82(12):1663-8.

Gift HC, Atchison KA, Dayton CM (1997). Conceptualizing oral health and oral health-related quality of life. *Soc Sci Med* 44(5):601-8.

Gillibrand E, Mosley J (1995). She Who Dares Wins: Harper Collins, London.

Gitmez AS, Morcöl G (1994). Socio-economic status and life satisfaction in Turkey. *Social Indicators Research* 31(1):77-98.

Gosney MB (1986). An investigation into some of the factors influencing the desire for orthodontic treatment. *Br J Orthod* 13(2):87-94.

Goursand D, Paiva SM, Zarzar PM, Ramos-Jorge ML, Cornacchia GM, Pordeus IA, et al. (2008). Cross-cultural adaptation of the Child Perceptions Questionnaire 11-14 (CPQ_{11-14}) for the Brazilian Portuguese language. *Health Qual Life Outcomes* 6:2.

Gregory J, Gibson B, Robinson PG (2005). Variation and change in the meaning of oral health related quality of life: a 'grounded' systems approach. *Soc Sci Med* 60(8):1859-68.

Guarnaccia P (1996). Anthropological perspectives. The importance of culture in the assessment of quality of life. In: Spilker B, editor. Quality of life and pharmaeconomics in clinical trials. 2nd ed. Philadelphia: Lippincott-Raven.

Guillemin F, Bombardier C, Beaton D (1993). Cross-Cultural Adaptation of Health-Related Quality-of-Life Measures - Literature-Review and Proposed Guidelines. *Journal of Clinical Epidemiology* 46(12):1417-1432.

Gururatana O (2008). Testing Thai versions of the child perception questionnaire. School of Clinical Dentistry, Uni. Sheffield. Sheffield, UK.

Guyatt GH, Deyo RA, Charlson M, Levine MN, Mitchell A (1989). Responsiveness and validity in health status measurement: a clarification. *J Clin Epidemiol* 42(5):403-8.

Guyatt GH, Feeny DH, Patrick DL (1993). Measuring health-related quality of life. *Ann Intern Med* 118(8):622-9.

Hanson CL (2001). Quality of life in families of youth with chronic conditions. In: Quality of life in child and adolescent illness: concepts, methods and findings. (Ed). Hans M. Koot and Jan L. Wallander, 1st . edn. Brunner-Routledge. p.181-212.

Harkapaa K, Jarvikoski A, Mellin G, Hurri H, Luoma J (1991). Health locus of control beliefs and psychological distress as predictors for treatment outcome in low-back pain patients: results of a 3-month follow-up of a controlled intervention study. *Pain* 46(1):35-41.

Hattie H, Marsh HW, Neill JT, Richards GE (1997). Adventure Education and Outward Bound: Out-of-Class Experiences That Make a Lasting Difference *Review of Educational Research* 67(1):43-87.

Health Management Information System (2007), Banting, Selangor. JKN(G), Malaysia.

Heo S, Moser DK, Riegel B, Hall LA, Christman N (2005). Testing a published model of health-related quality of life in heart failure. *J Card Fail* 11(5):372-9.

Herdman M, Fox-Rushby J, Badia X (1997). 'Equivalence' and the translation and adaptation of health-related quality of life questionnaires. *Qual Life Res* 6(3):237-47.

Herdman M, Fox-Rushby J, Badia X (1998). A model of equivalence in the cultural adaptation of HRQoL instruments: the universalist approach. *Quality of Life Research* 7(4):323-335.

Hetherington E, Parke R, Locke V (1999). Child Psychology: A Contemporary Viewpoint. 5th edn. USA: McGraw-Hill.

Higginson I, Carr A (2003). Clinical utility of Quality of life measures. ed. Robinson PG, Carr JC, Higginson J. How to choose a quality of life data. (Ed). Alison J Carr, Irene J Higginson and Peter G Robinson, 1st edn. BMJ Books, BMA House, Tavistock Square, London. p.63-77.

Hilton A, Skrutkowski M (2002). Translating instruments into other languages: development and testing processes. *Cancer Nurs* 25(1):1-7.

Ho Cheung William L, Oi Kwan Joyce C (2009). The Relationship Between Children's Locus of Control and Their Anticipatory Anxiety. *Public Health Nursing* 26(2):153-160.

Hodge HC, Holloway PJ, Bell CR (1982). Factors associated with toothbrushing behaviour in adolescents. *Br Dent J* 152(2):49-51.

Holt RD (2001). Advances in dental public health. *Prim Dent Care* 8(3):99-102.

Huebner ES (1991). Initial Development of the Student's Life Satisfaction Scale. *School Psychology International* 12(3):231-240.

Hughes RB (1984). Satisfaction with one's body and success in breastfeeding. *Issues Compr Pediatr Nurs* 7(2-3):141-53.

Hui CH, Triandis HC (1985). Measurement in Cross-Cultural Psychology: A Review and Comparison of Strategies. *Journal of Cross-Cultural Psychology* 16(2):131-152.

Humphris G, Freeman R, Gibson B, Simpson K, Whelton H (2005). Oral health-related quality of life for 8-10-year-old children: an assessment of a new measure. *Community Dent Oral Epidemiol* 33(5):326-32.

Hunt SM (1986). Cross-cultural issues in the use of socio-medical indicators. *Health Policy* 6(2):149-58.

Hutchinson J (1996). Quality of life in ethnic groups. In: Spilker B, editor. Quality of life and pharmaeconomics in clinical trials. 2nd ed. Philadelphia: Lippincott-Raven.

Ilich I (1979). Limits to Medicine. London: Marion Boyars.

Inglehart M, Bagramian R (2002). Oral health-related quality of life: An introduction Carl Stream, IL: Quintessence Publishing Co. p.1-6.

IQOLA (2006). International Quality of Life assessment.
http://www.iqola.org/project.aspx Download on 12/8/2006

Irvin S, Carroll W (1980). Testing assessment across cultures: Issues in methodology and theory. In: Triandis HC and Berry JW. Ed., Handbook of cross-cultural Psychology, vol.2 Boston: Allyn & Bacon.

Jaafar N (1999). Evaluation of The Outcome of Dental Care Service Among Malaysian Secondary School Children. Department of Community Dentistry. Fac. of Dentistry, Uni. Malaya.

James W (1983). The Principles of Psychology: Harvard University Press, Cambridge, MA. (Original work published 1890)

Janz NK, Janevic MR, Dodge JA, Fingerlin TE, Schork MA, Mosca LJ, et al. (2001). Factors influencing quality of life in older women with heart disease. *Med Care* 39(6):588-98.

John MT, Hujoel P, Miglioretti DL, LeResche L, Koepsell TD, Micheelis W (2004). Dimensions of oral-health-related quality of life. *J Dent Res* 83(12):956-60.

Jokovic A, Locker D, Stephens M, Kenny D, Tompson B, Guyatt G (2002). Validity and reliability of a questionnaire for measuring child oral-health-related quality of life. *J Dent Res* 81(7):459-63.

Jones CM, Worthington H (1999). The relationship between water fluoridation and socioeconomic deprivation on tooth decay in 5-year-old children. *Br Dent J* 186(8):397-400.

Jones M, Lee JY, Rozier RG (2007). Oral Health Literacy Among Adult Patients Seeking Dental Care. *The Journal of the American Dental Association* 138(9):1199-1208.

Juniper EF, Guyatt GH, Feeny DH, Ferrie PJ, Griffith LE, Townsend M (1996). Measuring quality of life in children with asthma. *Qual Life Res* 5(1):35-46.

Kahn JR, Fazio EM (2005). Economic Status Over the Life Course and Racial Disparities in Health. *Gerontol B Psychol Sci Soc Sci* 60(suppl_Special_Issue_2):S76-84.

Kallestal C, Dahlgren L, Stenlund H (2000). Oral health behaviour and self esteem in Swedish children. *Soc Sci Med* 51(12):1841-9.

Kallestal C, Dahlgren L, Stenlund H (2006). Oral health behavior and self esteem in Swedish adolescents over four years. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine* 38(5):583-590.

Kamaruddin NR (2001). Social profile of adult patients utilizing government and private dental clinics in Ipoh Perak. Fac. Of Dentistry, University of Malaya.

Kempen GI, Jelicic M, Ormel J (1997). Personality, chronic medical morbidity and health-related quality of life among older persons. *Health Psychol* 16(6):539-46.

Kenealy PM, Kingdon A, Richmond S, Shaw WC (2007). The Cardiff dental study: a 20-year critical evaluation of the psychological health gain from orthodontic treatment. *Br J Health Psychol* 12(Pt 1):17-49.

Kenealy K, Gleeson K, Frude N, Shaw W (1991). The importance of the individual in the causal relationship between attractiveness and self esteem. *Journal of Community & Applied Social Psychology* 1(1):45-56.

Kim A, Lim E (1999). How critical is back translation in cross-cultural adaptation of attitude measures? Presented at the Annual Meeting of the American Educational Research Association. Montreal, pp.19-23.

Kirkham J, Robinson C, Strafford SM, Shore RC, Bonass WA, Brookes SJ, et al. (2000). The chemical composition of tooth enamel in junctional epidermolysis bullosa. *Arch Oral Biol* 45(5):377-86.

Kivimaki M, Elovainio M, Vahtera J, Nurmi JE, Feldt T, Keltikangas-Jarvinen L, et al. (2002). Sense of coherence as a mediator between hostility and health: seven-year prospective study on female employees. *J Psychosom Res* 52(4):239-47.

Klages U, Bruckner A, Zentner A (2004). Dental aesthetics, self-awareness and oral health-related quality of life in young adults. *Eur J Orthod* 26(5):507-514.

Kliever W, Sandler I (1992). Locus of control and self esteem as moderators of stress-symptoms relation in children and adolescents. *Journal of Abnormal Child Psychology* 20:293-313.

Kneckt MC, Keinanen-Kiukaanniemi SM, Knuuttila ML, Syrjala AM (2001). Self esteem as a characteristic of adherence to diabetes and dental self-care regimens. *J Clin Periodontol* 28(2):175-80.

Kneckt M (2000). Psychological features characterizing oral health behavior, diabetes self-care and health status among IDDM patients, University of Oulu, FIN-90014 University of Oulu, Finland.

Koot H (2001). The study concept of quality of life: Concept and methods. cf. Hans M. Koot. The study of quality of life: Concepts and methods. In Quality of life in child and adolescent illness: concepts, methods and findings Ed. Hans M. Koot and Jan L. Wallander, 1st. edn: Brunner-Routledge. p.5.

Kressin NR, Spiro A, 3rd, Skinner KM (2000). Negative affectivity and health-related quality of life. *Med Care* 38(8):858-67.

Kressin NR, Reisine S, Spiro A, Jones JA (2001). Is negative affectively associated with oral quality of life? *Community Dentistry and Oral Epidemiology* 29(6):412-423.

Kreuter M, Skinner C (2000). Editorial. What's in a name. Oxford University Press. p.1-4.

Kroeger A (1983). Health interview surveys in developing countries: a review of the methods and results. *International Journal of Epidemiology* 12:465-481.

Kuuppelomaki M, Utriainen P (2003). A 3 year follow-up study of health care students' sense of coherence and related smoking, drinking and physical exercise factors. *International Journal of Nursing Studies* 40:383-388.

Kuyken W, Orley J, Hudelson P, Sartorious N (1994). Quality of life assessment across cultures. *International Journal of mental Health* 23:5-27

Lai CS, Shieh TY, Yang YH, Chong MY, Hung HC, Tsai CC (2006). Factors associated with quitting areca (betel) quid chewing. *Community Dent Oral Epidemiol* 34(6):467-74.

Lai C-S, Shieh T-Y, Yang Y-HC, Chong M-Y, Hung H-C, Tsai C-C (2006). Factors associated with quitting areca (betel) quid chewing. *Community Dentistry & Oral Epidemiology* 34(6):467-74.

Landgraf J, Abetz L (1998). Influences of socio-demography characteristics on parental reports of children's physical and psychosocial well being. In: Drotar D (Ed)Measuring health related quality of life in children and adolescent: Implication for research and practice. Mahwah, NJ: Lawrence Erlbaum Associates, New Jersey.

Langius A, Bjorvell H, Lind MG (1994). Functional status and coping in patients with oral and pharyngeal cancer before and after surgery. *Head Neck* 16(6):559-68.

Langius, Björvell (2001). The applicability of the Antonovsky Sense of Coherence Scale to a group of Pentecostalists. *Scand J Caring Sci* 15(2):190-192.

Larson J (1991). The Measurement of Health: Concepts and Indicators: Greenwood Press.

Larsson G, Kallenberg KO (1996). Sense of coherence, socioeconomic conditions and health: Interrelationships in a nation-wide Swedish sample. *The European Journal of Public Health* 6(3):175-180.

Larsson G, Kallenberg KO (1996). Sense of coherence, socioeconomic conditions and health: Interrelationships in a nation-wide Swedish sample. *The European Journal of Public Health* 6(3):175-180.

Lawrence HP, Thomson WM, Broadbent JM , Poulton R (2008). Oral health-related quality of life in a birth cohort of 32-year olds. *Community Dentistry and Oral Epidemiology* 36(4):305-316.

LefCourt H (1982). Locus of Control: Current Trends in Theory and Research, 2nd ed. Hillsdale, NJ: Lawrence Erlbaub.

Leplège A, Verdier A The adaptation of health status measures: methodological aspects of the translation procedure. In Shumaker SA, Berzon R (eds). The International Assessment of Health-Related Quality of Life: Theory, Translation, Measurement & Analysis: Rapid Communications Oxford, New York 1995. p.93-101.

Lewin K (1935). A dynamic theory of personality. New York: McGraw Hill.

Lewis FM, Morisky DE, Flynn BS (1978). A test of the construct validity of health locus of control: effects on self-reported compliance for hypertensive patients. *Health Educ Monogr* 6(2):138-48.

Li H C W, Lopez V (2004). Chinese translation and validation of the Nowicki-Strickland locus of control scale for children. *International Journal of Nursing Studies* 41(5):463-469.

Liberatos P, Link BG, Kelsey JL (1988). The measurement of social class in epidemiology *Epidemiologic Reviews* 10(1):87-121.

Liberatos P, Link BG, Kelsey JL (1988). The measurement of social class in epidemiology *Epidemiologic Reviews* 10(1):87-121.

Lindstrom B, Eriksson M (2005). Salutogenesis. *J Epidemiol Community Health* 59(6):440-2.

Lindstrom B, Eriksson M (2006). Contextualizing salutogenesis and Antonovsky in public health development. *Health Promot Int* 21(3):238-44.

Llewellyn CD, Warnakulasuriya S (2003). The impact of stomatological disease on oral health-related quality of life. *Eur J Oral Sci* 111(4):297-304.

Locker D (1988). Measuring oral health: a conceptual framework. *Community Dent Health* 5(1):3-18.

Locker D (1992). The burden of oral disorders in a population of older adults. *Community Dent Health* 9(2):109-24.

Locker D (1996). Applications of self-reported assessments of oral health outcomes. *J Dent Educ* 60(6):494-500.

Locker D (2000). Deprivation and oral health: a review. *Community Dent Oral Epidemiol* 28(3):161-9.

Locker D (2004). Oral health and quality of life. *Oral Health Prev Dent* 2 Suppl 1:247-53.

Locker D, Jokovic A, Clarke M (2004). Assessing the responsiveness of measures of oral health-related quality of life. *Community Dent Oral Epidemiol* 32(1):10-8.

Locker D, Allen F (2007). What do measures of oral health-related quality of life measure? *Community Dentistry and Oral Epidemiology* 35:401-411.

Locker D, Slade G (1994). Association between clinical and subjective indicators of oral health status in an older adult population. *Gerodontology* 11(2):108-114.

Locker D (2007). Disparities in oral health-related quality of life in a population of Canadian children. *Community Dentistry and Oral Epidemiology* 35(5):348-356.

Locker D (2009). Self esteem and Socioeconomic Disparities in Self-Perceived Oral Health. *Journal of Public Health Dentistry* 69(1):1-8.

Lollar DJ, Simeonsson RJ, Nanda U (2000). Measures of outcomes for children and youth. *Arch Phys Med Rehabil* 81(12 Suppl 2):S46-52.

Long AF, Dixon P (1996). Monitoring outcomes in routine practice: defining appropriate measurement criteria. *J Eval Clin Pract* 2(1):71-8.

Lubetkin EI, Jia H, Franks P, Gold MR (2005). Relationship among sociodemographic factors, clinical conditions and health-related quality of life: examining the EQ-5D in the U.S. general population. *Qual Life Res* 14(10):2187-96.

Lundberg O, Peck MN (1994). Sense of coherence, social structure and health: Evidence from a population survey in Sweden. *The European Journal of Public Health* 4(4):252-257.

Lundberg O (1997). Childhood conditions, sense of coherence, social class and adult ill health: exploring their theoretical and empirical relations. *Soc Sci Med* 44(6):821-31.

Lynch JW, Smith GD, Kaplan GA, House JS (2000). Income inequality and mortality: importance to health of individual income, psychosocial environment, or material conditions. *Bmj* 320(7243):1200-4.

Lynch J, Kaplan G (2006). Socioeconomic position in Berkham LF & Kawachi I (Eds) Social epidemiology: New York; Oxford: Oxford University Press.

MacEntee MI, Hole R, Stolar E (1997). The significance of the mouth in old age. *Soc Sci Med* 45(9):1449-58.

MacEntee MI (2006). An existential model of oral health from evolving views on health, function and disability. *Community Dental Health* 23(1):5-14.

Macgregor ID, Balding JW (1987). Toothbrushing frequency and personal hygiene in 14-year-old schoolchildren. *Br Dent J* 162(4):141-4.

Macgregor ID, Balding JW (1991). Self esteem as a predictor of toothbrushing behaviour in young adolescents. *J Clin Periodontol* 18(5):312-6.

Macgregor ID, Regis D, Balding J (1997). Self-concept and dental health behaviours in adolescents. *J Clin Periodontol* 24(5):335-9.

Madjar I (1992). Metapersonal perspectives on health and illness, In Boddy, J. (Ed), Health: Perspectives and Practices, (2nd ed): The Dunmore Press.

MAPI, (2004). Research Institute. Linguistic validation. Available at: http://mapi-research.fr/definition main.asp. Accessed in August 2004.

Marcia J (1980). Identity in adolescence. In Adelson J (Ed.), Handbook of Adolescent Psychology. New York: Wiley. p.159-187.

Marin G, Marin B (1991). Research with Hispanic population. Newbury Park CA: Sage Publication 1991. CF: Carlson ED (2000). A case study in translation methodology using the Health Promotion Lifestyle Profile II.

Marques S, Pais-Ribeiro J, Lopez S (2007). Validation of a Portuguese Version of the Students' Life Satisfaction Scale. *Applied Research in Quality of Life* 2:83-94.

Marshman Z, Rodd H, Stern M, Mitchell C, Locker D, Jokovic A, et al. (2005). An evaluation of the Child Perceptions Questionnaire in the UK. *Community Dent Health* 22(3):151-5.

Marshman Z, Gibson BJ, Owens J, Rodd HD, Mazey H, Baker SR, et al. (2007). Seen but not heard: a systematic review of the place of the child in 21st-century dental research. *Int J Paediatr Dent* 17(5):320-7.

Marshman Z, Robinson P (2007). Child and Adolescent Oral Health-Related Quality of Life. *Semin Orthod* 13:88-95.

Marshman Zoe (2007). The impact Development Defects of Enamel on Young People, School of Clinical Dentistry, University of Sheffield, UK.

McCombs B (1991). Metacognition and motivation in higher level thinking. Paper presented at the annual meeting of the American Educational Research Association, Chicago.

McDowell I, C N (1996). Measuring Health: a Guide to Rating Scales and Questionnaires. 2nd edn ed.: Oxford University Press, Oxford.

McGrath C, Broder H, Wilson-Genderson M (2004). Assessing the impact of oral health on the life quality of children: implications for research and practice. *Community Dent Oral Epidemiol* 32(2):81-5.

McKee J (1988). Holistic health and the critique of Western medicine. *Soc Sci Med* 26(8):775-84.

McKeown T (1979). The Role of Medicine: Dream, Mirage or Nemesis? Oxford: Blackwell.

Mechanic D (1995). Sociological dimensions of illness behavior. *Soc Sci Med* 41(9):1207-16.

Meeberg GA (1993). Quality of life: a concept analysis. *J Adv Nurs* 18(1):32-8.

Meggert S (2000). Who cares what I think: Problems of low self esteem. In Capuzzi D, Gross DR (Eds.). Youth at risk: A prevention resource for counsellors, teachers and parents (3rd ed.). Alexandria, VA: American Counselling Association.

Mimura C, Griffiths P (2004). A Japanese version of the perceived stress scale: translation and preliminary test. *Int J Nurs Stud* 41(4):379-85.

Moorman C, Matulich E (1993). A Model of Consumers' Preventive Health Behaviors: The Role of Health Motivation and Health Ability. *The Journal of Consumer Research* 20(2):208-228.

Mozes B, Maor Y, Shmueli A (1999). Do We Know What Global Ratings of Health-Related Quality of Life Measure? *Quality of Life Research* 8(3):269-273.

Mruk C, (1995). Self esteem: Research, Theory and Practice. New York: Springer Publishing.

Mruk C (1999). Self esteem: Research, Theory and Practice. New York: Springer Publishing.

Mumcu G, Hayran O, Ozalp DO, Inanc N, Yavuz S, Ergun T, et al. (2007). The assessment of oral health-related quality of life by factor analysis in patients with Behcet's disease and recurrent aphthous stomatitis. *J Oral Pathol Med* 36(3):147-52.

Najman JM, Aird R, Bor W, O'Callaghan M, Williams GM, Shuttlewood GJ (2004). The generational transmission of socioeconomic inequalities in child cognitive development and emotional health. *Soc Sci Med* 58(6):1147-58.

Nakazono TT, Davidson PL Andersen RM (1997). Oral health beliefs in diverse populations. *Adv Dent Res* 11(2):235-44.

Natapoff JN (1978). Children's views of health: a developmental study. *American Journal of Public Health* 68(10):995-1000.

Newton JT, Robinson PG, Khan F, Gelbier S, Gibbons DE (2002). Testing a model of the relationship between gender, ethnicity, clinical status and impact in older adults from minority ethnic groups. *Gerodontology* 19(2):102-8.

Nikias M, Bailit H, Beck J, Cohen L, Conrad D, Giddon D, et al. (1979). Progress report of the committee on sociodental indicators of the behavioural science group, monograph.

Nikias M (1985). Oral disease and quality of life. *American Journal of Public Health* 75(1):11-12.

Nokes KM, Holzemer WL, Corless IB, Bakken S, Brown M-A, Powell-Cope GM, et al. (2000). Health-Related Quality of Life in Persons Younger and Older than 50 Who are Living with HIV/AIDS. *Research on Aging* 22(3):290-310.

Norain AT, Norlida A (2009). Water Fluoridation - A Public Health Approach in Caries Prevention in Malaysia. A Presentation at Symposium Pengurusan and Peroditan Industri Air (2-3 Nov, 2009). SACC, Shah Alam, Selangor, Malaysia.

Normandeau S, Kalnins I, Jutras S, Hanigan D (1988). A description of 5- to 12-year-old children's conception of health within the context of their daily life. *Psychol Health* 13:883-96.

Nunnally J (1978). Psychometric Theory. 3rd edn ed.: McGraw-Hill, New York.

O'Connor R (1993). Issues in the measurement of health-related quality of life. Working Paper 30. NHMRC National Centre for Health Program Evaluation, Melbourne, Australia,

July 1993. CF: Eiser C, Morse R (2001). Quality of life measure in chronic diseases of childhood. Health Technology assessment 5(4):1-157.

Odman PA, Lange AL, Bakdash MB (1984). Utilization of locus of control in the prediction of patients' oral hygiene performance. *J Clin Periodontol* 11(6):367-72.

Onyeaso CO (2003). An assessment of relationship between self esteem, orthodontic concern and Dental Aesthetic Index (DAI) scores among secondary school students in Ibadan, Nigeria. *Int Dent J* 53(2):79-84.

Oral Health Division, Ministry of Health Malaysia (1997). National Oral Health Survey of School Children 1997 (NOHSS '97). MOH/K/GIG/6.98(RR), 1998.

Oral Health Division, Ministry of Health Malaysia (2004). Oral Healthcare for Children With Special Needs. Guidelines for Implementation, 2004. MOH/K/GIG/7.2004(GU).

Oral Health Division, Ministry of Health Malaysia (2000). National Oral Health Survey of Adults (NOHSA 2000). Kuala Lumpur: Oral Health Division, Ministry of Health Malaysia, 2004.

Oral Health Division, Ministry of Malaysia (2005). Oral Health Care in Malaysia. MOH / K / GIG / 4.05.

Ostberg AL, Eriksson B, Lindblad U, Halling A (2003). Epidemiological dental indices and self-perceived oral health in adolescents: ecological aspects. *Acta Odontol Scand* 61(1):19-24.

Pallant JF, Lae L (2002). Sense of coherence, well-being, coping and personality factors: further evaluation of the sense of coherence scale. *Personality and Individual Differences* 33(1):39-48.

Pallant J (2001). SPSS Survival Manual. A step by step guide to data analysis using SPSS for Window (Versions 10 and 11): Open University Press, Bunkingham, Philadelphia p.3-10.

Parcel GS, Meyer MP (1978). Development of an instrument to measure children's health locus of control. *Health Educ Monogr* 6(2):149-59.

Patrick DL, Deyo RA (1989). Generic and disease-specific measures in assessing health status and quality of life. *Med Care* 27(3 Suppl):S217-32.

Pearlin LI, Schooler C (1978). The structure of coping. *J Health Soc Behav* 19(1):2-21.

Peres MA, Peres KG, Traebert J, Zabot NE, de Lacerda JT (2005). Prevalence and severity of dental caries are associated with the worst socioeconomic conditions: A Brazilian cross-sectional study among 18-year-old males. *Journal of Adolescent Health* 37(2):103-109.

Perrin EC, Gerrity PS (1981). There's a demon in your belly: children's understanding of illness. *Pediatrics* 67(6):841-9.

Peters M, Passchier J (2006). Translating instruments for cross-cultural studies in headache research. *Headache* 46(1):82-91.

Petersen P (2003). The World Oral Health Report 2003: continuous improvement of oral health in the 21st century - the approach of the WHO Global Oral Health Programme. WHO/NMH/NPH/ORH/03.2. p. 3-24.

Peterson C, Bell M (1996). Children's memory for traumatic injury. *Child Dev* 67(6):3045-70.

Piaget J (1929). The child's conception of the world: Harcourt Brace, New York.

Raphael D, Renwick R, Brown I, Rootman I (1996). Quality of life indicators and health: Current status and emerging conceptions. *Social Indicators Research* 39(1):65-88.

Ravassipour DB, Hart PS, Hart TC, Ritter AV, Yamauchi M, Gibson C, *et al.* (2000). Unique enamel phenotype associated with amelogenin gene (AMELX) codon 41 point mutation. *J Dent Res* 79(7):1476-81.

Reasoner R (2009). The true meaning of self esteem. National Association for Self Esteem. [Online exclusive]. Retrieved November 20, 2009, from http://www.self-esteem-nase.org/what.php.

Rebok G, Riley A, Forrest C, Starfield B, Green B, Robertson J, et al. (2001). Elementary school-aged children's reports of their health: a cognitive interviewing study. *Qual Life Res* 10(1):59-70.

Regis D, Macgregor ID, Balding JW (1994). Differential prediction of dental health behaviour by self esteem and health locus of control in young adolescents. *J Clin Periodontol* 21(1):7-12.

Reisine ST, Bailit HL (1980). Clinical oral health status and adult perceptions of oral health. *Soc Sci Med Med Psychol Med Sociol* 14A(6):597-605.

Reisine ST (1981). Theoretical considerations in formulating sociodental indicators. *Soc Sci Med A* 15(6):745-50.

Reisine ST (1984a). Dental disease and work loss. *J Dent Res* 63(9):1158-61.

Reisine S (1984b). The economic, social and psychological impact of oral health condition, diseases and treatment. In social sciences and dentistry: a critical bibliography, eds. Cohen LK & Bryant P. London

Reisine S, Locker D (1995). Social, psychological and economic impacts of oral conditions and treatments. In: Cohen LK, Gift HC, editor. Disease prevention and oral health promotion. 1. Copenhagen: Munksgaard; 1995. p.33-72.

Reisine S (1996). An overview of self-reported outcome assessment in dental research. *J Dent Educ* 60(6):488-93.

Reisine ST, Psoter W (2001). Socioeconomic status and selected behavioral determinants as risk factors for dental caries. *J Dent Educ* 65(10):1009-16.

Renz A, Ide M, Newton T, Robinson PG, Smith D (2007). Psychological approaches may improve oral hygiene behaviour What interventions improve adherence to oral hygiene instruction in adults who have periodontal disease? *Cochrane Database Syst Rev* issue 2:39-40.

Ring L, Hofer S, Heuston F, Harris D, O'Boyle CA (2005). Response shift masks the treatment impact on patient reported outcomes (PROs): the example of individual quality of life in edentulous patients. *Health Qual Life Outcomes* 3:55.

Roberts R, Bengston V (1996). Affective ties to parents in early adulthood and self esteem across 20 years. *Soc. Psychol. Q* 59:96-106.

Robinson PG, Carr J, Higginson J (2003). How to choose a quality of life data. Ed. Alison J Carr, Irene J Higginson and Peter G Robinson, 1st edn. BMJ Books: BMA House, Tavistock Square, London. p.1-8.

Robinson PG, Nalweyiso N, Busingye J, Whitworth J (2005). Subjective impacts of dental caries and fluorosis in rural Ugandan children. *Community Dent Health* 22(4):231-6.

Rogosa DR (1980). A critique of cross-lagged correlation. *Psychological Bulletin* 88:245-258.

Ropka ME (2002). Symptom status and functional status outcomes: humanistic outcomes in obesity disease management. *Obes Res* 10 Suppl 1:42S-49S.

Rosenberg M (1965). Society and the adolescent self-image. Princeton, NJ: Princeton University Press.

Rosenberg M (1979). Conceiving the Self: Basic Books, New York.

Rosenberg M (1985). Self concept and psychological well-being in adolescence. In the development of the self, edited by Leahy RL. Orlando, FL: Academic Press. p.205-246

Rosenberg M (1990). The Self-Concept: Social Product and Social Force. In Social Psychology: Sociological Perspectives, edited by Morris Rosenberg and Ralph H. Turner. Transaction. (reissue, 1990, originally published by Basic Books, 1981). p.593-624.

Rosenberg M, Schooler C, Schoenbach C, Rosenberg F (1995). Global self esteem and specific self esteem: Different concepts, different outcomes. *American Sociological Review* 60(1):141-156.

Rosenstock IM (1966). Why people use health services. *Milbank Mem Fund Q* 44(3):Suppl:94-127.

Rotter JB (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychol Monogr* 80(1):1-28.

Ruben CW (1999). Oral Health for All: Policy for Available, Accessible and Acceptable Care. Executive Summary.p.1.

Rushforth H (1999). Practitioner review: communicating with hospitalised children: review and application of research pertaining to children's understanding of health and illness. *J Child Psychol Psychiatry* 40(5):683-91.

Rutter M (1985). Resilience in the face of adversity. Protective factors and resistance to psychiatric disorder. *Br J Psychiatry* 147:598-611.

Ryckman R (2004). Theories of Personality: Belmont, CA: Thomson/Wadsworth.

Sagy S, Antonovsky A, Adler I (1990). Explaining life satisfaction in later life: The Sense of Coherence Model and Activity Theory. *Behavior, Health and Aging* 1:11-25.

Sanders AE, Spencer AJ (2005). Why do poor adults rate their oral health poorly? *Australian Dental Journal* 50(3):161-167.

Santrock J (1986). Life-Span Development: Brown Publishers, Dubuque, IA.

Sararaks S, Azman AB, Low LL, Rugayah B, Aziah AM, Hooi LN, et al. (2005). Validity and reliability of the SF-36: the Malaysian context. *Med J Malaysia* 60(2):163-79.

Sartorius N, Kuyken W (1994). Translation of Health Status Instruments. In: Orley J, Kuyken W (Eds.) Quality of Life Assessment: International Perspectives. Springer Berlin Heidelberg. p.3-19.

Savolainen J, Suominen-Taipale AL, Hausen H, Harju P, Uutela A, Martelin T, et al. (2005a). Sense of coherence as a determinant of the oral health-related quality of life: a national study in Finnish adults. *Eur J Oral Sci* 113(2):121-7.

Savolainen JJ, Suominen-Taipale AL, Uutela AK, Martelin TP, Niskanen MC, Knuuttila ML (2005b). Sense of coherence as a determinant of toothbrushing frequency and level of oral hygiene. *J Periodontol* 76(6):1006-12.

Savolainen J (2005c). A salutogenic perspective to oral health Sense of coherence as a determinant of oral and general health behaviours and oral health-related quality of life, University of Oulu, Finland.

Schipper H, Clinch J, Powell V (1990). Definitions and conceptual issues. In Spilker B. (ed.), Quality of Life in Clinical Trials: Raven, New York.

Schmidt S, Bullinger M (2003). Current issues in cross-cultural quality of life instrument development. *Arch Phys Med Rehabil* 84(4 Suppl 2):S29-34.

Schmitt DP, Allik J (2005). Simultaneous administration of the Rosenberg Self esteem Scale in 53 nations: exploring the universal and culture-specific features of global self esteem. *J Pers Soc Psychol* 89(4):623-42.

Schnyder U, Buchi S, Sensky T, Klaghofer R (2000). Antonovsky's sense of coherence: trait or state? *Psychother Psychosom* 69(6):296-302.

Schou L, Currie C, McQueen D (1990). Using a "lifestyle" perspective to understand toothbrushing behaviour in Scottish schoolchildren. *Community Dent Oral Epidemiol* 18(5):230-4.

Scruggs RR, Warren DP, Levine P (1989). Juvenile diabetics' oral health and locus of control. A pilot study. *J Dent Hyg* 63(8):376-81.

Sechrest L, Fay TL, Zaidi SMH (1972). Problems of Translation in Cross-Cultural Research. *Journal of Cross-Cultural Psychology* 3(1):41-56.

Seeman M, Evans JW (1962). Alienation and Learning in a Hospital Setting. *American Sociological Review* 27(6):772-782.

Seligman M (1975). Helplessness of depression, development and death. San Francisco, CA: W. H. Freeman.

Shavers VL (2007). Measurement of socioeconomic status in health disparities research. *J Natl Med Assoc* 99(9):1013-23.

Shaw WC, Gbe MJ, Jones BM (1979). The expectations of orthodontic patients in South Wales and St Louis, Missouri. *Br J Orthod* 6(4):203-5.

Sheiham A, Maizels JE, Cushing AM (1982). The concept of need in dental care. *International Dental Journal* 32(3):265-70.

Shin DC, Johnson DM (1978). Avowed happiness as an overall assessment of the quality of life. *Social Indicators Research* 5(1):475-492.

Silva AN, Mendonca MH, Vettore MV (2008). A salutogenic approach to oral health promotion. *Cad Saude Publica* 24 Suppl 4:s521-30.

Slade GD, Spencer AJ, Locker D, Hunt RJ, Strauss RP, Beck JD (1996). Variations in the social impact of oral conditions among older adults in South Australia, Ontario and North Carolina. *J Dent Res* 75(7):1439-50.

Sloan JA, Aaronson N, Cappelleri JC, Fairclough DL, Varricchio C (2002). Assessing the clinical significance of single items relative to summated scores. *Mayo Clin Proc* 77(5):479-87.

Smith JM , Sheiham A (1979). How dental conditions handicap the elderly. *Community Dentistry Oral Epidemiology* 7(6):305-310.

Soelberg P (1967). Causal inference from cross-lagged correlation coefficients: fact or fancy?

Sonstroem RJ, Walker MI (1973). Relationship of attitudes and locus of control to exercise and physical fitness. *Percept Mot Skills* 36(3):1031-4.

Sousa KH, Holzemer WL, Henry SB, Slaughter R (1999). Dimensions of health-related quality of life in persons living with HIV disease. *J Adv Nurs* 29(1):178-87.

Sprangers MA, Aaronson NK (1992). The role of health care providers and significant others in evaluating the quality of life of patients with chronic disease: a review. *J Clin Epidemiol* 45(7):743-60.

Sprangers MA, Schwartz CE (1999). Integrating response shift into health-related quality of life research: a theoretical model. *Soc Sci Med* 48(11):1507-15.

Stewart D, Rosenbaum P (2003). The International Classification of Functioning, Disability and Health (ICF) A Global Model to Guide Clinical Thinking and Practice in Childhood Disability. Can Child Centre for Childhood Disability Research.
http://www.canchild.ca/Default.aspx?tabid=133.

Streiner D, Norman G (1994). Health measurement scales: a practical guide to their development and use. Oxford: Oxford Medical Publication.

Streiner D, Norman G (2003). Health measurement scales: A practical guide to their development and use (3rd ed.) Oxford: Oxford University Press.

Sullivan MD, Kempen GIJM, Sonderen EV, Ormel J (2000). Models of Health-Related Quality of Life in a Population of Community-Dwelling Dutch Elderly. *Quality of Life Research* 9(7):801-810.

Suominen S, Blomberg H, Helenius H, Koskenvuo M (1999). Sense of coherence and health - does the association depend on resistance resources? A study of 3115 adults in Finland. *Psychol Health* 15:1-12.

Suominen S, Helenius H, Blomberg H, Uutela A, Koskenvuo M (2001). Sense of coherence as a predictor of subjective state of health: results of 4 years of follow-up of adults. *J Psychosom Res* 50(2):77-86.

Suominen S, Gould R, Ahvenainen J, Vahtera J, Uutela A, Koskenvuo M (2005). Sense of coherence and disability pensions. A nationwide, register based prospective population study of 2196 adult Finns. *J Epidemiol Community Health* 59(6):455-9.

Surgeon General Report (2000). US Department of Health and Human Services. Oral health in America: a report of the surgeon general. Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health.

Syrjala AM, Ylostalo P, Niskanen MC, Knuuttila ML (2004). Relation of different measures of psychological characteristics to oral health habits, diabetes adherence and related clinical variables among diabetic patients. *Eur J Oral Sci* 112(2):109-14.

Tan EH, Batchelor P, Sheiham A (2006). A reassessment of recall frequency intervals for screening in low caries incidence populations. *Int Dent J* 56(5):277-82.

Taylor SE, Seeman TE (1999). Psychosocial resources and the SES-health relationship. *Ann N Y Acad Sci* 896:210-25.

Testa MA, Simonson DC (1996). Assessment of quality-of-life outcomes. *N Engl J Med* 334(13):835-40.

Torsheim T, Aaroe LE, Wold B (2001). Sense of coherence and school-related stress as predictors of subjective health complaints in early adolescence: interactive, indirect or direct relationships? *Soc Sci Med* 53(5):603-14.

Touze E, Saillour-Glenisson F, Durieux P, Verdier A, Leyshon S, Bendavid S, et al. (2006). Lack of validity of a French adaptation of a scale measuring attitudes towards clinical practice guidelines. *Int J Qual Health Care* 18(3):195-202.

Tubert-Jeannin S, Riordan PJ, Morel-Papernot A, Roland M (2004). Dental status and oral health quality of life in economically disadvantaged French adults. *Spec Care Dentist* 24(5):264-9.

Tubert-Jeannin S, Pegon-Machat E, Gremeau-Richard C, Lecuyer MM, Tsakos G (2005). Validation of a French version of the Child-OIDP index. *European Journal of Oral Sciences* 113(5):355-362.

Ullman C, Tatar M (2001). Psychological adjustment among Israeli adolescent immigrants: A report on life satisfaction, self-concept and self esteem. *Journal of Youth and Adolescence* 30(4): 449-463.

Van De Vijver FJR, Poortinga YH (1982). Cross-Cultural Generalization and Universality. *Journal of Cross-Cultural Psychology* 13(4):387-408.

Veenhoven R (2000). The Four Qualities of Life. *Journal of Happiness Studies* 1(1):1-39.

Vlassoff C (1994). Gender inequalities in health in the Third World: uncharted ground. *Soc Sci Med* 39(9):1249-59.

Wade DT, Halligan PW (2004). Do biomedical models of illness make for good healthcare systems? *Bmj* 329(7479):1398-401.

Wagner AK, Gandek B, Aaronson NK, Acquadro C, Alonso J, Apolone G, et al. (1998). Cross-cultural comparisons of the content of SF-36 translations across 10 countries: results from the IQOLA Project. International Quality of Life Assessment. *J Clin Epidemiol* 51(11):925-32.

Wainwright NW, Surtees PG, Welch AA, Luben RN, Khaw KT, Bingham SA (2007). Healthy lifestyle choices: could sense of coherence aid health promotion? *J Epidemiol Community Health* 61(10):871-6.

Wallander J (2001). Theoretical and developmental issues in quality of life for children and adolescents. In: Quality of life in child and adolescent illness: concepts, methods and findings. Ed. Hans M. Koot and Jan L. Wallander, 1st. edn: Brunner-Routledge. p.23-48.

Wallston BS, Wallston KA, Kaplan GD, Maides SA (1976). Development and validation of the health locus of control (HLC) scale. *J Consult Clin Psychol* 44(4):580-5.

Wallston K (1992). Hocus-pocus, the focus isn't strictly on locus: Rotter's social learning theory modified for health. *Cognit Ther Res* 16183-199.

Ware JE Jr, Sherbourne CD (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care* 30(6):473-83.

Ware JE, Kosinski M, Dewey JE (2000). How to score Version 2 of the SF-36 Health Survey. Lincoln, RI: QualiMetric Incorporated.

Watkins D, Dhawan N (1989). Do we need to distinguish the constructs of self-concept and self esteem? *Journal of Social Behavior and Personality* 4:555-562.

Watt R (2007). From victim blaming to upstream action: tackling the social determinants of oral health inequalities. *Community Dent Oral Epidemiol* 35:1-11.

Watt RG (2007). From victim blaming to upstream action: tackling the social determinants of oral health inequalities. *Community Dent Oral Epidemiology* 35(1):1-11.

Weintraub JA (1998). Uses of oral health related quality of life measures in Public Health. *Community Dent Health* 15(1):8-12.

Wiesmann U, Hannich H (2008). A salutogenic view on subjective wellbeing in active elderly persons. Aging and Mental Health 12:56-65. (Abstract).

Wennberg JE (1990). Outcomes research, cost containment and the fear of health care rationing. *N Engl J Med* 323(17):1202-4.

Werner O, Campbell D (1970). Translating, Working through Interpreters and the Problem of Decentering. In: Naroll R and Cohen R (eds.). Handbook of method in Cultural Anthropology. New York: American Museum of National History.

West KP, DuRant RH, Pendergrast R (1993). An experimental test of adolescents' compliance with dental appointments. *J Adolesc Health* 14(5):384-9.

WHO (1947). World Health Organisation. Constitution of the World Health Organisation. Geneva: WHO.

WHO (1980). International classification of impairments, disabilities and handicaps. Geneva: WHO.

WHO (1995). The World Health Organization quality of life assessment (WHOQOL): Position paper from the World Health Organization. *Social Science & Medicine* 41(10):1403-1409.

WHO (1997). Oral Health Survey Basic 4th edition.

WHO (2001). International classification of functioning, disability and health. Geneva: World Health Organisation.

WHO (2003). World Health Organization. The World Oral Health Report. Geneva: WHO.

Williams AF (1972). Personality characteristics associated with preventive dental health practices. *J Am Coll Dent* 39(4):225-34.

Williams KB, Gadbury-Amyot CC, Bray KK, Manne D, Collins P (1998). Oral health-related quality of life: a model for dental hygiene. *J Dent Hyg* 72(2):19-26.

Wilson IB, Cleary PD (1995). Linking Clinical-Variables with Health-Related Quality-of-Life - a Conceptual-Model of Patient Outcomes. *Jama-Journal of the American Medical Association* 273(1):59-65.

Winkleby MA, Jatulis DE, Frank E, Fortmann SP (1992). Socioeconomic status and health: how education, income and occupation contribute to risk factors for cardiovascular disease. *American Journal of Public Health* 82(6):816-820.

Wolfe GR, Stewart JE, Hartz GW (1991). Relationship of dental coping beliefs and oral hygiene. *Community Dentistry and Oral Epidemiology* 19(2):112-115.

Wu ZH, Rudkin L (2000). Social contact, socioeconomic status and the health status of older Malaysians. *Gerontologist* 40(2):228-34.

Wylie R (1979). The self concept: Theory and Research on selected topic. Rev. ed. Lincoln, NE: University of Nebraska Press.

Yamaoka K, Shigehisa T, Ogoshi K, Haruyama K, Watanabe M, Hayashi F, et al. (1998). Health-related quality of life varies with personality types: a comparison among cancer patients, non-cancer patients and healthy individuals in a Japanese population. *Qual Life Res* 7(6):535-44.

Yen IH, Syme SL (1999). The Social Environment and Health: A Discussion of the Epidemiologic Literature. *Annual Review of Public Health* 20(1):287-308.

Youngs GA, Rathge R, Mullis R, Mullis A (1990). Adolescent Stress and Self esteem. *Adolescence* 25(98):333-341.

Yu DSF, Lee DTF, Woo J (2003). Translation of the Chronic Heart Failure Questionnaire. *Applied Nursing Research* 16(4):278-283.

UNIT PERANCANG EKONOMI
Economic Planning Unit
JABATAN PERDANA MENTERI
Prime Minister's Department
BLOK B5 & B6
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62502 PUTRAJAYA
MALAYSIA

EPU

Telefon : 603-8888 3333
Telefax : 603-888

Ruj. Tuan:
Your Ref.:

Ruj. Kami:
Our Ref.: UPE: 40/200/19/1551

Tarikh:
Date: 18 December 2006

Amdah Mat
No. 14 Jalan Semilang 10
Taman Seri Putra, Banting
42700 Kuala Langat
Selangor

APPLICATION TO CONDUCT RESEARCH IN MALAYSIA

With reference to your application dated 25 October 2006, I am pleased to inform you that your application to conduct research in Malaysia has been approved by the **Research Promotion and Co-Ordination Committee, Economic Planning Unit, Prime Minister's Department.** The details of the approval are as follows:

Researcher's name	:	AMDAH MAT
Passport No. / I. C No:		630123-03-5112
Nationality	:	MALAYSIA
Title of Research	:	CHILD ORAL HEALTH
Period of Research Approved:		THREE MONTHS

2. Please collect your Research Pass in person from the Economic Planning Unit, Prime Minister's Department, Parcel B, Level 4 Block B5, Federal Government Administrative Centre, 62502 Putrajaya and bring along two (2) passport size photographs. You are also required to comply with the rules and regulations stipulated from time to time by the agencies with which you have dealings in the conduct of your research **(as per the attached)**.

3. I would like to draw your attention to the undertaking signed by you that you will submit without cost to the Economic Planning Unit the following documents:

a) A brief summary of your research findings on completion of your research and before you leave Malaysia; and

b) Three (3) copies of your final dissertation/publication.

4. Lastly, please submit a copy of your preliminary and final report directly to the State Government where you carried out your research.

Thank you.

Yours sincerely,

(MUNIRAH ABD. MANAN)
b.p. Ketua Pengarah,
Unit Perancang Ekonomi,
(Seksyen Ekonomi Makro)
Email: munirah@epu.jpm.my
Tel: 88882809/2818/2827

ATTENTION

This letter is only to inform you the status of your application and **cannot be used as a research pass**.

C.c:

Ketua Setiausaha,
Kementerian Kesihatan Malaysia
Cawangan Dasar Korporat dan Industri Kesihatan
Aras 6, 8, & 11 Blok E7
Pusat Pentadbiran Kerajaan Persekutuan
62590 Putrajaya.
(u.p: En. Mohd Yasser b. Mohd Hadzir) (Ruj. Tuan: (22) dlm KKM-89(56/101)

Pengarah
Bahagian Perancangan Penyelidikan & Dasar Pendidikan
Kementerian Pelajaran Malaysia
Aras 1-4, Blok E8
Kompleks Kerajaan Parcel E
Pusat Pentadbiran Kerajaan Persekutuan
62604 Putrajaya
(u.p: Dr. Zahri bin Aziz) (Ruj. Tuan: KP(BPPDP)603/011 (8)

APPENDIX B: PART A CHILD ORAL HEALTH

EXAMINER CODE: DATE:

PART A
CHILD ORAL HEALTH

Hello,

Thanks for agreeing to help us with our study!

This study is being done so that there will be more understanding about problems children may have because of their teeth, mouth, lip and jaws. By answering the questions, you will help us learn more about young people's experience.

PLEASE REMEMBER:

• Don't write your name on the questionnaire

• Your participation is entirely voluntary and we can assure you we will treat your information as STRICTLY CONFIDENTIAL and it will only be used for this research.

EXAMINER CODE: DATE:

PART A **CHILD ORAL HEALTH**	
These questions to be filled in by the parents or guardians. Please answer all the questions below. All information is solely for the use of the researcher.	
1.	Your Age ☐ 20 to 29 ☐ 30 to 39 ☐ 40 to 49 ☐ Above 50
2.	Your sex ☐ Male ☐ Female
3.	Your Religion ☐ Islam ☐ Buddhists ☐ Hinduism ☐ Christian ☐ Other, please specify.....

4.	Your ethnicity/race ☐ Malay ☐ Chinese ☐ Indian ☐ Other, please specify.....
5.	What is the highest level of education that you attained? ☐ No formal education ☐ Primary School ☐ PMR or equivalent ☐ SPM/STPM or equivalent ☐ Vocational ☐ Institution ☐ University/MARA ☐ Other, please specify.....
6.	At present, are you working? ☐ Yes ☐ No

7.	How much is your monthly household income? ☐ Less than RM500 ☐ RM 501 - RM 1,000 ☐ RM 1001 - RM 1,500 ☐ RM 1,501 - RM2,000 ☐ More than RM 2,001
8.	☐ How many children do you have?
9.	What are the ages of your other children? The oldest child is years ☐ old The second child is years ☐ old The third child is years ☐ old The fourth child is years ☐ old The fifth child is years ☐ old The sixth child is years ☐ old The seventh child is years ☐ old

Thank you for your participation.....

APPENDIX C: PART B CHILD ORAL HEALTH QUESTIONNAIRE

EXAMINER CODE: **DATE:**

PART B
CHILD ORAL HEALTH

Thanks for agreeing to help us with our study!

This section is about how you think about yourself. Please answer all the questions and please choose the answers that fit for you. You only need to give one answer for every question.

PLEASE REMEMBER:

- Don't write your name on the questionnaire
- This is not a test and there are no right or wrong answers
- Answer as honestly as you can. Don't talk to anyone about questions when you are answering them. Your answers are private; no one you know will see them
- Please circle the answer that is best for you

Please tell us what you think about your health. Give your answer either 'YES' or 'NO' by circling the answer. **PLEASE CIRCLE ONE ANSWER ONLY**

		YES	**NO**
1.	Good health comes from being lucky	YES	NO
2.	I can do things to keep from getting sick	YES	NO
3.	Bad luck makes people get sick	YES	NO
4.	I can only do what the doctor tells me to do	YES	NO
5.	If I get sick, it is because getting sick just happens	YES	NO
6.	People who never get sick are just plain lucky	YES	NO
7.	My mother must tell me how to keep me from getting sick	YES	NO
8.	Only a doctor or a nurse keeps people from getting sick	YES	NO
9.	When I am sick I can do things to get better	YES	NO
10.	If I get hurt it is because accidents just happen	YES	NO
11.	I can do many things to fight illness	YES	NO
12	Only the dentist can take care of my teeth	YES	NO
13.	Other people must tell me how to stay healthy	YES	NO
14.	I always go to the nurse right away if I get hurt at school	YES	NO
15.	The teacher must tell me how to keep from having accidents at school	YES	NO
16.	I can make many choices about my health	YES	NO
17.	Other people must tell me what to do if I feel sick	YES	NO
18.	Whenever I feel sick I go to see the school nurse right away	YES	NO
19.	There are things I can do to have healthy teeth	YES	NO
20.	I can do many things to prevent accidents	YES	NO

We would like to know how you feel about yourself. If you strongly agree, circle 1. If you agree with the statement, circle 2. If you disagree, circle 3. If you strongly disagree, circle 4.

PLEASE CIRCLE ONLY ONE ANSWER

		1 STRONGLY AGREE	2 AGREE	3 DISAGREE	4 STRONGLY DISAGREE
1.	I feel that I'm a person of worth, at least on an equal plane with others.				
2.	I feel that I have a number of good qualities.				
3.	All in all, I am inclined to feel that I am a failure.				
4.	I am able to do things as well as most other people.				
5.	I feel I do not have much to be proud of.				
6.	I take a positive attitude toward myself.				
7.	On the whole, I am satisfied with myself.				
8.	I wish I could have more respect for myself.				
9.	I certainly feel useless at times.				
10.	At times I think I am no good at all.				

In this section we would like to know what thoughts about life you have had during the past few weeks. Think about how you spend each day and night and then think about how your life has been during most of this time. Circle the numbers next to each statement to show how much you agree or disagree with each statement. For example, if you Strongly Agree that "Life is great," you would circle number 6 next to those words.

It is important to know what you **REALLY** think, so please answer the questions the way you really think, not how you should think. This is **NOT** a test. There are **no** right or **wrong** answers.

PLEASE CIRCLE ONLY ONE ANSWER FOR EACH ITEM

		Strongly Disagree 1	Moderately Disagree 2	Mildly Disagree 3	Mildly Agree 4	Moderately Agree 5	Strongly Agree 6
1.	My life is going well.						
2.	My life is just right						
3.	I would like to change many things in my life.						
4.	I wish I had a different kind of life.						
5.	I have a good life						
6.	I have what I want in life.						
7.	My life is better than most kids.						

	These are questions ask about the world around you. Each question has seven possible answers. Please mark the number for your answer. If the words under 1 are right for you, circle 1; if the words under 7 are right for you, circle 7. If you feel differently, circle the number which expresses your feeling. Please give only one answer to each question.
1.	Do you have feelings that you don't really care about what goes on around you? 1 2 3 4 5 6 7 Very seldom or never — Very often
2.	Has it happen in the past that you were surprised by the behaviour of people whom you thought you knew well? 1 2 3 4 5 6 7 Never Happened — Always Happened
3.	Has it happened that people whom you counted on disappointed you? 1 2 3 4 5 6 7 Never Happened — Always Happened

4.	Until now your life has had: 1 2 3 4 5 6 7 No clear goals or purposes at all — Very clear goals and purpose
5.	Do you have the feeling that you're being treated unfairly? 1 2 3 4 5 6 7 Very often — Very seldom or never
6.	Do you have the feeling that you are in an unfamiliar situation and don't know what to do? 1 2 3 4 5 6 7 Very often — Very seldom or never
7.	Doing the things you do everyday is: 1 2 3 4 5 6 7 A source of deep pleasure and satisfaction — A source of pain and boredom

8.	Do you have very mixed-up feelings and ideas? 1 2 3 4 5 6 7 Very often Very seldom or never
9.	Does it happen that you have feelings inside you would rather not feel? 1 2 3 4 5 6 7 Very often Very seldom or never
10.	Many people-even those with a strong character-sometimes feel like losers in certain situations. How often have you felt this way in the past? 1 2 3 4 5 6 7 Never Very often

11.	When something happens, have you generally found that; 1 2 3 4 5 6 7 You overestimated or underestimated its importance — You saw things in the right proportion
12.	How often do you have the feeling that there's little meaning in the things you do in your daily life? 1 2 3 4 5 6 7 Very often — Very seldom or never
13.	How often do you have feelings that you're not sure you can keep under control? 1 2 3 4 5 6 7 Very often — Very seldom or never

	These set of questions asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. Answer every question by marking the answer as indicated. If you are unsure about how to answer a question please give the best answer you can.
1.	Compared to one year ago, how would you rate your health in general now? (Please tick **one** box.) Much better than one year ago ☐ Somewhat better now than one year ago ☐ About the same as one year ago ☐ Somewhat worse now than one year ago ☐ Much worse now than one year ago ☐
2.	In general, would you say your health is: (Please tick **one** box) Excellent Very Good Good Fair Poor

	How TRUE or FALSE is each of the following statements for you? **Please circle one number on each line**					
		Definitely True	**Mostly True**	**Don't Know**	**Mostly False**	**Definitely False**
3.	I seem to get sick a little easier than other people					
4.	I am as healthy as anybody I know					
5.	I expect my health to get worse					
6.	My health is excellent					

Thank you for taking part....

Now let's have a five minutes break....

Then go on to PART C questionnaire.....

.....To part C

APPENDIX D: PART C CHILD ORAL HEALTH QUESTIONNAIRE

PART C(i)

CHILD ORAL HEALTH

Hello,

Thanks for agreeing to help us with our study!

This study is being done so that there will be more understanding about problems children may have because of **their teeth, mouth, lips and jaws**. By answering the questions, you will help us learn more about young people's experiences.

PLEASE REMEMBER:

- Don't write your name on the questionnaire
- This is **not a test** and there are no right or wrong answers
- Answer **as honestly** as you can. Don't talk to anyone about questions when you are answering them. Your answer are **private**; no one you know will see them
- Read each question **carefully** and think about your experiences in the **past 3 months** when you answer
- Before you answer, ask yourself: **'Does this happen to me because of problems with my teeth, lips, mouth or jaws?**
- Put an √ in the box for the answer that is best for you

Today's Date: day/month/year

FIRST, A FEW QUESTIONS ABOUT YOU

1. **Are you a boy or a girl**

   Boy

   Girl

2. **When were you born? DAY /MONTH/YEAR**

3. **Would you say the health of your teeth, lips, jaws and month is:**

   Excellent

   Very good

   Good

   Fair

   Poor

4. **How much does the condition of your teeth, lips jaws or month affect your <u>life overall?</u>**

   Not at all

   Very little

   Some

   A lot

   Very much

QUESTIONS ABOUT ORAL PROBLEMS

In the <u>past 3 months</u>, how often have you had:

5. **Pain in your teeth, lips, jaws or mouth?**

   Never

   Once or twice

   Sometimes

   Often

   Everyday or almost every day

6. **Bleeding gums?**

Never

Once or twice

Sometimes

Often

Everyday or almost every day

7. **Sores in your mouth?**

Never

Once or twice

Sometimes

Often

Everyday or almost every day

8. **Bad breath?**

Never

Once or twice

Sometimes

Often

Everyday or almost every day

9. **Food stuck in or between your teeth?**

Never

Once or twice

Sometimes

Often

Everyday or almost every day

10. Food stuck in the top of your mouth?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

For the next questions....

Has this happened because of your teeth, mouth, lips jaws or mouth?

In the past 3 months, how often have you:

11. Breathed through your mouth?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

12. Taken longer than others to eat a meal?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

13. Had trouble sleeping?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

In the past 3 months, because of your teeth, lips, mouth or jaw, how often has it been:

14. Difficult to bite or chew food like apples, corn on the cob or steak?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

15. Difficult to open your mouth wide?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

16. Difficult to say any words?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

17. Difficult to eat foods you would like to eat?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

18. Difficult to drink with a straw?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

19. Difficult to drink or eat hot or colds foods?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

QUESTIONS ABOUT FEELINGS

Have you had the feelings because of your teeth, lips, jaws or mouth?

If you had this way for another reason, answer 'Never'

In the past 3 months, how often have you:

20. Felt irritable or frustrated?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

21. Felt unsure of yourself?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

22. Felt shy or embarrassed?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

In the past 3 months, because of your teeth, lips, mouth or jaw, how often have you:

23. Been concerned what other people think about your teeth, lips mouth or jaw?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

24. Worried that you are not as good-looking as others?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

25. Been upset?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

26. Felt nervous or afraid?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

27. Worried that you are not as healthy as others?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

28. Worried that you are different than other people?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

QUESTIONS ABOUT SCHOOL

Have you had these experiences because of your teeth, lips, jaws or mouth? If was for another reason, answer 'Never'

In the past 3 months, how often have you:

29. Missed school because of pain, appointments, or surgery?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

30. Had a hard time paying attention in school?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

31. Had difficulty doing your homework?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

32. Not wanted to speak or read out loud in class?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

QUESTIONS ABOUT YOUR SPARE-TIME ACTIVITIES&BEING WITH OTHER PEOPLE

Have you had these experiences because of your teeth, lips, jaws or mouth? If was for another reason, answer 'Never'

In the past 3 months, how often have you:

33. Avoided taking part in activities like sports, clubs, drama, music, school trips?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

34. Not wanted to talk to other children?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

35. **Avoided smiling or laughing when around other children?**

Never

Once or twice

Sometimes

Often

Everyday or almost every day

36. **Had difficulties playing a musical instrument such as recorder, flute, clarinet, trumpet?**

Never

Once or twice

Sometimes

Often

Everyday or almost every day

37. **Not wanted to spend time with other children?**

Never

Once or twice

Sometimes

Often

Everyday or almost every day

38. **Argued with other children or your family?**

Never

Once or twice

Sometimes

Often

Everyday or almost every day

In the past 3 months, because of your teeth, lips, mouth or jaw, how often have :

39. Other children teased you or called you names?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

40. Other children made you feel left out?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

41. Other children asked you questions about your teeth, lips jaws or mouth?

Never

Once or twice

Sometimes

Often

Everyday or almost every day

NEARLY FINISHED!

PART C (ii)

The questions below are about your beliefs about things you have to do to have good oral health. Please choose one answer and tick the box which best describes how you feel;

To have good oral health you must;		1 Extremely Important	2 Fairly Important	3 Doesn't matter much/ not very important	4 Not at all important
1.	Use fluoride toothpaste				
2	Drink fluoride water				
3	Use dental floss				
4	Keep the teeth and gums very clean				
5	Avoid a lot of sweet foods				
6	Visit dentist regularly				
7	Participate in school dental program				

THE LAST QUESTION!

Just one more thing. To test how good this questionnaire is at giving us the information we need, we would like a group of children to complete it again.

Would you be willing to help us by completing another copy of the questionnaire soon?

Yes.

We appreciate the time and thought you have given to this questionnaire

THANK YOU FOR HELPING US

APPENDIX E: INFO SHEET FOR PARENT

TITLE OF STUDY: CHILD ORAL HEALTH
PARENTS/GUARDIAN INFORMATION SHEET

Invitation for your child to take part in a research project

We are inviting your child to take part in a research study. With your permission we would like to collect data from your children regarding his/her oral health and quality of life. It is important for you to understand why the research is being done and what it will involve. You are invited to ask us any questions if you need any clarification or if you would like more information. Take time to decide whether or not you are happy for your child to take part. This information sheet will tell you all about the study and it comprise of two sections as below;

- Part 1 tells you the purpose of this study and what will happen if he/she takes part.
- Part 2 gives you more detailed information about the study.

What is the purpose of the study?

The aim of the present study is to identify what things might influence children's oral health and quality of life. We hope our findings will help us to gain a better understanding of children's experiences of their oral health problems.

Why have I been chosen?

We want to find out how the child oral health and quality of life changes overtime and the factors mediate those changes.

Does my child have to take part?

No, it is completely up to you to decide whether or not to take part. You and your child are free to withdraw from the research at any time and without giving any reason.

What will happen to my child if we agree to take part?

If you agree for your child to take part, you'll need to sign the consent form and complete the questionnaire PART A enclosed with this leaflet. You must return PART A questionnaire in the sealed envelope provided and a copy of the signed consent form. You can hand it over through your child to give to the class teacher. You should keep the other signed copy of the consent form and this information sheet for your own records.

What does my child have to do if we agree to take part?

Your child will be asked to answer questions about how he/she thinks about himself/herself and how much his/her mouth affects his/her daily life. We will examine your child's mouth but ***no treatment will be administer***.

What are the possible disadvantages of taking part?

There are no risks for individuals participating in the study.

What are the possible benefits of taking part?

There are no direct benefits to your child from taking part but the information we get might help improve the dental care system and tell the healthcare professionals about care the children need to enhance their quality of life.

What happens when the research study stops?

Following completion of this research we will analyse the data, which will be part of the researcher's fulfilment of her PhD thesis. We will also produce reports and related publications based on the results of the study. There will be no impact on your child's care as a result of this study or its completion.

Will my taking part in the study be kept confidential?

Yes. All information that you provide us will be kept strictly confidential. The details of this are included in Part 2.

How can I find out more about the project?

Part 2 of this form gives more details about the project. If you would like to talk to someone, in the first instance please contact:

Dr Amdah Mat
Banting Dental Clinic, Banting
42700 Kuala Langat, Selangor
Telephone: 0331817669/0331817636
Email: dramdahmat@yahoo.co.uk

What happens if something goes wrong during the project?

We cannot see anything going wrong during this project as no treatment is being done. However, if you feel unhappy about anything to do with the project, we will be very happy to talk to you about your concerns at anytime. Any complaint should be addressed to the Senior Dental Officer, Banting Dental Clinic or Malaysia Dental Council, Oral Health Department, Ministry of Health.

Contact details for Senior Dental Officer for further enquiry or concerns:

Senior Dental Officer
Banting Dental Clinic, Banting 42700,
Kuala Langat, Selangor.
Telephone No: 0331817669
Email: drnomah@yahoo.com

Oral Health Division,
Ministry of Health Malaysia
Level 5, Block E-10,
Parcel E, Precinct 1, Federal Government Administrative Centre,
62590 Putrajaya, Malaysia
Tel: +60(3)88834215
+60(3)88834216
Fax:+60(3)88886133

Contact details at the University of Sheffield:

Professor Peter G. Robinson
Department of Oral Health and Development
School of Clinical Dentistry
Claremont Crescent
Sheffield, S10 2TA
Telephone: 0114 271 7885
Email: peter.g.robinson@shef.ac.uk

This completes Part 1 of the Information Sheet now please turn to Part 2.

Part 2

If you understand the information in Part 1 and you are considering participating, please continue to read the additional information in Part 2 before making a decision.

What will happen if I don't want my child to carry on with the study?

You are free to withdraw your child from the study at anytime, without giving any reason.

What if there is a problem?

We cannot see anything going wrong during this project as no treatment is being done. But if you or your child feels unhappy about anything to do with the project, and you have any reason to complain about any aspect of the way you have been approached or treated during this research, the complaint bureau of Banting Dental Clinic or Malaysia Dental Council, Oral Health Department, Ministry of Health are available to you and you are not affected because you have taken part in the research. Contact details as provided below;

Senior Dental Officer
Banting Dental Clinic
Banting 42700, Kuala Langat
Selangor.
Telephone No: 0331817669
Email: drnomah@yahoo.com

Oral Health Division,
Ministry of Health Malaysia
Level 5, Block E-10,
Parcel E, Precinct 1, Federal Government Administrative Centre,
62590 Putrajaya, Malaysia
Tel: +60(3)88834215
+60(3)88834216
Fax:+60(3)88886133

Will my taking part in this study be kept confidential?

All information that you provide us for this study will be kept **strictly confidential**. The whole study will be conducted according to guidance on ethics from The University of Sheffield and the Economic Planning Unit, Prime

Minister's Department, Government of Malaysia, Public Dental Service, Government of Malaysia and Education Planning and Research Department, Ministry of Education.

To protect your privacy the following measures will be taken to ensure that no-one, apart from the principal researcher has access to your identity. We promise that:

- Your name and your child's name will not appear on any questionnaire. You will be allocated a code number which will be used as an identifier. Only you and the principal researcher will know your name and code number.
- Your name and your child name's will not be used in the analysis or writing up of the findings of the research report.
- Your questionnaires will be kept in a safe locked cabinet in the Banting Dental Clinic, Kuala Langat for 5 years duration after completion of the study.
- All information supplied will be kept with the strictest confidential and only reviewed by the researcher.

What will happen to the results of the research study?

When the research stops we will look at the data recording sheets and will analysed the findings. Statistical data will be included in the researcher's PhD thesis and will also be prepared in a scientific paper for publication in a highly-regarded dental or health-related journal. We also plan to report our findings at national and international dental conferences.

Who is organising and funding the study?

The study is being organised by the Department of Oral Health and Development of the University of Sheffield, UK. Funding has been provided by the University of Sheffield and Dr Amdah Mat is a sponsored student by Public Services Department, Government of Malaysia for 3 years duration of her study.

Who has reviewed the study?

Before any research was done, ethical approval for the study has been sought from the appropriate body from University of Sheffield and the Economic Planning Unit, Prime Minister Department, Government of Malaysia.

Thank you for your help

TITLE OF STUDY: CHILD ORAL HEALTH

CHILD INFORMATION SHEET

What is this research? Why is this project being done?

Hello. We would like your help with a research project. Research is a careful experiment to find answer to an important question. This project is to identify what things might influence children's quality of life. We hope our findings will help us to gain a better understanding of children's experiences of their oral health problems. Before you decide to take part it is important for you to know what it will involve.

Why have I been asked to take part?

We are asking 12-13 year-old children participating in school dental program to take part. This is because we are interested in oral health and quality of life among people of your age.

Did anyone else check the study is ok to do?

Yes. Before any research is allowed to happen, it has to be checked by a group of people called an Ethics Committee. They make sure the research is ok to do. Your project has been checked by the Education Planning and Research Department, Ministry of Education and was approved by the Ethical Board, Economic Planning Unit, Prime Minister Department, Government of Malaysia and Oral Health Division, Ministry of Health, Malaysia

Do I have to take part?

No, it entirely up to you to decide whether or not to take part.

What will I have to do if I take part in the study?

There are a few things you can do to help us. You will be required to answer questions that will be given out to you called PART B and PART C questionnaires

- ☐ PART B questionnaire is about how you think about yourself and the world around you.
- ☐ PART C questionnaire is about your oral health

You will be required to answer the questionnaire over the next-weeks and again in another 6-month.

After answering both of the questionnaires, we will check your mouth and teeth but no treatment will be administered.

Will joining the study help me?

The research may not help you immediately but the information we obtained from your help will be used to help us to find the better ways of providing care to people like you.

Might anything about the research upset me?

No, it shouldn't. We will just ask you to fill in some questionnaires and let us examine your mouth. We can assure you, we will not administer any treatment.

Will my medical details be kept private?

Yes. We will make sure other people will never know the information you gave to us. Your name will never be used in any data forms, or in our report, we know you only by 'code'. All information that you provide us will be kept strictly confidential. The only people who will see the information will be us.

Contact details for researcher for further enquiry or concerns:

Dr Amdah Mat
Banting Dental Clinic
Banting
42700 Kuala Langat
Selangor
Telephone: 0331817669/0331817636
Email: dramdahmat@yahoo.co.uk

Oral Health Division,
Ministry of Health Malaysia
Level 5, Block E-10,
Parcel E, Precinct 1, Federal Government Administrative Centre,
62590 Putrajaya, Malaysia
Tel: +60(3)88834215
+60(3)88834216
Fax:+60(3)88886133

Contact details at the University of Sheffield:

Professor Peter G. Robinson
Department of Oral Health and Development
School of Clinical Dentistry
Claremont Crescent
Sheffield
S10 2TA
Telephone: 0114 271 7885
Email: peter.g.robinson@shef.ac.uk

Participant Code: .....

CONSENT FORM

Title of Project: CHILD ORAL HEALTH

Name of Researchers: Dr. Amdah Mat, Professor Peter G. Robinson

Please initial box

1. I confirm that I have read and understand the information sheet dated ..... (Version 2.0) for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my child's school dental service being affected. ☐
3. I understand that all data will be treated confidentially ☐
4. I agree to take part in the above study. ☐

Name of Participant	Signature	Date
Dr. Amdah Mat	Signature	Date
Professor Peter G. Robinson	Signature	Date

Fair Processing Notice
Your personal data will be used only accordance with Thesis Research (PhD) at University of Sheffield United Kingdom under the Data Protection Act 1998 and in compliance with the Freedom of information Act 2000. The researcher will not disclose any personal information to any other third parties without your express consent.

Date: 19/10/06 Version: 2.0

APPENDIX F: CLINICAL FORMAT

CLINICAL EXAMINATION

1. PERSONAL DETAILS

Identification Number: | | | | | | | | |

Date: | | | | | | |

Date of birth: (dd/mm/yy)	Age (years): (last birthday)	Sex (M=1, F=2):	Ethic group: (Malay/Chinese/Indian/Others)

2. CARIES STATUS & TREATMENT NEED

17	16	15	14	13	12	11		21	22	23	24	25	26	27
							Caries Status							
							Treatment Need							

47	46	45	44	43	42	41		31	32	33	34	35	36	37
							Caries Status							
							Treatment Need							

Caries Status (Codes 0-9)
0=sound
1=decayed
2=filled with decay
3=filled but no decay
4=missing due to caries
5=missing due to other reasons
6=sealant present
7=bridge abutment or crown
8=unerupted tooth
9=not recorded

Treatment Need (Codes 0-8)
0=none, no treatment required
1=filling needed, one surface only
2=filling needed, two or more surface
3=crown/abutment
4=Veneer or laminate
5=pulp care and restoration
6=extraction needed
7=Fissure sealant present
8=need for other care (specify).....
9=not recorded

OFFICE USE: CARIES SUMMARY:

DMFX | | DX | | M | | F | |

3. PERIODONTAL STATUS (CPI)

16						11						26					
0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
46						31						36					

CPI Codes
0=healthy
1=bleeding
2=calculus
3=shallow pocket 4 -5mm
4=deep pocket more>6mm
5=excluded sextant
9=not recorded

4. TRAUMA STATUS

Trauma present	1=yes	2=no		
Trauma severity	1=less<1/3	2=1-2/3	3=more>2/3	
No. of teeth affected				

5. MALOCCLUSION (IOTN INDEX)

DENTAL Health Component index

Grade 1 - does not need
Grade 2 - little need for treatment
Grade 3 – borderline need
Grade 4 – treatment required
Grade 5 - great need for treatment

APPENDIX G: CLINICAL EXAMINATION PROTOCOL

Clinical examination protocol

Caries status and treatment need and periodontal status was scored according to the survey criteria (WHO 1997) (Appendix F).

Trauma status was defined according to the survey criteria (WHO 1997) and scored as fractured when some of its surface is missing as a result of trauma and there is no evidence of caries. The examination only concerned the anterior permanent dentition. The classification noted only the presence of trauma and the trauma severity (Appendix F).

Classification of Crown Fractures

Crown Fracture Involving Enamel Only. The severity coded '1' - fracture involves only the enamel portion of the tooth.

Crown Fracture Involving Dentin. The severity coded '2' - fractures exposing dentin. These fractures can be recognized by the yellow to pink color of the dentin.

Crown Fracture Exposing the Pulp. The severity coded '3' - fractured in the middle third of the clinical crown often expose vital tissue of the tooth (i.e., the pulp).

Malocclusion (IOTN Index) - Malocclusion was graded using The Index of Orthodontic Treatment Need (IOTN) used the dental health component (DHC) aided with aesthetic component (AC) (Brook and Shaw 1989).

There are five grades within the DHC - Grades 1 representing 'does not treatment'; Grade 2 representing 'little need for treatment'; Grade 3 representing 'borderline need'; Grade 4 representing 'treatment required'; Grade 4 representing 'great need for treatment'

These five grades within the DHC have been grouped following grades 1 and 2 representing 'slight or no need for treatment', grade 3 representing 'borderline' cases, and grades 4 and 5 representing those in 'great need of orthodontic treatment'

APPENDIX H: PART B CHILD ORAL HEALTH QUESTIONNAIRE (MALAY)

KOD PEMERIKSA: ..... **TARIKH:.....**

BAHAGIAN B
KESIHATAN MULUT KANAK-KANAK

Terima kasih kerana bersetuju membantu kami dalam kajian ini.

Soalan bahagian ini berkaitan dengan pandangan anda tentang diri anda sendiri.
Sila jawab semua soalan dan pilih hanya satu jawapan yang sesuai tentang diri anda sendiri.

Anda perlu ambil perhatian tentang perkara berikut:

- Jangan tulis nama anda pada kertas ini
- Soalan yang dikemukakan bukan ujian jadi tiada jawapan yang betul atau salah.
- Jangan berbincang dengan kawan-kawan anda atau memberitahu jawapan anda pada mereka. Jawapan anda adalah rahsia. Jadi jawab soalan berikut dengan jujur.
- Pilih hanya satu jawapan sahaja bagi setiap soalan.

.....pastikan anda jawab semua soalan!!!

KOD PEMERIKSA: ..... **TARIKH:.....**

Soalan di bawah tentang diri dan kesihatan anda. Sila jawab soalan di bawah samada '**Ya**' **atau 'Tidak'.**

	BULATKAN HANYA SATU JAWAPAN	**Ya**	**Tidak**
1.	Nasib baik menentukan diri anda mempunyai kesihatan yang baik	Ya	Tidak
2.	Saya boleh mengambil langkah-langkah tertentu untuk mengelak diri dari jatuh sakit	Ya	Tidak
3.	Nasib yang tidak baik akan menentukan seseorang mendapat sakit	Ya	Tidak
4.	Saya hanya boleh melakukan perkara yang disuruh oleh doktor sahaja	Ya	Tidak
5.	Saya jatuh sakit kerana sudah ditakdirkan	Ya	Tidak
6.	Orang yang tak pernah sakit adalah kerana nasib baik mereka sahaja	Ya	Tidak
7.	Ibu saya mesti memberitahu saya bagaimana untuk menghindarkan diri dari jatuh sakit	Ya	Tidak
8.	Hanya doktor atau jururawat sahaja yang boleh menghindari diri saya dari mendapat penyakit	Ya	Tidak
9.	Bila sakit, saya boleh melakukan perkara tertentu untuk membolehkan saya sembuh	Ya	Tidak
10.	Jika saya mengalami kecederaan, memang itu sudah ditakdirkan buat diri saya	Ya	Tidak
11.	Saya boleh melakukan banyak perkara untuk menghindari diri dari jatuh sakit	Ya	Tidak
12	Hanya doktor gigi sahaja yang dapat menjaga kesihatan gigi saya	Ya	Tidak
13.	Orang lain perlu memberitahu saya macam mana untuk sentiasa sihat	Ya	Tidak
14.	Selalunya saya akan terus berjumpa guru/guru kesihatan atau ke bilik sakit jika mendapat kecederaan di sekolah	Ya	Tidak
15.	Guru mesti memberitahu saya macam mana untuk menggelak dari mendapat kecederaan di sekolah	Ya	Tidak
16.	Saya boleh membuat banyak pilihan mengenai kesihatan diri saya	Ya	Tidak
17.	Orang lain mesti memberitahu saya apa yang perlu dilakukan jika saya jatuh sakit	Ya	Tidak
18.	Apabila saya merasa tidak sihat, saya akan segera berjumpa dengan guru/guru kesihatan atau ke bilik sakit sekolah	Ya	Tidak
19.	Terdapat langkah-langkah atau perkara yang saya boleh lakukan untuk menjamin kesihatan gigi saya.	Ya	Tidak
20.	Saya boleh melakukan banyak perkara untuk mengelakkan diri dari mendapat kemalangan	Ya	Tidak

KOD PEMERIKSA: ..... **TARIKH:.....**

Kami ingin mengetahui pandangan anda tentang diri sendiri. Kalau anda amat setuju dengan kenyataan berikut bulatkan 1. Kalau setuju bulatkan 2. Kalau anda tak setuju bulatkan 3. Kalau amat tak bersetuju bulatkan 4.

TOLONG BULATKAN HANYA SATU JAWAPAN

		1 AMAT SETUJU	2 SETUJU	3 TAK SETUJU	4 AMAT TAK SETUJU
1.	Saya rasa saya manusia yang berguna, sekurang-kurangnya setaraf dengan orang lain	1	2	3	4
2.	Saya rasa saya mempunyai banyak sifat terpuji	1	2	3	4
3.	Pada keseluruhannya, saya rasa saya lebih cenderung kearah menghadapi kegagalan	1	2	3	4
4.	Saya mampu menjalankan tugasan dengan baik seperti orang lain juga	1	2	3	4
5.	Pada anggapan saya, saya tidak mempunyai banyak perkara yang boleh membanggakan diri sendiri.	1	2	3	4
6.	Saya bersikap positif	1	2	3	4
7.	Pada keseluruhannya saya berpuas hati dengan diri saya sendiri	1	2	3	4
8.	Harapan saya, saya lebih menghormati diri sendiri	1	2	3	4
9.	Saya pasti ada waktunya saya merasa diri ini tidak penting langsung	1	2	3	4
10.	Kadang-kadang saya rasa saya tidak berguna langsung	1	2	3	4

KOD PEMERIKSA: ..... **TARIKH:.....**

Kami ingin mengetahui apa yang anda fikir tentang kehidupan anda dalam beberapa minggu yang lepas. Untuk membantu, anda boleh bayangkan bagaimana anda telah melaluinya kemudian sila jawab soalan dibawah dan beri jawapan yang anda fikir sesuai dengan diri anda

Jawab kenyataan dibawah mengikut pandangan anda sendiri dan bukannya dipengaruhi oleh faktor lain. Sebagai contoh; **'Kehidupan anda amat bahagia'** dan anda **bersetuju** dengan kenyataan tersebut kerana ia sememangnya apa yang telah anda telah lalui, sila bulatkan pada pilihan samada **'Amat-setuju', 'Sedehana-setuju' atau 'Kurang-Setuju'** pada ruangan yang disediakan. Jika anda **tidak bersetuju** bulatkan pada ruangan '**Amat-tak setuju', 'Sederhana-Tak setuju' atau 'Kurang-tak setuju'.**

PENTING: Anda mesti ingat ini bukannya peperiksaan. Tiada jawapan betul atau salah. Cuma nyatakan apa yang anda benar-benar fikir tentang kehidupan anda.

	KENYATAAN.....	**1 Amat Tak setuju**	**2 Sederhana Tak setuju**	**3 Kurang TakSetuju**	**4 Kurang Setuju**	**5 Sederhana Setuju**	**6 Amat Setuju**
1.	Kehidupan saya berjalan lancar	1	2	3	4	5	6
2.	Kehidupan saya cuma selesa	1	2	3	4	5	6
3.	Saya ingin mengubah banyak benda dalam kehidupan saya	1	2	3	4	5	6
4.	Saya berharap mempunyai kehidupan yang berbeza	1	2	3	4	5	6
5.	Saya mempunyai kehidupan yang baik	1	2	3	4	5	6
6.	Saya mendapat apa yang saya ingini dalam hidup saya	1	2	3	4	5	6
7.	Kehidupan saya lebih baik berbanding dengan kanak-kanak lain	1	2	3	4	5	6

KOD PEMERIKSA: ..... **TARIKH:.....**

	Dibawah adalah soalan berkaitan dengan kehidupan anda. Setiap soalan mempunyai 7 skala jawapan. Sila tandakan nombor yang menandakan perasaan anda, Kalau anda rasa nombor 1 adalah betul untuk diri anda sila bulatkan nombor 1; kalau nombor 7 pilihan anda sila bulatkan nombor 7. Kalau keadaan lain yang kurang ekstrim selain dari nombor 1 dan 7 sila tandakan nombor yang sesuai menandakan perasaan anda. Sila tandakan hanya satu jawapan untuk setiap soalan.
1.	Adakah anda pernah rasa seolah-olah tidak peduli tentang apa yang berlaku di sekeliling anda? 1 2 3 4 5 6 7 Amat jarang atau tidak pernah — Amat kerap
2.	Pernahkah terjadi pada anda dimana orang yang anda ingat anda kenal tetapi berperangai sebaliknya? 1 2 3 4 5 6 7 Tidak pernah terjadi — Kerap terjadi
3.	Pernahkah terjadi orang yang anda harapkan tapi sebaliknya mengecewakan anda? 1 2 3 4 5 6 7 Tidak pernah terjadi — Kerap terjadi

KOD PEMERIKSA: ..... **TARIKH:.....**

4.	Sehingga sekarang anda: 1 2 3 4 5 6 7 Tiada matlamat jelas dan pasti — Ada matlamat yang jelas dan pasti
5.	Pernahkah anda rasa anda tidak dilayan dengan adil? 1 2 3 4 5 6 7 Amat kerap — Amat jarang atau tidak langsung
6.	Pernahkah anda melalui situasi yang tidak pernah anda lalui sebelum ini tetapi anda tidak tahu macammana untuk mengendali situasi sebegitu? 1 2 3 4 5 6 7 Amat kerap — Amat jarang atau tidak langsung
7.	Melakukan perkara yang anda lakukan setiap hari:: 1 2 3 4 5 6 7 Adalah sesuatu yang membahagiakan dan memuaskan anda — Adalah sesuatu yang memeritkan dan membosankan anda

KOD PEMERIKSA: ..... **TARIKH:.....**

8.	Adakah anda mempunyai idea dan perasaan yang berbelah-bagi: 1 2 3 4 5 6 7 Amat kerap — Amat jarang atau tidak langsung
9.	Pernahkah anda mengalami perasaan yang anda tidak ingin melaluinya? 1 2 3 4 5 6 7 Amat kerap — Amat jarang atau tidak langsung
10.	Banyak orang – walaupun berpendirian teguh tetapi kadang-kadang masih merasa dirinya tidak berguna. Berapa kerap anda mengalami perasaan sebegitu dimasa lampau? 1 2 3 4 5 6 7 Tidak pernah — Amat kerap

KOD PEMERIKSA: ..... **TARIKH:.....**

11.	Bila sesuatu perkara terjadi, selalunya anda: 1 2 3 4 5 6 7 Memperbesarkan atau memperkecilkan Kepentingan sesuatu keadaan — Anda melihat sesuatu perkara dari sudut positif
12.	Berapa kerapkah anda merasa bahawa perkara yang dilakukan setiap hari hanya memberi sedikit pengertian pada anda? 1 2 3 4 5 6 7 Amat kerap — Amat jarang atau tidak langsung
13.	Berapa kerapkah anda merasa tidak pasti anda mampu mengawal perasaan anda? 1 2 3 4 5 6 7 Amat kerap — Amat jarang atau tidak langsung

KOD PEMERIKSA: ..... **TARIKH:.....**

	Soalan berikutnya berkenaan kesihatan anda. Pastikan anda menjawab semua soalan dan tandakan hanya satu jawapan sahaja.
1.	Berbanding setahun yang lepas, bagaimana agaknya kesihatan anda sekarang? (Tanda hanya satu jawapan sahaja) Lebih sihat berbanding setahun yang lalu Adakalanya lebih sihat dari setahun yang lalu Agak sama dengan setahun yang lalu Adakalanya tidak sihat berbanding setahun yang lalu Semakin tidak sihat berbanding setahun yang lalu.
2.	Pada amnya, adakah anda merasa kesihatan anda: (Tanda hanya satu jawapan) Teramat sihat Sangat sihat Sihat Sederhana Tidak sihat

	Jawab samada kenyataan dibawah betul atau salah bagi diri anda? **Bulatkan hanya satu jawapan sahaja.**					
		Amat Betul	**Betul**	**Tidak Tahu**	**Salah**	**Amat Salah**
3.	Rasanya saya mudah mendapat sakit berbanding dengan orang lain	1	2	3	4	5
4.	Saya sesihat orang yang saya kenali juga	1	2	3	4	5
5.	Saya boleh jangka kesihatan saya akan menjadi lebih teruk	1	2	3	4	5
6.	Kesihatan saya amat baik	1	2	3	4	5

APPENDIX I: PART C CHILD ORAL HEALTH QUESTIONNAIRE (MALAY)

KOD PEMERIKSA: ..... **TARIKH:.....**

BAHAGIAN C
KESIHATAN MULUT KANAK-KANAK

Terima kasih kerana bersetuju membantu kami dalam kajian ini.

Kajian ini dijalankan agar dapat memberi kefahaman mengenai masalah yang dihadapi oleh kanak-kanak berkaitan dengan gigi, mulut, bibir dan rahang mereka. Dengan menjawab soalan yang kami sertakan disini, anda akan menolong kami mengetahui dengan lebih mendalam tentang pengalaman mereka.

Anda perlu ambil perhatian tentang perkara berikut:

- Jangan tulis nama anda
- Sila jawab semua soalan
- Pilih hanya satu jawapan sahaja bagi setiap soalan
- Soalan yang dikemukakan bukan ujian, jadi tiada jawapan betul atau salah
- Jangan berbincang dengan kawan-kawan anda atau memberitahu jawapan anda pada mereka. Jawapan anda adalah rahsia. Jadi jawab soalan berikut dengan jujur!
- Sila baca soalan dengan teliti dan fikir pengalaman yang telah anda lalui dalam **tempoh 3 bulan yang lepas**
- Sebelum menjawab, tanya diri sendiri **'adakah masalah ini berpunca disebabkan gigi, bibir, mulut atau rahang anda'**
- Sila letakkan tanda (√) pada kotak yang disediakan bagi jawapan yang anda fikirkan terbaik mengenai diri anda.

.....pastikan anda jawab semua soalan!!!

KOD PEMERIKSA: ..... **TARIKH:.....**

	BAHAGIAN C(i)
	SOALAN DI BAWAH TENTANG DIRI ANDA.
1.	Adakah anda lelaki atau perempuan? ☐ Lelaki ☐ Perempuan
2.	Bilakah anda dilahirkan? ...../...../..... Tarikh Bulan Tahun
3.	Adakah <u>kesihatan</u> gigi, bibir, rahang dan mulut anda: ☐ Teramat baik ☐ Sangat Baik ☐ Baik ☐ Sederhana ☐ Teruk
4.	Adakah keadaan gigi, bibir, rahang atau keadaan mulut anda mempengaruhi **kesihatan anda keseluruhannya?** ☐ Tidak memberi kesan ☐ Sedikit memberi kesan ☐ Kadang-kadang memberi kesan ☐ Banyak memberi kesan ☐ Amat banyak memberi kesan dan penting

KOD PEMERIKSA: ..... **TARIKH:.....**

SOALAN TENTANG MASALAH MULUT
Dalam tempoh **3 bulan yang lepas**, berapa kerap anda:

5.	Sakit pada gigi, bibir, rahang atau mulut anda? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
6.	Gusi berdarah? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
7.	Pedih/sakit dalam mulut anda? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

8.	Mulut berbau? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
9.	Makanan terlekat dicelah gigi anda? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
10.	Makanan terlekat di lelangit anda? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

UNTUK SOALAN SETERUSNYA...
Dalam tempoh **3 bulan yang lepas,** adakah masalah ini berlaku kerana keadaan gigi, bibir, rahang atau mulut anda?
.

11.	Terpaksa bernafas melalui mulut? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
12.	Mengambil masa yang lama untuk makan berbanding orang lain? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
13.	Menghadapi masalah untuk tidur? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

	Dalam tempoh **<u>3 bulan yang lepas</u>**, disebabkan keadaan gigi, bibir, mulut atau rahang anda, berapa kerap anda:
14.	Mengalami kesukaran untuk megigit atau mengunyah makanan seperti epal, jagung atau daging ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
15.	Mengalami kesukaran untuk membuka mulut dengan lebar? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
16.	Mengalami kesukaran untuk menyebut sesuatu perkataan? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

17.	Mengalami kesukaran untuk makan makanan yang anda gemari? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
18.	Mengalami kesukaran untuk minum dengan penyedut minuman atau 'straw'? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
19.	Mengalami kesukaran untuk minum atau makan makanan panas atau sejuk? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

SOALAN BERKENAAN EMOSI/PERASAAN

Dalam tempoh **3 bulan yang lepas**, berapa kerapkah anda berperasaan seperti di bawah ini yang disebabkan **gigi, bibir, rahang atau mulut anda**? Sila jawab **'Tidak pernah'** jika disebabkan keadaan lain.

20.	Rasa terganggu atau kecewa? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
21.	Rasa tidak yakin dengan diri sendiri? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
22.	Rasa malu atau segan? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

Dalam tempoh **3 bulan yang lepas**, berapa kerap anda berperasaan seperti berikut disebabkan keadaan **gigi, bibir, rahang atau mulut anda?**	
23.	Risau tentang pandangan orang lain tentang keadaan gigi, bibir, rahang atau mulut anda? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
24.	Perasaan risau anda tidak sekacak atau secantik mereka yang lain? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
25.	Berperasaan runsing? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

26.	Berperasaan gementar atau takut? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
27.	Runsing anda tidak sesihat seperti orang lain? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
28.	Runsing anda berbeza dari orang lain? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

SOALAN TENTANG SEKOLAH

Berapa kerapkah anda mengalami keadaan seperti di bawah dalam tempoh **3 bulan yang lepas** disebabkan **gigi, bibir, rahang atau mulut anda**? Sila jawab **'Tidak Pernah'** jka dsebabkan oleh keadaan lain.

29.	Tidak dapat hadir ke sekolah, disebabkan sakit , temujanji atau rawatan? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
30.	Tidak dapat menumpu sepenuh perhatian ketika di sekolah? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
31.	Mengalami kesukaran untuk membuat kerja sekolah? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

32.	Tidak mampu bercakap atau membaca dengan kuat serta lantang di sekolah? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

SOALAN TENTANG AKTIVITI MASA LAPANG DAN BERINTERAKSI DENGAN ORANG LAIN

Berapa kerapkan anda mengalami keadaan seperti di bawah dalam tempoh **3 bulan yang lepas** disebabkan **gigi, bibir, rahang atau mulut anda**? Sila jawab **'Tidak Pernah'** jika disebabkan oleh keadaan lain.

33. Mengelak dari mengambil bahagian dalam aktiviti sukan, persatuan, drama, muzik atau rombongan sekolah

- ☐ Tidak pernah
- ☐ Sekali atau dua kali sahaja
- ☐ Kadang-kadang
- ☐ Selalu/kerap kali
- ☐ Setiap hari atau hampir setiap hari

34. Tidak mahu bercakap dengan rakan-rakan lain?

- ☐ Tidak pernah
- ☐ Sekali atau dua kali sahaja
- ☐ Kadang-kadang
- ☐ Selalu/kerap kali
- ☐ Setiap hari atau hampir setiap hari

35. Mengelak dari tersenyum atau ketawa bila bersama-sama dengan rakan-rakan lain?

- ☐ Tidak pernah
- ☐ Sekali atau dua kali sahaja
- ☐ Kadang-kadang
- ☐ Selalu/kerap kali
- ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

36.	Menghadapi masalah bermain alat-alat muzik seperti rekoder, seruling, klarinet atau trumpet? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
37.	Tidak mahu bermain dengan rakan-rakan lain? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
38.	Bertengkar dengan rakan-rakan atau ahli keluarga anda? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

	Dalam tempoh **3 bulan yang lepas**, berapa kerap anda berperasaan seperti berikut disebabkan keadaan **gigi, bibir, rahang atau mulut anda?**
39.	Diejek oleh rakan-rakan lain? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
40.	Rakan-rakan lain membuat diri anda rasa tersisih? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari
41.	Rakan-rakan lain bertanya tentang gigi, bibir, rahang atau mulut anda? ☐ Tidak pernah ☐ Sekali atau dua kali sahaja ☐ Kadang-kadang ☐ Selalu/kerap kali ☐ Setiap hari atau hampir setiap hari

KOD PEMERIKSA: ..... **TARIKH:.....**

BAHAGIAN C (ii)

Soalan di bawah adalah mengenai mengenai perkara yang anda perlu lakukan untuk memperolehi kesihatan pergigian yang baik.
Sila pilih satu jawapan dan tanda (√) pada kotak berkenaan.

	Untuk memperolehi kesihatan pergigian yang baik, anda mesti...	1 Amat penting	2 Tidak berapa penting	3 Tidak diambil kira/ tidak penting	4 Tidak penting sama kali
1.	Guna ubat gigi berfluorida				
2.	Minum air berfluorida				
3.	Guna benang 'floss' gigi				
4.	Menjaga gigi serta gusi supaya sentiasa bersih				
5.	Menjauhi makanan manis				
6.	Kerap berjumpa doktor gigi				
7.	Menyertai program pergigian sekolah				

Terima kasih kerana sudi membantu.....