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Differences in estimates of dental treatment needs and workforce requirements between the standard normative need (WHO model) and sociodental approach to assessing dental need

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Abstract

Background. Most dental planners use the normative approach for dental workforce planning. An alternative, the sociodental approach of need assessments has been developed to assess dental needs. Studies indicate large differences in needs assessed using the two methods. **Objectives.** To assess and compare dental needs and manpower required for dental care of a sample of adult Koreans aged 30 to 64 years using the normative and the sociodental need approaches for three dental treatments; restorative, prosthetic and periodontal treatments. **Methods.** Assessments of dental needs and time required to treat using two approaches were based on analysis of data obtained from a sub-sample of 1029 30-64 year-old-adults from the 2003 Korean National Oral Health Survey. They were clinically examined for normative needs and interviewed using an Oral Health Related Quality of Life (OHRQoL) measure and their oral health related behaviours to assess propensity. Two needs methods were generated: 1. Normative Need (NN) defined by dental professionals; 2. Socio-Dental Approach (SDA) that includes Impact-Related Needs (IRN) using an OHRQoL measure, OIDP, and Propensity-Related Needs (PRN). Amount of dental needs, time to treat, and numbers of dentists needed per 100,000 people were estimated for restorative, prosthetic, and periodontal treatments using NN, IRN and PRN. **Results.** Significant differences of about 72% existed between estimates of need for prosthetic treatment using NN and IRN. In workforce estimates, the differences in dentists required to treat 100,000 people were; 87.1 dentists would be needed using NN compared to 22.8 dentists for IRN and 18.9 for PRN for prosthetic treatment; 22.5 dentists using NN compared to 15.9 or 2.7 using PRN for periodontal treatment; and 8.8 dentists using NN compared to 6.6 for PRN for restorative treatment. **Conclusions.** The socio-dental approach for assessing dental needs found lower levels of treatment need than the normative approach. The socio-dental approach should be applied to dental workforce planning.

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CHAPTER 1

Introduction

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Health workforce planning

Health care systems encompass a mixture of numerous factors such as organisational forms, types of practitioners, sources of financing, and delivering framework. They are frequently regarded as an industry with economic principles (McPake et al. 2002). However, it is well known that the principle of economics do not successfully apply in health care. There are several reasons for this market failure (The Office of Health Economics 2005). They include problems of risk and uncertainty which cause moral hazard and adverse selection; unequal information between patients and health professions. In a free market, the buyer and seller have enough information on the product but it is not so in the health care market. Patients have less knowledge than health professionals and that unequal possession enables the doctors and dentists to induce demand, so-called supplier-induced demand; imperfect competition because suppliers act as monopoly and price makers rather than price taker. In most cases the health profession decides the type of treatment and the patients have few choices. As a result, the people who are consumers in health care market are price takers rather than price makers which is opposite in a free market; lastly, externalities of selfishness and caring.

As indicated above, it is necessary to intervene in health care market and there is a vital role of government or other professionals if planning health care system to work properly. They are encouraged to find the best way to obtain desired results because the resources for health care are limited. This is called Pareto efficient which is combined allocate efficiency and productive efficiency. Allocate efficiency is the economy produces exact quantity and type of health care that society wants and productive efficiency is to provide health care at the lowest possible cost. There are various ways of intervening in the process of planning to economise and input factors can be the most obvious candidate to control.

In the health care system there are several inputs to produce health care (e.g. land, labour, capital, and management) and one of the most important elements is workforce. Schaefer and Pizurki (1984) said health care system has 'always been primarily a labour-intensive effort, whether occurring inside or outside the confines of a health-care institution'.

Many countries have problems with unmet need and accessibility of dental treatment and the people complain because they think there are not enough dentists. However dental associations often argue that there are too many dentists working in countries and that hinders their business. Grumbach (2002) mentioned workforce planning as 'getting the right number of physicians in the right specialities in the right locations at the right time'. That applies to dental health (Richards 2000; Ahmed et al. 2000; Maupome et al. 2001; Casamassimo et al. 2002; Gibson 2004; FDI Dental Practice Committee 2005).

Policies on workforce vary according to the needs of society. During the 1970s lack of manpower was a main concern in many countries but that changed rapidly in a decade. The efforts to increase the resources, such as the number of dental personnel and facilities including hospitals, ended up in an oversupply (Bourgeois et al. 1993). Manpower planners were asked to be more logical and base estimates on evidence for example demand and supply (Beck and McGill 1976; Dolkart 1978). Many researchers tried to analyse the data and to find proper methods for dental workforce planning (DeFriese and Barker 1982; FDI and WHO 1985; Beagrie 1986; House 1987; Goodman and Weyant 1990).

There are several models for planning workforce. The World Health Organisation (WHO) model of need-based and demand-weighted approach is recommended by that world authority. It has been applied in several countries, namely, France and Australia (Bourgeois et al. 1993; Morgan et al. 1994). However, the WHO model has some flaws (Bronkhorst et al. 1991; Bourgeois et al. 1993; Morgan et al. 1994). One major shortcoming is the sole use of normative need as a basis of calculation.

There are different kinds of needs; normative, felt, expressed, and unmet needs (Sheiham and Spencer 2002). Most dental service planning only relies on the normative need and that has serious limitations. First of all, normative need judged by professionals is not free from their own values and it is not objective. Secondly, it does not consider other factors such as socioeconomic factors. Alternative systems are necessary. One of them is the sociodental approach to assessing dental needs which combines normative needs with quality of life indicators (Sheiham and Tsakos 2006).

The conceptual frameworks of the normative and sociodental approaches are different and there is evidence that the needs assessed by the two approaches differ. Therefore, it was decided to apply some of the principles outlined in previous studies on the subject to a large scale national study to assess the manpower implications of using the two approaches. In this study I use data from the 2003 Korean National Oral Health Survey (KNOHS) for modelling workforce needs using differing methods of assessing dental needs.

CHAPTER 2

Literature Review

CHAPTER 2. LITERATURE REVIEW

All dental work force planning is based to a large extent on the assessment of oral and dental health needs. Dental health departments and Government departments use data from national surveys to estimate the numbers and types of dental personnel. Despite numerous studies on the limitations of how dental needs are assessed, the WHO model based on normative needs is used and extrapolations made to manpower needs. In addition to the literature on limitations of how dental needs are assessed, there is a considerable body of literature on the differences between needs assessed using the normative and sociodental approaches. There is obviously a need to translate these research findings into practical manpower planning terms. That is what this thesis will attempt to do. It sets out to assess the differences in manpower calculations based on the WHO and the sociodental approach for assessing dental needs using data from a national oral health survey which is the usual basis for calculating needs and manpower.

In this review the basic concepts of dental workforce planning, such as need, demand and supply will be discussed. Then the definitions, procedure and process, and related factors with workforce planning are reviewed. Based on those concepts we can follow the development of the models for dental workforce planning. The four most frequently used types of modelling will be presented. Then the WHO model for assessing dental needs, which is widely used and will be tested in this study, is explained in more detail. The application and limitations of the WHO model of need assessment will be discussed and an alternative, sociodental approach to estimate treatment needs, will be suggested.

The sociodental approach begins from recognition of the shortcomings of normative need assessment system. Each term in the sociodental approach will be defined and the process of development of sociodental estimates of treatment needs described. Here follows a brief outline of the sociodental approach in the study.

The sociodental approach starts from normative needs. That is then combined with the impacts related with oral status. Several concepts concerned with Impact-Related Needs (IRN) will be described, especially Oral Health Related Quality of Life (OHRQoL). The estimates of IRN are then incorporated with individual propensity factors which are a measure of the pattern of oral health related behaviour. The product of Impact-Related Needs (IRN) and propensity is Propensity-Related Needs (PRN). Needs calculated using the sociodental approach and the WHO normative approach are then converted into timings to do each type of dental procedure. Those estimates of time required are in turn translated into manpower by average time worked per year per dentist.

2.1 Dental workforce planning

2.1.1 Basic concepts of health care planning

Before focusing on models for health care workforce, several basic concepts are important to define (Subcommittee on Health and the Environment 1976) (Figure 2.1).

- Need: a normative, usually professional judgement as to the amount and kind of health- or medical-care services required by an individual having certain characteristics in order to attain or maintain some standard level of health. Need is the basis for assessing workforce needs and there are numerous definitions of needs (Bradshaw 1972).

- Demand: the volume and type of health-care services that an individual desires to consume at some price level. Demand is distinguished from utilisation, which is the volume and type of services actually consumed. When demand becomes utilisation, reference is frequently made to "effective demand".

- Supply: the quality of health-care services of manpower provided or available, normally as the price of services varies. Increases in demand normally induce an increase in price. In addition, for most services, an increase in price will induce an increase in supply.

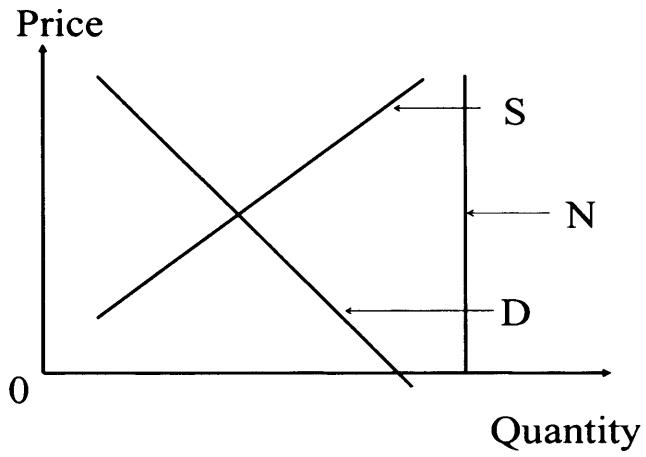


Figure 2.1 Relationship of aggregate Demand (D), Supply (S), and Normatively Defined Need (N) for Health Care Services (Jeffers et al. 1971; DeFriese and Barker 1982)

Health manpower plans are developed in three stages; health manpower planning, health manpower production, and health manpower management (Hall and Mejia 1978; Schaefer and Pizurki 1984). Several researchers have outlined the meaning of workforce planning. Sorkin (1977) defined it as 'a method to ensure that we shall have enough health personnel to match but not exceed the future demand for their services' and Ross (1988) as 'a process that transforms a country's resources into services that can cope with its priority dental problems' and 'the process of defining the oral health community problems, identifying resources, establishing feasible oral health and oral care goals and specifying technical and administrative actions to reach these goals'. The former definition approaches workforce planning from the aspect of structure. It means that the supply of work force in health care,

including dentists, can be changed according to the trends in demand. The latter defined by Ross is the dynamic process which needs to follow the procedures.

Hall and Mejia (1978) summarised the health manpower planning process as six stages: (1) Initiation of the planning cycle. Motivate planning, identify major problem areas, and request for help by defined groups; (2) Situation analysis and planning the planning. Survey preliminarily for planning context, review priorities and constraints, plan the planning, do the initial reconnaissance of data availability, design the study, and involve relevant agencies and institutions and the public; (3) Data collection and analysis. Select sample, design the questionnaire, do data collection and verification, prepare the projections, and revise priorities and study design as appropriate; (4) Policy and plan formulation with communication. Review alternatives, cost benefit and other special studies, discuss with policy makers and other interested groups, formulate policy and plan, and communicate decisions; (5) Plan implementation. Programme and formulate the project and management planning; and (6) Evaluation. How the policies were valid, how well they were implemented, and how the result was good.

The dynamic procedure of workforce planning which focuses on economic analysis is as follows (Abel-Smith 1994): (1) List current stock by category; (2) Project future supply on present policies and demand based on affordability; (3) Match supply against affordable demand; (4) Increase or decrease planned output; and (5) Examine some key constraints such as willingness to work in rural area or male/female balance.

Dental workforce planning, as a part of health care system, follows similar procedures (Slack 1974):

1) The analysis and projections of dental health needs and demands for services by the population. Such data are obtained by epidemiological surveys and from treatment records;

2) The assessment of present dental health manpower availability and the analysis of its pattern of utilisation;

3) The formulation of policy; and

4) The estimation of future manpower requirements and of relevant education and training needs in the light of the overall dental health plans

In all the guidelines for manpower planning, assessment of needs plays a central pivotal role.

2.1.2 Related factors

During the dental workforce planning procedure, there are several factors to consider. They are:

- The effective economic demand for one or another type/level of health personnel, the appropriateness of their knowledge and skills to do the work to be done or the achievement of specified objectives regarding health status, and the pattern of distribution of personnel by geography, by institutions, and by specialities (Schaefer and Pizurki 1984);

- The availability of resources, appropriate technology, the effective management of resources, the population's participation and acceptance (Ross 1988);

- Productivity, efficiency, extent of duties of allied personnel, new technology and techniques, and emerging research that alters the manner of diagnosis and treatment (Seldin 2001); and

- Environmental factors including the socioeconomic status, race and ethnicity, disability status and disease patterns of the population and demand and supply of services (Seldin 2001).

As mentioned above, dental health care is influenced by various factors and 'decisions about the organisation of health care services should be based on state-of-the-art information on health technology, epidemiological data, the effectiveness

of treatment interventions and professional practices in specific settings' (Maupome et al. 2001).

2.2 Dental workforce planning models

Many researches have been conducted to plan the dental workforce. The most frequently cited framework of modelling is DeFriese and Barker's (1982) classification. The following conceptual models underlying workforce studies includes the concepts, procedures, and related elements. In this model, the critical questions involve a comparison of the volume of services that can be produced (manpower/services supply, S) with the volume of services required (including need and demand, R) (DeFriese and Barker 1982; 1983; Maupome et al. 2001). These workforce studies are categorised mainly in four different ways (Figure 2.2):

- Need-based projection from manpower-to-population ratio (S3:R3, Dental manpower supply: Population at risk);
- Demand-based manpower capacity utilisation surveys (Dentist attitudes for manpower requirements or Dental office visit, shortage vs. surplus);
- Econometric practice-productivity studies: full-time equivalent (FTE) dentists (S2:R3, practice productivity: population at risk); and
- Need-based demand-weighted approach: oral-health-status/ treatment-needs approaches (S1:R1, Dental service supply: Dental service requirements)

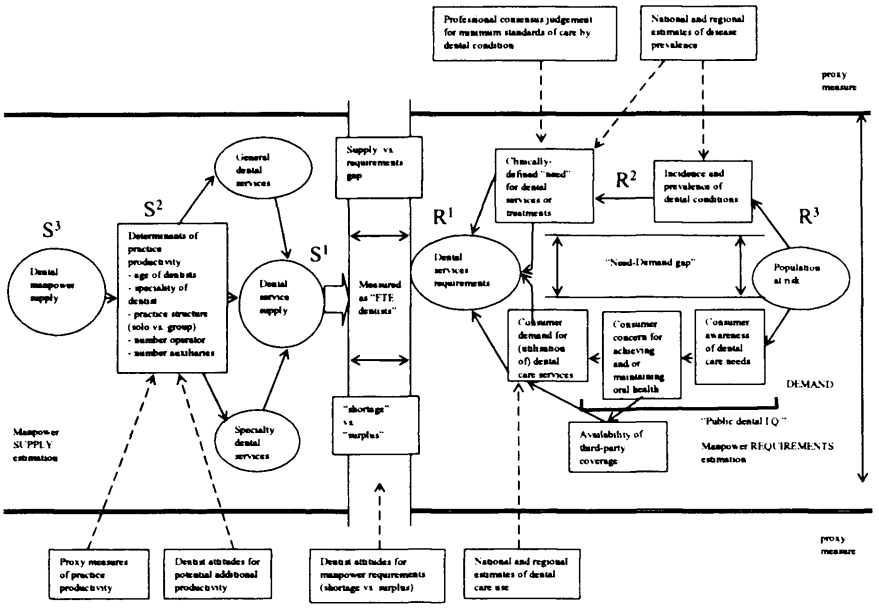


Figure 2.2 The dental manpower analytical model (DeFriese and Barker 1982)

2.2.1 Need-based projections from manpower-to-population ratios

The manpower-to-population ratios method indicates the number of dentists needed in relation to the ratio of residents in a specific area, such as a city or country. The results of a need-based model from the ratio for the manpower-to-population are straightforward and unambiguous to interpret. For these reasons this method is popular (Songpaisan 1985; Collins et al. 1993; McClendon et al. 1997; Mick and Lee 1999). Nevertheless, there are serious disadvantages to use manpower-to-population ratios. First of all, environmental factors related with delivery system and health care system, i.e. demographic variation, socioeconomic conditions, price for health service, the third-party payment, productivity of personnel and technique, are omitted in this planning. Also there is a potential argument about the digital number of the ratio which can be easily changed and is not absolute.

2.2.2 Demand-based manpower capacity utilisation surveys

This model had been developed through the researches of Minnesota, Ohio and Tennessee. They used the survey to assess the shortage of dental personnel and busyness of dentists from dentists exclusively. In the Minnesota study three main component were collected: (1) practicing dentists regarding their judgments as to the existence of particular shortage areas in the state; (2) general descriptive characteristics of dentists and their practices; and (3) a set of data collected from secondary data sources on the "quality of life" including thirty different social and economic indicator (Born 1974; Clemens 1975; DeFriese and Barker 1982). The main question in this study was 'what criteria do dentist think are most important in defining a dental manpower shortage area' and 'what techniques do dentists think are useful in resolving shortage are problems'. Research from Ohio and Tennessee compared two data on dental office visits, one estimated from the national data per capita (population demand) and the other from dentists who replied with weeks worked in the last year and a number of patients seen per week (provided/available estimation). After that, they checked the surplus or shortage of manpower supplied (Engler 1976; 1979; DeFriese and Barker 1982).

Even though these approaches have advantages in terms of utilisation for the manpower projection, they have some problems. They do not address the oral-health needs of the populations served and mainly rely on the information from dental professionals, who are on the supply side. Moreover, these studies assumed a rather simple relationship between variables included in the analyses but the underlying conceptual models of how one variable may be influencing another is rather complex. Furthermore, this model does not provide any vision for future dental programme development and does not consider the dental care delivery system.

2.2.3 Econometric practice-productivity studies

Econometric practice-productivity model starts from the limitation of the previous study, need-based or demand-based manpower projections. They have focused attention on the imbalance between the supply and demand for dental-care services, but did not devote significant attention to the measurement of the capacity of the current dental-care system to produce the volume of services required to meet the demand and the organisational features of the practice of dentistry known to be significant determinants of production (that is, number of auxiliaries, number of operatories, number of dentists in group practice). Accurate estimates of changes in dentists' productivity are important in evaluating the adequacy of the number of dentists to meet the demand for dental services (Beazoglou et al. 2002). Therefore, basing forecasts of the future need for dentists on the dentist-to-population ratio or demand ignore this productivity estimation (Dolkart 1978). They measured manpower supply, practice productivity, and determinants of productivity through the survey and the demands for dental-care services estimated from national dental-care utilisation data. Lastly, the supply and demand are compared with the form of visits per year and the shortage and surplus can be simulated as a result. However, this model was insufficient as a workforce model for future estimation of manpower. The analysis of this model does not include the need for dental care service and utilisation factors of users. Those points made this model limited to the supply side even though it decreased the number of dental personnel needed.

2.2.4 Need-based demand-weighted approaches to dental manpower planning

Need-based demand-weighted approach to dental manpower planning has five components (DeFriese and Barker 1982): (1) a study of manpower supply and distribution; (2) a study of the epidemiological distribution of dental disease and conditions; (3) a conversion of epidemiological data on disease prevalence (and estimates of disease incidence) into estimates of treatment needs; (4) a study of the productive capacity of private dental offices; and (5) a synthesis of all of these data

components for the purpose of estimating dental manpower requirements. The formula combined the above factors is explained as follows:

$$M_{pt} = \left[\frac{P \times C \times V \times T}{W}\right] \times D$$

M_{pt} : Manpower required in year t

P : The population that needs a given type of care for a specific health problem in year t, current or projected

C : The average number of conditions per person per year

V : The average number of a given kind of service per condition per year, based on need i.e. dental caries, edentulism, preventive dental services, and periodontal disease

T : Average time required per service

W : Average workload of the individual practitioner – total amount of service time provided by the average practitioner per year for a given service

D : Effective consumer demand for care

Defriese and Barker (1982) concluded that there is a difference of needs for additional dental services in certain areas compared with that in other places even if they have same number of people and productivity and this is the main reason to be based on need weighting demand.

There are some obvious shortcomings in this approach. The data used in the formula are expensive to produce and it assumes that present health care system is well fitted to the level of dental care needs of the population. Determining the meaning and measurement of consumer demand remains an important concern in planning and should receive additional attention in efforts to urge new approaches of manpower requirements even though mentioned as difficult to prove.

2.2.5 The WHO model: Health Through Oral Health

The World Health Organisation and the Federation Dentaire International set up a joint working group (JWG6) to produce a tool for decision-makers that can be used for planning services (World Health Organisation 1989). The manual stated that "it can be used to determine: 1) the amount of various types of care needed; 2) present and future demand for care; and 3) a rational plan for future developments based upon 1) and 2) and taking account of present and future personnel levels". The proposed model requires various types of data such as:

- Dental needs of the population under consideration;
- Demand for dental services prevailing in this population; and
- The annual working time of a dental practitioner/operator.

With the above data the method provides two sets of calculations:

- The quantity of services required to satisfy the needs of the current and predicted population and the full time equivalent (FTE) personnel needed to provide them; and
- The quantity of services which could actually be provided given the level of demand.

The final outcome of the programme is expressed as an operator-to-population ratio specific for that population. By modifying the data entered the program is capable of producing a variety of estimates of this ratio – high, moderate and low approximations for example.

Several countries applied the WHO model to calculate the number of dentists. The followings are examples from France and Australia. They examined the model to apply and discussed the problems related to its systematic use. In France, there was a big increase in the number of dental surgeons trained during the 1970s and the 1980s and that resulted in an oversupply of dentists. After recognising an excess of

resources, staff was cut in universities and a number of departments of dentistry were closed (Bourgeois et al. 1993). The result of calculation with the WHO method showed that there was an oversupply of dentists in terms of the ratio of dentists: population. The number expected from the method was 1:1854 or 1:1937 excluding orthodontists, but the actual ratio was 1:1500. The difference can be evaluated in various ways: (1) the planning model is correct, which means that France still has more dentists than that are needed to satisfy the demands of the population; (2) there was gap in the working hypotheses that make up the data base. Indeed, only the values of the DMFT index for the 0-14-year-old cohort, certain periodontal data and the average working years of dentists were known with precision. The other variables, such as the prosthetic status of the population in France, the length of time spent on each treatment, the retreatment periods, and so forth, were only estimates based on incomplete data; and (3) the results observed using the theoretical model varied in an uneven way according to the criteria considered. It is interesting to note that each time the model has been applied to specific data at the WHO, the answers provided by the system seemed to indicate an overestimation of projected needs expressed in terms of numbers of dentists required. Although the model is flexible and an effective aid to planning, it highlights the need to have the greatest possible amount of documented information, not only epidemiological data, but also data on changes in demand for treatment.

The aims of the study in Australia were: "firstly to use the WHO/FDI JWG6 program to provide predictions and general answers to policy questions, based on the current state (using 1988 data) of need for dental services and personnel in the state of Victoria; secondly, to forecast community service and personnel requirements for future years using this same approach; and finally, following use of the program in this situation analysis, to report on its strengths and weaknesses as a workforce planning tool" (Morgan et al. 1994). The WHO/FDI JWG6 computer model suggested that the supply of dental health care providers in Victoria is slightly below the estimate. It was, however, close to the current existing numbers of oral health personnel (predicted ratio: 1:2019/ 1988 actual ratio 1:2520). The downward trend of supply contrasts with the upward trend of population oral health needs as predicted by the WHO/FDI model. The difference between the supply of

dentists and the requirement of oral health services represents the lack of supply of services to the need for services.

2.2.5.1 The limitations of the JWG6 WHO/FDI model

Several limitations of JWG6 WHO/FDI model have been mentioned by researchers.

First, the model needs extensive information. In the planning model of workforce, the data about the dental status or treatment need and other demographic background information are necessary to calculate the number of the personnel (Bourgeois et al. 1993). If the essential data are not enough for the modelling and evaluation of the planning, the whole process could be out of date based on inapplicable information or mismatched (Morgan et al. 1994).

Second, the methodology adopted is flawed because it neglects cohort and period effects in the estimates of oral care needs (Bronkhorst et al. 1991). The WHO workforce model used the present data for forecasting the future need of dental treatment. They assumed the quantity of service would not be changed after time passed. However, future planning needs to estimate that there will be an increase or decrease in the amount of service needed with time and other related factors. The WHO model overlooked this point even though the assessment of present ideal ratios of dentist to population is also important (Morgan et al. 1994).

Third, the unit of oral health personnel is not clearly defined. The concept of the 'unit' of oral health personnel is in an important position for developing a programme. This unit is designated a full time equivalent (FTE) which includes dentists, dental auxiliaries, primary health care workers, and non-health personnel. The amount of demand and supply for treatment need would be changed according to the mixture of the workforce (Gibson 2004). Also it would be of benefit if the model were to distinguish between the various oral health care workers and the services that they provide.

Finally, it fails to consider other factors which influence the whole system and its implementation. Some of the papers suggested that one should reflect on other related factors which are also important to utilise the dental care (Maizels et al. 1993; Wilson and Cleary 1995; Locker and Jokovic 1996; McGrath and Bedi 1999; Pitts 2005). The factors affecting population need and demand must be identified and estimated. Also a forecast of numbers of oral health workers required should take account of socio-economic factors that could modify the behaviour and the practice of dentists (Bourgeois et al. 1993). These can be a changing oral health pattern, politico-economic incentives and constraints, oral health workforce mix, population changes, research advances, and dentists' capacity to supply services (Morgan et al. 1994). The FDI Dental Practice Committee (2005) defined 'estimation of the dental workforce is a supply and demand determination that requires understanding of the available supply of dental services, the normative (patient determined) need for dental care in the population and an understanding of the demand for dental services in that population'. The influence of these factors will impact on the system of education and training including the number of students and specialists needed.

2.2.6 Further developments: workforce planning models that include socio-economic factors

There are various elements influencing demand and supply for health care. The health care utilisation is a result of characteristics of the population at risk and delivery system. The related aspects of the population to utilise health service can be categorised as biological, psychological, and socio-environmental elements:

- People can recognise symptoms when they have biological changes which include visual and sensory changes such as dental pain. These symptoms predispose people to seek dental care (Kay 1993; Varenne et al. 2005). Varenne and colleagues (2005) showed that 59.7% of the new patients in the hospital visited the dental-care services because of pain;

- Psychological factors such as attitudes, beliefs, awareness, concerns, expectations and emotions, also influence the decision process of dental care need (Kiyak 1983; Woloshynowych et al. 1998; Freeman 1999d) and negative feelings such as fear and anxiety about treatment act as an barrier to using dental service (Quteish Taani 2002; Milsom et al. 2003); and

- Finally the socio-environmental factors including health care system, socioeconomic situation, and cultural background are proved to be associated with dental visits (Kiyak 1993; Heft et al. 2003).

A Behavioural Model of health services utilisation was tested by Anderson et al (1973; 1995). This model had been developed to understand why people use health services, to define and measure equitable access to health care, and to assist in developing policies to promote equitable access. There are mainly four dynamic factors influencing utilisation and they are explained below (Figure 2.3):

- Environment: Health care system is included with recognition of the importance of national health policy and the resources and their organisation; and External environment including physical, political, and economic components;

- Population characteristics: Predisposing characteristics are those that exist before disease, and can be either mutable or immutable. Enabling characteristics are resources that affect one's ability to access the health care system, such as household income or health insurance coverage. Need variables reflect illness levels, such as dental disease, pain, or a person's perceived need for care; and

- Health behaviour: Personal health practices such as diet, exercise, and self care as interaction with the use of formal health services to influence health outcomes; and Use of health services is a means to other ends and outcomes from a policy perspective; and

- Outcomes: Can be Perceived health status, Evaluated health status, and Consumer satisfaction.

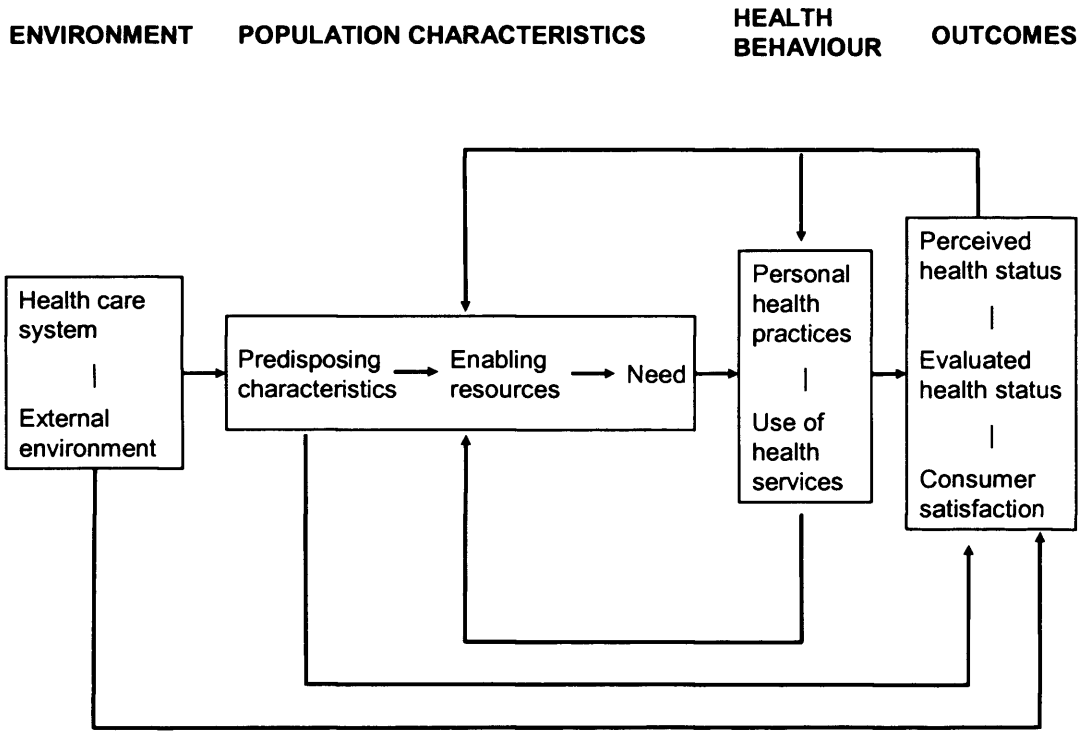


Figure 2.3 Behaviour Model of health service utilisation (Andersen 1995)

The model starts from the 'Environment' affecting the 'Population characteristics'. The 'Population characteristics' is a functional process of their predisposition to use services, factors which enable or impede use, and need for care. Then these characteristics lead to 'Health behaviour', which includes personal health practices and use of health services. Finally this pattern of health behaviour influences the 'Outcomes' such as perceived health status, evaluated health status, and consumer satisfaction. Also the model includes feedback loops such as outcomes affect subsequently health behaviour patterns as well as population characteristics.

Anderson (1995) mentioned dental services as '...more likely be explained by social structure, beliefs, and enabling factors'. A study tested the determinants of utilisation in dental health care based on Anderson's modelling (Scheutz and Heidmann 2001). They assessed the variables related to become a regular dental service user. The following factors were relevant in each procedure: (1) Predisposing factors. Age, sex, and exercise; (2) Enabling/disabling factors. Yearly income, cost of importance, and Corah's Dental Anxiety Scale; and (3) Need factors. Perceived condition of teeth.

Gilbert and colleagues (2003) also analysed dental utilisation with the Behaviour Model of health care. They concluded that there was a paradox of dental needs with three components: (1) need is indeed predictive of dental care use, depending upon how need is measure; (2) people with a higher probability of reporting need are actually less likely to enter the dental care system; and (3) need can actually be predictive of dental care use in a negative direction and a positive direction depending on which measure of need is used. For example, self-reported disease and oral pain are factors more likely to be associated with seeking care whereas clinically-determined needs are actually less likely factors.

As shown above the environmental and sociodental factors are strongly related with health behaviour and outcomes such as health care utilisation. However, there has been no study including these elements in the oral health care planning. Recently a new assessment system of dental needs have been developed, which is called the sociodental approach to assessing dental needs (Sheiham and Tsakos 2006). This is an assessment tool combined with relevant sociodental factors such as perceived impacts and health behaviours. More detail will be discussed in the following section.

2.3 Sociodental approaches to estimate treatment needs

2.3.1 Definitions of oral health need and the their limitations

"Health care needs represent the distribution in populations of indications for treatment, and must therefore include a range of factors that influence the decision to treat. These include the level of morbidity, the presence of comorbidity, other influences upon the potential to benefit from an intervention, as well as the acceptability of the intervention to the recipient. This can be described at the personal level of the individual's preferences in relation to their own perception of their problem" (Coast et al. 1996).

Traditional methods of assessing need are concerned mainly with the technical question of assessing need. However, concern with effectiveness and acceptability is central to any formulation of health care needs. At present there is no general agreement on what constitutes health need. The need for health was perceived as relief from the negative states of distress, discomfort, disability, handicap and the risk of mortality and morbidity (Acheson 1978). Sometimes need is defined in terms of treatment required as 'a service equivalent of need' or 'need for concept which are procedures that may be deployed to meet that need' (Donabedian 1974). This approach is frequently limited by resources. Cooper (1975) had a similar definition; 'a state of health assessed as in need of treatment by a medical practitioner'. The current view of needs concentrates on the ability to benefit. It is summed up by Matthew (1971) as "a need for medical care exists when an individual has an illness or disability for which there is an effective and acceptable treatment or cure." It can be defined either in terms of the type of illness or disability causing the need or of the treatment or facilities for treatment required to meet it.

There are several definitions of need for dental treatment (Bradshaw 1972; Sheiham and Spencer 2002; Sheiham and Tsakos 2006). Bradshaw's (1972) paradigm forms a sociological approach that sets up a useful definitional matrix for needs. Firstly,

'normative need' is that which the expert or professional, administrator or social scientist defines as need in any given situation. 'Felt need' is equated with 'want', expressed as the individuals own assessment of his or her requirement for health care. This is called perceived need for treatment. There is 'expressed need' or demand. That is felt need converted into action by seeking assistance. 'Comparative need', involves comparisons with the situation of others and considerations of equity. The expressions of need using these definitions are not necessarily consistent in relation to any individual. For many conditions, perceived need depends on the beliefs and knowledge of the person affected, and hence on value judgements. In turn, these are influenced by psychological, socio-economic and cultural factors, not simply by the supply of services.

Normative dental need is the predominant method used for assessing dental need in the direct treatment planning approach. It is interpreted as the quantity of dental health care which expert opinion judges ought to be consumed over a relevant period, by the people to remain or become as healthy for dental condition. The manual of oral health survey method by World Health Organisation (1997) is commonly used as reference and this has definitions for restorative, periodontal, and prosthodontic status and overall needs. Normative need for dental care may be subdivided into diagnostic needs, preventive needs and disease, disability, or dysfunction-oriented needs, or into initial and maintenance needs. Estimates of dental care needs are expressed in terms of numbers of people needing care, numbers of dental or preventive procedures, hours of work by dental personnel, division of labour between dentists and dental and other ancillaries and lastly the costs of the care needed.

However, there are well-known limitations of the normative system defining oral health. 'From the point of view of contemporary definitions of health, DMF and CPITN have serious limitations; they tell us nothing about the functioning of either the oral cavity or the person as a whole and nothing about subjectively perceived symptoms such as pain and discomfort' (Locker 1989).

Several limitations in conventional need assessment system were discussed by Sheiham et al (2002; 2006) (Figure 2.4). First of all, professional judgements translated into normative need are neither value-free, nor objective. It relies on the decision of the dentally trained people. Some of the studies showed that there is lack of agreement between examiners (Elderton and Nuttall 1983; Gjermo 1991; Lanning et al. 2005). Secondly, subjective concepts of health have been important even in the clinical setting. For example, the satisfaction of the patient with their oral health (Kress 1987; Kress, Jr. 1988; Levin 2005; Anderson et al. 2005) and the quality of life (Locker 1988; Adulyanon and Sheiham 1997; Cunningham and Hunt 2001) are recognised as important scales to measure health. These are more meaningful in health care planning because of their close relationship with utilisation (Yamalik 2005a; Yamalik 2005b). Lastly, normative need is criticised for its unrealistic approach. For example, workforce planning model based on the normative need usually resulted in overestimated resource for the future (Bourgeois et al. 1993; Morgan et al. 1994). It causes over-investment in dental care from the government. As a result finite resources are allocated improperly and it can cause lost opportunity to be used better elsewhere. Glass (1976) criticised the normative approach as a useless concept in planning health services.

1. Normatively defined need is not as precisely quantifiable as the term suggests. It is often a subjective assessment by the health professional of whether a person will benefit from a particular procedure or not. Professional judgements in normative need are not value-free nor objective. Indeed, the concept of objectivity often depends upon a consensus agreement from a number of subjective approaches. Even within those agreements, there were intra-examiner and inter-examiner variability among different judgements - judgements differ widely. Indeed, the concept of objectivity is much less clear cut than is often supposed. Therefore, objectivity cannot be regarded as a property of measures of normatively assessed health status and needs.

2. The standard norm of measures of disease accepted by dentists, which are translated into treatment need is not always the norm in terms of functional or social dimension of people examined. This problem occurs particularly in conditions which lack easy definition such as occlusal disharmonies. Oral health problems probably have much more to do with individual's quality of life and personal comfort than with person's ability to carry out usual daily activities and people's dental satisfaction bears little relation to clinical assessment of oral condition.

3. Epidemiological techniques of documenting incidence and prevalence of illnesses and chronic conditions are not the same as identifying needs for health care. The issue of service effectiveness apart, there is the vital role of the social sciences in developing an understanding of the patient's perspective regarding his or her illness, which should sensitise health professionals to his or her needs.

4. Concepts of ill health and disease are frequently determined by cultural values. The clinical definition, which is based on the disease analogy, rarely coincides with consumer definitions. The assessment of health by lay persons differs from that of professionals.

5. Estimates of treatment needs obtained by using the condition-to-need or the professional screening approach do not consider the outcomes of oral diseases or the consequence of limited resources for health care.

6. By concentrating on the technical aspect of need, the attitudes and behaviour of the patient are frequently not given sufficient attention, nor is any emphasis given to the promotion of health, well-being and the prevention of disease.

7. The need justified by purely professional assessment is questioned in terms of human or consumer rights. Discrimination between people with the same needs cannot be morally justified. Decisions of priority in medicine must be discussed publicly and should not be the sole prerogative of any single professional group or agency of government. In addition, recent developments in consumerism and marketing have highlighted the importance of patient satisfaction.

8. It rules out the use of alternative treatments.

9. By stipulating the most effective treatment, which may be very costly, slightly less effective but cheaper treatments which could be more widely applied are not considered.

10. Normative need is criticized for its paradoxical approach. Although, it recommends treatment, in the belief that all the sick should be helped, treatment is not obtained in most situations because of limited health care resources. "If some of the needy receive complete care, nothing may be left for others. We cannot be endlessly generous and continue to be fair" (Acheson 1978). This is why Fuchs (1974), an economist, described normative need as 'romantic rather than humanitarian need.'

Figure 2.4 The major shortcomings of normative needs and a service-oriented definition of need (Sheiham and Tsakos 2006)

'Health needs assessment is a systematic approach attempting to ensure that the health service uses its resources to improve the health of the population in the most efficient way' (Sheiham and Tsakos 2006). It is obvious from the criticisms mentioned above that if the WHO normative approach is used then resources to improve the health of the population will not be used in the most efficient way. A common assumption in the planning of dental health services, which is currently being challenged, is that the need for health care can be objectively determined by professionals. Contemporary thinking is that health care needs may be defined in other than normative ways, because definitions of states of ill-health have become open to wider interpretations. Health and oral health care needs now extend beyond a narrow clinical interpretation to issues like:

- The impact of ill-health on individuals and on society;
- The degree of disability and dysfunction that ill-health brings;
- The perceptions and attitudes of patients themselves towards ill-health; and
- The social origins of many common illnesses

Based upon the criticisms mentioned here, Sheiham (2000a) suggested that the key elements of a dental need system are:

1) Measuring dental needs should include the outcomes underlying need. These outcomes comprise risk of morbidity and impairment, pain and discomfort, disability and dysfunction, handicap, and mortality based on the WHO concepts (Locker 1989). Attempts to meet each kind of need should lead to an acceptable overall outcome.

2) Assessment of need should be supplemented by measures of the social and perception aspects of oral health from lay people. Definitions of need should be a joint responsibility of health professionals and citizens.

3) The consideration of people's need should be in relation to the utility of the procedures available to meet it and the resources that permit those procedures to

be used. There has to be the probability that the use of the proposed dental service will lead to an acceptable sustainable outcome. Resources should be available to provide the treatment needed. Therefore, both effectiveness and cost of oral health cares have to be included in need considerations.

4) More realistic assessment of needs should comprise the individual's potential or propensity for responding to oral health care. This aspect of need should provide different treatments and strategies to be planned for different individuals and groups in the population according to their potential to benefit based on propensities

"These factors influence the utilisation of health services and, ultimately, the effectiveness of treatment. In this sense, they represent key concepts that should be seriously considered in the process of planning health care services" (Sheiham and Tsakos 2006). It is therefore imperative that the perceptions and behaviours of the population whose needs are being assessed are taken into account when assessing needs.

2.3.2 The importance of subjective measures – perceived needs and impacts

The above review highlights that the normative system for oral health need is not a sole indicator even though they are used as standard for treatment. Subjective measures have emerged as an important aspect of needs assessment both because of the limitations of this normative assessment and broader definitions of health. There are several reasons to consider perceived oral health and perceived treatment needs as important.

First, perceived oral health and perceived treatment needs are closely related with use of dental care (Freeman 1999b; Scheutz and Heidmann 2001). The Federation Dentaire Internationale (FDI) (Cohen 1987; Freeman 1999a) suggested that three separate category of barrier should be considered in access to dental care: society, dental profession, and individual. Among those three the last individual category

included lack of perceived need, anxiety and fear, financial considerations and lack of access. Freeman (1999b) explained the chain of these psycho-social factors which hinder accessing dental care. She commented that "patients' responses to an invitation for a routine examination appear to be influenced by dental anxiety status, previous dental experiences and lifestyle commitments. Patients' perceptions of treatment need are also under the control of the psycho-social determinants of dental health. Hence the impetus to change felt need to demand for care is thought to be based upon a combination of psycho-social factors."

The other reason is the consistent finding of a considerable gap between normative and perceived measures of need. Many researchers have found that there are differences between practitioners and patients' views about need for treatment (Table 2.1) and oral health status (Table 2.2). Many researchers suggested the differences are mainly related to various perceptions of need in lay people (Kiyak 1993; Tickle and Worthington 1997; Chisick et al. 1998; Heft et al. 2003; Ekanayke and Perera 2005). Freeman (1999c) pointed out that "the dental health professional's concept of need is related to their professional knowledge and skills and is connected to the patient's physical dental health status. The patient's concepts of need are related to psycho-social influences such as previous dental experiences and dental phobia status. The dentist's clinical skill and judgement lead to a diagnosis together with the formulation of an appropriate treatment plan. Successful treatment outcome will be dependent upon the patient's capacity to use the treatment offered".

Table 2.1 Some examples of the differences between professional and lay people's opinions about needs for dental care (Gherunpong 2004)

Subjects	Normative need	People's need	Author
254 elderly	Overall treatment: 78%	42% of normative	(Smith and Sheiham 1980)
1275 adults, elderly	Periodontal treatments (bleeding/inflamed gum): 98% Complex periodontal treatment: 38% Fillings: 76% Replacements: 64% of denture wearers Replacing missing teeth: 23%	Perceived bleeding gum: 40% Perceived inflamed gum: 16% 20% recognised gum disease 70% recognised decayed teeth 42% 14%	(Tervonen and Knuuttila 1988)
2784 15-74 yr	Cosmetic dental care: 16-63 %	18-40%	(Burgersdijk et al. 1991)
95 elderly	Overall treatment	39% of normative	(Cautley et al. 1992)
74 elderly	Overall treatment: 70%	30%	(Fiske and Lloyd 1992)
53 adults	Overall treatment: 91%	76%	(Hancock and Blinkhorn 1996)
493 elderly	Overall treatment	41% of normative	(Locker and Jokovic 1996)
232 edentulous elderly	Prosthodontic treatments: 81%	23%	(Srisilapanan 1997)
549 dentate, elderly	Prosthodontic treatments: 70% Extractions: 29% Restorations: 12% Crown and bridge: 3%	9% 8% 6% 1%	(Srisilapanan 1997)
139 adults	Overall treatment	Agreement = 64.7% (compared with normative)	(Robinson et al. 1998)
1126 children	Overall treatment	58.9% of normative needs	(Gherunpong 2004)

Table 2.2 The differences between normative and subjective measures

Normative measures	Subjective measures	Relation	Author
Clinical status	**Perceived status**		
No. of decayed, missing teeth and deep pockets	Perceived oral health status	+ (weak)	(Reisine and Bailit 1980)
Dental symptom, days of pain and dental functional status	Perceived dental health		(Rosenberg et al. 1988)
No. of missing teeth and replaced teeth Denture status	Perceived dental condition	agreement: 65% good	(Palmqvist et al. 1991)
DMFT index Total missing teeth	Perceived oral health	not significant -	(Matthias et al. 1995)
Clinical status	Perceived status	-	(Kallio 1996)
Being edentulous or not having a partial denture, having no oral pain, and fewer oral symptoms	Perceived oral health	+	(Atchison and Gift 1997)
Tooth loss	Perceived oral health	+ (longitudinal)	(Locker 1997)
Epidemiological indicators of oral health status	Perceived condition of oral health	significant	(Gift et al. 1998)
Periodontal status, CPITN	Perceived periodontal status	weakly predictive	(Gilbert and Nuttall 1999)
Plaque index and gingival index	Self-assessed gingival bleeding	+ (moderate)	(Taani and Alhaija 2003)
Periodontal status, CPITN Dental caries, DMFT	Perceived periodontal status Perceived dental health status	v.low +/ v.high - moderate +/ -	(Vered and Sgan-Cohen 2003)
Dental caries, DMFT	Perceived oral health	weak correlation	(Ostberg et al. 2003)
Periodontal status, CPITN	Perceived periodontal status	systemic review	(Blicher et al. 2005)
Clinical status	**Perceived needs**		
Remaining roots, loose teeth, and dental pain	Perceived dental treatment need	+	(Heft et al. 2003)
No. of decayed-filled teeth, oral hygiene periodontal pockets / marginal bone loss	Perceived dental treatment need	significant predictor	(Lundegren et al. 2004)
Presence of mobile teeth	Perceived needs for dental care	+	(Ekanayake and Perera 2005)

(Table 2.2 continued)

Normative measures	Subjective measures	Relation	Author
Clinical status	**Perceived impact**		
Higher DMFT, fewer functioning teeth Periodontal indices	Impact on eating Impact scores	+ Not significant	(Cushing et al. 1986)
Carious surfaces	Impacts	Weak	(Locker 1992)
Oral conditions	OHIP	-	(Locker and Slade 1993)
Missing teeth Occluding pairs of teeth in posterior	Impact OHIP	+ (weak) + (weak)	(Locker and Slade 1994)
Tooth loss (anterior)	Impact	+	(Slade and Spencer 1994)
Fewer decayed Missing teeth without replacement Decayed and missing teeth	DIDL All dimensions except comfort	+ (weak) -	(Leao and Sheiham 1995)
DMFT index Occluding pairs of teeth	No. of impact "	+ -	(Rosenoer and Sheiham 1995)
No. of decayed teeth	Symptom, well-being, and function	+	(Chen and Hunter 1996)
Missing teeth, retained root fragments, root-surface decay, and periodontal pockets	Higher level of OHIP	+	(Slade et al. 1996)
No. of natural teeth	OHIP	-	(Lester et al. 1998)
Clinical status	Perceived impact	+ and -	(Nuttall et al. 2001)
Tooth loss (anterior and posterior), mobile teeth Caries	OIDP score Impacts	+ Not significant	(Srisilapanan and Sheiham 2001)
No. of teeth	OIDP	-	(Sheiham et al. 2001b)
Occluding pairs of teeth	OIDP	-	(Tsakos et al. 2004)
No. of missing teeth, denture, halitosis No. of teeth with 3rd degree mobility	OHIP scores	+ (weak)	(Ekanayake and Perera 2004)

Lundegren et al. (2004) mentioned that this discrepancy between the patient's and the dentist's perception of dental treatment need possibly presents a problem in treatment planning and the patient's cooperation. To understand and assess factors relating to lay perceptions of dental health would therefore be of interest to planners and help improve communication between patients and dentists at an individual level. They (Lundegren et al. 2004) explored the factors related with differences between subjective and objective needs in 20 to 25 year old Swedes. Three assessments of the dentists appeared significant in predicting the patient's self-assessed treatment needs: (1) number of decayed-filled teeth; (2) patients' oral hygiene; and (3) pathological periodontal pockets and/or marginal bone loss present at the last visit. The other three patients status measures related with self-assessed dental needs were: (1) educational level; (2) self-assessed dental health compared to contemporaries; and (3) concern about dental health. In the combined model the patients assessment were greater important than the dentists assessment. These findings highlight the lack of agreement between dentists and patients and dentists' poor understanding dental treatment needs. They show the importance of developing normative and perceived measures.

Vigild (1993) criticised the normative assessment based solely on clinical diagnosis which leads to an overestimation of the true need for treatment. Some of the elderly people in her study did not want treatment, because there was no perceived need. Others may be in a poor mental condition and cannot express their wishes for treatment and they would probably not benefit from treatment. Realistic treatment need is a combination of the normative need, the self-perceived need, and the expressed demand for treatment, and takes into account the mental and physical state of the individual, as well as ethical considerations.

For the reason outlined above, normative need should be complemented by psychological and sociodental indicators such as impacts on daily performance and quality of life related factors, which reflect the diverse aspect of needs. Socio-dental indicators were defined as "a measure of the extent to which oral conditions disrupt normal social role functioning and lead to major changes in behaviours such as an inability to work or attend school, or undertake parental or household duties"

(Cohen and Jago 1976; Locker 1989). Quality of life indices, especially related with health and oral health have been developed as new measures of health outcomes (Locker 1996).

2.3.3 Health-Related Quality of Life (HRQoL)

Since the 1970s there has been a shift in approaches to assessing health. Health is defined not as the absence of disease but 'a state of complete physical, mental and social well-being' (World Health Organisation 2006). However, most disease indices concentrated on the measurement of mortality and morbidity rather than health, itself. The concept of health has been broadened and the conventional way of assessment relying on clinicians is questioned (Bowling 1997a). Alternative methods have been proposed. One is the Health-Related Quality of Life (HRQoL) approach that focuses on subjective self-reported evaluation of people's health status. Patrick and Chiang (2000) summarised the relations between quality of life and health concepts as follows (Figure 2.5):

1) Health-Related Quality of Life indices are usually interpreted as similar to Quality of Life but the former can be a part of the Quality of Life measurements;

2) "Beneath the skin" is the typical element of individual such as gene, age, lifestyle and illness behaviour (internal to individual) to decide quality of life;

3) "Outside the skin" such as socio-cultural and environmental factors (external to individual) is also important; and therefore

4) Health-Related Quality of Life is a complex of these factors indicating health status.

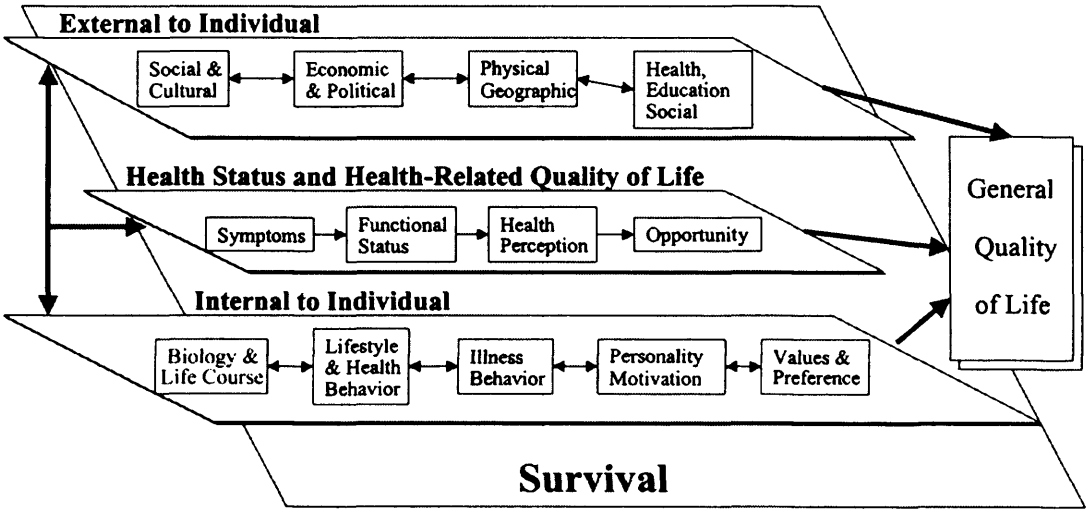


Figure 2.5 Relations among quality-of-life and health concepts (Patrick and Chiang 2000)

An index of Health-Related Quality of Life can be a 'particular measure in a particular application to detect change at all or minimally important changes' (Patrick and Chiang 2000) and Oral Health-Related Quality of Life is one of them.

2.3.4 Oral Health-Related Quality of Life (OHRQoL)

Various kinds of Oral Health Related Quality of Life (OHRQoL) measures have been used to estimate impacts from oral disease. These include: SIDD (Social Impacts of Dental Disease) (Cushing et al. 1986); GOHAI (Geriatric Oral Health Assessment Index) (Atchison and Dolan 1990); OHIP (Oral health Impact Profile) (Slade and Spencer 1994); DIDL (Dental Impacts on Daily Living) (Leao and Sheiham 1995); and OIDP (Oral Impacts on Daily Performance) (Adulyanon and Sheiham 1997). In the following section the most frequently used and popular indices, OHIP and OIDP are described.

The Oral Health Impact Profile (OHIP) is based on the Locker's (1988) concepts for biological, behavioural and psychological consequences of oral disease (Figure

2.6, a). It measures seven conceptual dimensions of quality of life with forty nine statements (OHIP-49); functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. Later, it shortened as fourteen items (OHIP-14) (Slade 1997). Also the model of conceptual framework was tested empirically recently (Figure 2.6, b) (Nuttall et al. 2006).

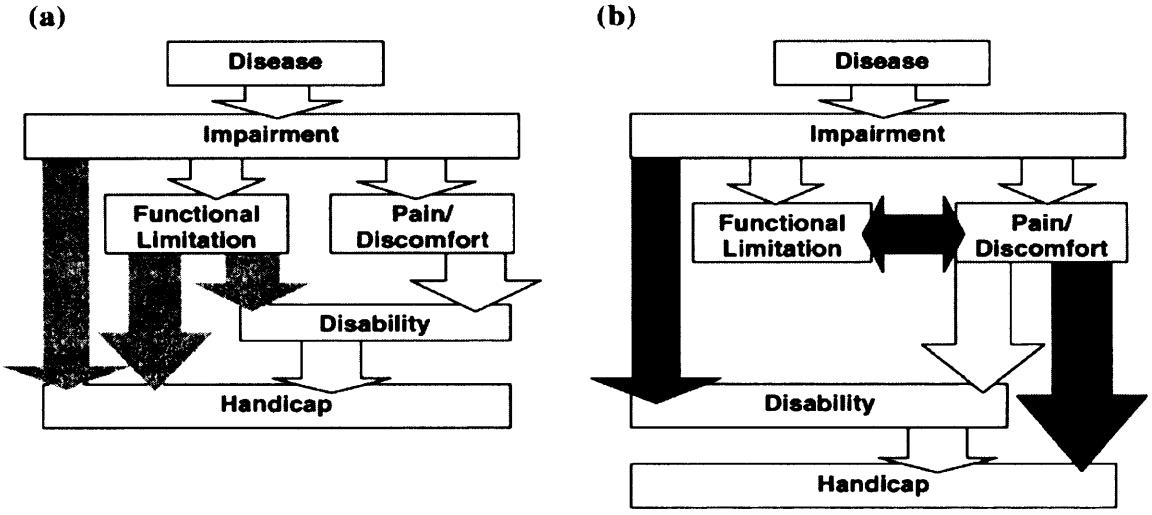


Figure 2.6 (a) Base model of the Oral Health Impact Profiles (OHIP); (b) the empirically derived population-response model (Nuttall et al. 2006)

The theoretical framework of the Oral Impacts on Daily Performance (OIDP) (Figure 2.7) was developed from WHO's (1980) International Classification of Impairments, Disabilities and Handicaps (Adulyanon and Sheiham 1997). The first level includes "the oral status or impairments", which most clinical indices attempt to measure. The second level is "the intermediate impacts" which implies the possible earliest negative impacts caused by oral health status, such as pain, discomfort, or functional limitation. The third level represents "ultimate impacts" which is impacts on ability to perform daily activities consisting physical, psychological and social performances. The OIDP index measures the last level of impacts from oral health. At first they used 8 performances which are affected by oral health: Eating and enjoying food; Speaking and pronouncing clearly; Cleaning

teeth; Sleeping and relaxing; Smiling, laughing and showing teeth without embarrassment; Maintaining usual emotional state without being irritable; Carrying out major work or social role; and Enjoying contact with people. It was modified later by Tsakos et al (2001). They clarified the content and simplified the wording of different items. The score is calculated by multiplying the frequency with the severity score on each performance and the total was the sum of all the performance score for an individual. Then the sum was divided by the maximum possible score and changes as percentage by multiplying 100.

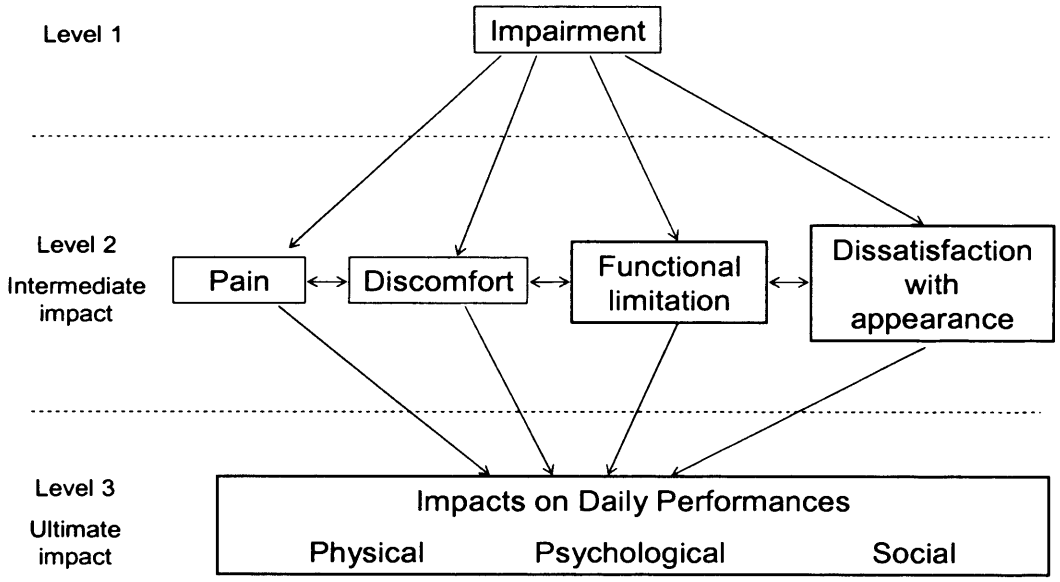


Figure 2.7 Theoretical framework of Oral Impacts on Daily Performances (OIDP) (Adulyanon and Sheiham 1997)

In the last decade, studies have been done using the OIDP indices to assess sociodental treatment needs that include subjective perceptions (Maizels et al. 1993; Srisilapanan and Sheiham 2001; Sheiham and Spencer 2002; de Oliveira and Sheiham 2003; Srisilapanan et al. 2003; de Oliveira and Sheiham 2004; Gherunpong 2004; Sheiham and Tsakos 2006). The OIDP and CHILD-OIDP indices have many advantages compared with other OHRQoL measures.

A particular advantage of the OIDP is that it includes Condition-Specific OIDP (CS-OIDP) which asks participants to report the specific conditions affecting each oral impact on daily performance. That allows impacts to be related to a particular dental condition and is vital to assessing specific types of treatment needs. The general OIDP score tells us how much oral conditions generally impacts on daily life but it does not say much about the oral impacts linked to specific oral conditions. If we use the general OIDP, there is a danger of being applied to the conditions which are not related with specific dental treatments. For example, someone needs periodontal treatment and the score for OIDP was high. However, if the condition affecting his or her life was 'clicking or grating noise in jaw joint', it is difficult to argue that the impacts came from periodontal disease. Most Oral Health Related Quality of Life indices are general and not specific to each dental disease. The OIDP index overcomes this problem by using the Condition-Specific OIDP (CS-OIDP).

Most importantly, as the central focus of this thesis, the OIDP is the only Oral Health Related Quality of Life system which has combined with a dental needs assessment system (Srisilapanan et al. 2003; Sheiham and Tsakos 2006; Gherunpong et al. 2006a). Other OHRQoL methods are used to measure presence of, or changes in quality of life. They are not applicable to needs assessment systems which is the most important part of planning. The OIDP index does have the facility to be merged into a treatment need system and it has been shown to be a valid sociodental indicator (Sheiham and Tsakos 2006; Gherunpong et al. 2006b).

2.3.5 Incorporating propensity measures into sociodental needs assessment

Patients' attitude and behaviours are known to have a strong influence on effectiveness of treatments and improvement of oral health (Maizels et al. 1993). Effectiveness of treatments depends on dentists but also on patients. Patients' behaviours are relevant to effectiveness of dental treatment in every field of dentistry (Schou 2000). Therefore, assessing treatment needs without adequate

consideration of the patient's oral health-related behaviour has important shortcomings.

Several studies have shown the effect of oral health-related behaviours on treatment outcomes (Faculty of Dental Surgery 1997; Faculty of Dental Surgery of the Royal College of Surgeons of England Clinical Effectiveness Committee 1999; Clarkson et al. 2000; Faculty of Dental Surgery of the Royal College of Surgeons of England Clinical Effectiveness Committee 2003; National Institute for Clinical Excellence 2004; Faculty of Dental Surgery of the Royal College of Surgeons of England Clinical Effectiveness Committee 2005; Health Development Agency 2005). Based on these recommendations from the above mentioned experts and professional bodies, the following behaviours were selected as the main propensity factors:

- Toothbrushing habits. Dental plaque is one of the main risk factors for dental disease and tooth brushing is practical way of controlling plaque (Stecksen-Blicks and Borssen 1999; Ashley et al. 1999; Vanobbergen et al. 2001a; Tinanoff et al. 2002; Levy et al. 2003; Taani et al. 2003; Perinetti et al. 2005);

- Use of fluorides. Exposure to fluoride has been approved as a preventive measure for dental caries and one of the effective methods applying is fluoride toothpaste (Moynihan 2000; Hausen et al. 2000; Sheiham 2001; Moynihan 2002; Levy et al. 2003; Ojima et al. 2005). A major systemic review of topical fluorides for preventing dental caries in children and adolescents showed that fluoride toothpastes gave the best protection against caries (Marinho et al. 2003a; Marinho et al. 2003b; Marinho et al. 2004a; Marinho et al. 2004b);

- Diet, especially sugary food and drinks. Many authors concluded that there is strong relationship between sugary food/drinks consumption and dental caries (Moynihan 2000; Burt and Pai 2001; Sheiham 2001; Moynihan 2002; Mobley 2003);

- Dental attendance patterns. There is some disagreement about the optimal interval for dental check-ups (Sheiham 1977; Beal 1977; Knott 1977; Kett-White 1978; Sheiham 1980; Sheiham 2000b; Coombes 2001a; Coombes 2001b; Davenport et al. 2003). Nevertheless regular attendees have better oral health than irregular attenders (Sheiham et al. 1985; Todd and Lader 1991; Murray 1996; Bullock et al. 2001; Richards and Ameen 2002); and

- Smoking patterns. Smoking is a negative behaviour which affects health, oral health, periodontal health and oral cancers (Bergstrom and Preber 1994; Jones 2000; Winn 2001; Sham et al. 2003; Watt et al. 2003; Reibel 2003; Petersen 2003; Bergstrom 2004).

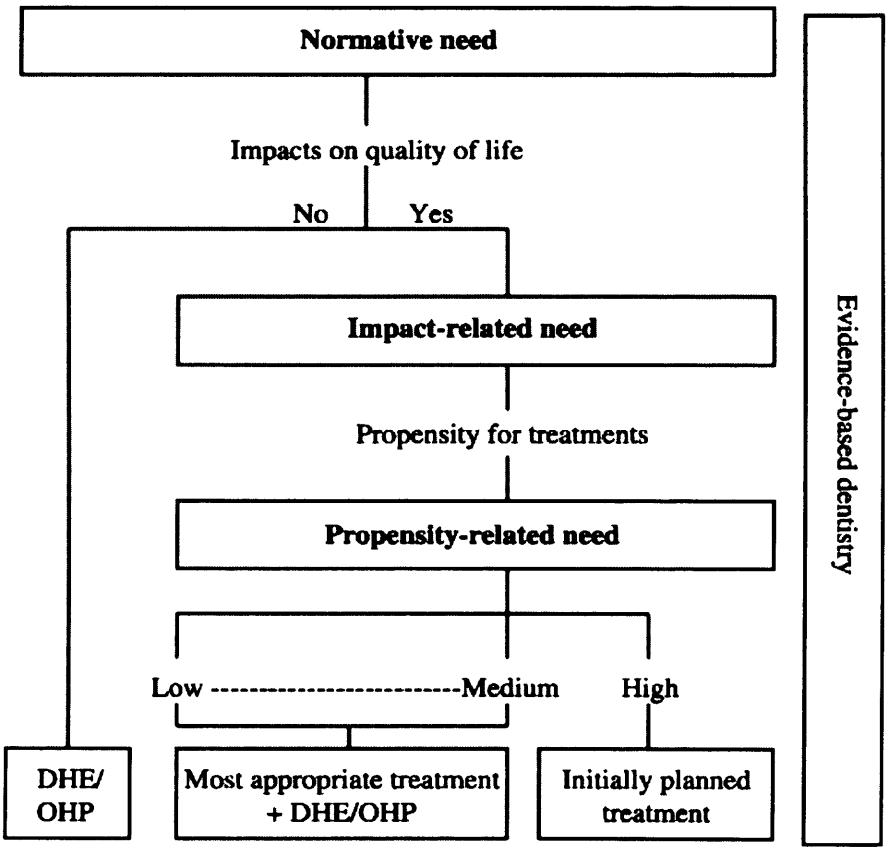
2.3.6 Evidence-based dentistry: Effective treatment

The final treatment plans for a person should be decided using the process outlined above for the sociodental approach to assessing treatment needs. They must be based on what we currently know is effective treatment. Evidence-based medicine is a key to the decision for interventions which will improve the health of patients. In addition, knowledge of the life history of the diseases must be used for the decision when to intervene (Hart 1997). Systematic reviews are necessary to inform evidence-based dentistry as a basis for clinical judgements which treatments to be used (Richards and Lawrence 1995; Coulter 2001; Marinho et al. 2003b; Ismail and Bader 2004).

2.3.7 Sociodental approaches to estimate dental treatment needs

The use of an OHRQoL measure such as the OIDP index and the propensity factors introduces a new way of assessing dental needs; a sociodental approach integrating normative with a subjective index. The integration works as shown in Figure 2.8.

First, the normative treatment needs of the people are evaluated by dental professionals. Some people are defined as needing dental treatment. Each group of subjects with or without normative needs are divided into two groups based on whether they have or do not have a dental impact assessed using the OIDP. At that stage the needs are called Impact-Related Needs (IRN). It should be noted that those with a normative need but without an OIDP impact are considered for Dental Health Education (DHE) or Oral Health Promotion (OHP). Thereafter, the propensity measure, described below, is brought into the calculation on the basis that some treatments are unlikely to be effective if the person does not carry out oral health related behaviours relevant to that condition. That calculation is called Propensity-Related Need (PRN). Throughout the needs assessment exercise, evidence-based concepts on what treatment is best are applied. In practice, that involves drawing up guidelines for treatments based on systematic reviews.



DHE/OHP, dental health education/oral health promotion

Figure 2.8 Basic Model of Dental Needs (BMDN) (Gherunpong et al. 2006b)

2.4 Summary: Using sociodental needs assessments to plan oral health care

Ross (1988) defined workforce planning for dental care as 'a process that transforms a country's resources into services that can cope with its priority dental problems' and 'the process of defining the oral health community problems, identifying resources, establishing feasible oral health and oral care goals and specifying technical and administrative actions to reach these goals'. There were many studies modelling the dental workforce. Defriese and Barker's (1982) classification is the most frequently used framework.

As stated earlier the World Health Organisation and the Federation Dentaire International set up a joint working group (JWG6) to produce a tool for decision-makers that can be used for planning services (1989). The proposed WHO/FDI model is based on the need-based demand-weighted approach.

However, several limitations of JWG6 WHO/FDI model were mentioned by researchers and one of them is the lack of other factors influencing the whole system and its implementation (Bourgeois et al. 1993; Morgan et al. 1994). There are studies including these environmental factors to health utilisation, Health Behaviour Model (Andersen and Newman 1973; Andersen 1995). This behavioural model emphasises the importance of predisposing characteristics and need variables such as dental disease, pain, or a person's perceived need for care as well as health behaviour. The WHO/FDI model differs significantly from a behavioural model of health services utilisation proposed by Anderson et al (1973; 1995).

There has been no study using the elements of Anderson's model in the oral health care planning field even though the environmental and sociodental factors are strongly related to health behaviours and outcomes such as health care utilisation as shown above. Some of the concepts formulated by Anderson were incorporated into the sociodental approach to assessing dental needs suggested by Adulyanon (1996) and developed by Sheiham and Tsakos (2006). This is an assessment tool combined with relevant sociodental factors such as perceived impacts and oral health related behaviours.

A rationale of sociodental approaches starts from the limitations of the normative approach. Normative need, in the direct treatment planning approach, is defined as the quantity of dental health care which expert opinion judges ought to be consumed over a relevant period, by the people to remain or become as healthy for dental condition. However, there are following limitations of the normative assessment of oral health (Sheiham and Spencer 2002; Sheiham and Tsakos 2006): first of all professional judgements translated into normative need are not objective and show lack of agreement between examiners (Elderton and Nuttall 1983; Gjermo 1991; Lanning et al. 2005); second, subjective concepts of health have been important even in the clinical setting, such as the satisfaction of the patient with their oral health (Kress 1987; Kress, Jr. 1988; Levin 2005; Anderson et al. 2005) and the quality of life (Locker 1988; Adulyanon and Sheiham 1997; Cunningham and Hunt 2001). They are closely related with utilisation (Yamalik 2005a; 2005b); and lastly, normative need is criticised for its unrealistic approach resulting in overestimates of necessary resources (Bourgeois et al. 1993; Morgan et al. 1994). As Locker (1989) pointed out the conventional need assessments 'tell us nothing about the functioning of either the oral cavity or the person as a whole and nothing about subjectively perceived symptoms such as pain and discomfort'.

For the reasons outlined above, normative need should be complemented by psychological and sociodental indicators such as Oral Impacts on Daily Performance (OIDP). Effectiveness of treatment depends on dentists but also on patients. Patients' attitude and behaviours are known to have a strong influence on effectiveness of treatments and improvement of oral health (Maizels et al. 1993; Schou 2000). Based on the recommendations of many researchers the following behaviours were selected as the main propensity factors for the sociodental approach: toothbrushing habits, use of fluorides, diet, especially sugary food and drinks, dental attendance patterns, and smoking patterns.

The final treatment plans for a subject should be incorporated with effective treatment. Systemic reviews are necessary to inform evidence-based dentistry as a basis for clinical judgements which treatments to be used.

Therefore, the assessment of dental treatment need should include following factors: 1) Normative need defined by dental professional; 2) Subjective perception for treatment by people, such as the oral impacts on daily life; 3) Attitudes of patients including propensity factors; and finally 4) Evidence-based dentistry for effective treatment.

Sociodental treatment need assessment has many implications for the planning and provision of dental services (Sheiham et al. 1982; Sheiham and Tsakos 2006; Gherunpong et al. 2006a). Most of all, the sociodental approach supports the development of a health-oriented model of care in preference to the normative treatment model which dominates current dental services. Second, it encourages a shift of emphasis from the purely mechanical to the behavioural aspects of treatment. Lastly, it increases the likelihood of better effectiveness of treatment and a greater degree of long-term success from evidence-based dentistry.

Studies of the sociodental approach to assess dental need showed huge gaps between conventional normative system and sociodental approaches (Table 2.3). For example, in the study by Srisilapanan et al (1997; 2003), around 50% of the people who had normative need for prosthetic treatment did not have any impacts from prosthetic problems. de Oliveira et al (2003; 2004) found that among the children considered as requiring orthodontic treatment need using the Index of Orthodontic Treatment Need (IOTN), 46% had no OHRQoL impacts related to malocclusion. For periodontal treatment need, 72% of Thai children who had normative need did not have any impacts related to periodontal conditions (Gherunpong 2004; 2006).

Table 2.3 Comparison of Sociodental Needs; Normative Needs (NN), Impact-Related Needs (IRN), and Propensity-Related Needs (PRN) in previous studies

	Adulyanon (1996)		**Srisilapanan (1997; 2003)**		**Gherunpong (2004; 2006)**		
	PN	**CPN**	**PN**	**CPN**	**BMDN**	**PN**	**CPN**
Age	35-44		60-74		11-12		
Total No.	501		549		1034 (100.0%)		
NN	162	350	289	348	45.1%	3.2%	97.0%
IRN	55	99	146	57	30.9%	0.4%	26.6%
(–% from NN)	(66.1)	(71.7)	(49.5)	(83.6)	(31.5)	(87.1)	(72.6)
PRN	-	26	102	34	10.3%	-	-
(–% from NN)	-	(92.6)	(64.7)	(90.2)	(77.2)	-	-

NN	Normative Needs	PN	Prosthetic Treatment
IRN	Impact-Related Needs	CPN	Periodontal Treatment
PRN	Propensity-Related Needs	BMDN	Basic Model of Dental Needs

With such big differences between normative and sociodental needs we can postulate that the results of workforce calculations would be different if approaches other than normative, such as a sociodental needs approach are used.

Rationally, the size of workforce should be decided using a combination of normative dental treatment as well as sociodental and socio-economic factors which reflect the system of society and the people in the system (FDI Dental Practice Committee 2005). As far back as 1982 Defries and Barker (1982) gave reasons why the sociodental system is necessary in dental workforce planning; "...planners and health professionals have a tendency to see manpower as an end in itself, rather than a means to the attainment of more general health goals. All too often, health manpower...rather than the health-care services that people seek...is given primary emphasis in the planning process."

A sociodental system has been developed and extensively tested by the University College London group. Despite the obvious logic of the system it has not been applied in large national dental surveys. In this thesis an attempt will be made to use the sociodental approach to assess dental treatment needs. As we are concerned with conversion of needs into manpower estimates, a comparison will be made

using the conventional normative methods, favoured by many epidemiologists, and sociodental approach. This study will not only compare estimates of dental treatment needs but calculate dental workforce numbers using the standard normative needs (WHO model) and sociodental approach to assessing dental needs.

CHAPTER 3

Aims and Objectives

CHAPTER 3. AIMS AND OBJECTIVES

3.1 Hypothesis

3.1.1 Comparing sociodental needs with normative needs

In this thesis, sociodental needs are compared with normative dental needs to assess the extent of the difference. A hypothesis is:

Null hypothesis (Ho): "the proportion of the people and the amount of treatment assessed using a sociodental needs approach will be the same as assessed by normative needs method."

Alternative hypothesis (Ha): "the proportion of the people and the amount of treatment assessed using a sociodental needs approach will be smaller than those assessed by normative needs method."

Ho: Ps=Pn and As=An

Ha: Ps<Pn and As<An

Ps : the proportion of the people with sociodental needs
Pn : the proportion of the people with normative needs
As : the amount of treatment with sociodental needs
An : the amount of treatment with normative needs

3.1.2 Application of normative need and sociodental need assessment approaches into the workforce model and comparison of the results of using the two approaches

In this study both normative needs and sociodental needs assessment approaches are applied into the workforce model with timings for the treatment. Finally, the results of workforce planning and total timing from normative needs and sociodental needs are compared.

Null hypothesis (Ho): "the workforce timing with the sociodental needs approach will be the same as those with the normative needs assessment approach."

Alternative hypothesis (Ha): "the workforce timing with the sociodental needs approach will be smaller than those with normative needs assessment approach."

Ho: Ws=Wn

Ha: Ws<Wn

Ws : the workforce timing with sociodental needs

Wn : the workforce timing with normative needs

3.2 Aims

This study aims to estimate the differences of dental treatment needs and workforce numbers using the standard normative need (WHO model) and sociodental approach to assessing dental needs.

3.3 Objectives

3.3.1 To assess the clinical oral status and normative dental treatment needs in a sample of adult Koreans aged 30 to 64 years.

3.3.2 To assess the association between the normative clinical measures and Socio-Economic Status (SES) in a sample of adult Koreans aged 30 to 64 years.

3.3.3 To generate a sociodental approach to assessing dental needs which includes Normative Need (NN), Impact-Related Need (IRN) using the Oral Impacts on Daily Performances (OIDP) index, and Propensity-Related Need (PRN) using oral health behaviours.

3.3.4 To assess and compare dental needs of a sample of adult Koreans aged 30 to 64 years using the conventional normative need system and the sociodental need approach for three types of dental treatment; restorative, prosthetic, and periodontal treatments.

3.3.5 To compare dental workforce estimates for treating adult Koreans using the standard normative need (WHO model) and sociodental approach to assessing dental needs.

CHAPTER 4

Theoretical Framework

CHAPTER 4. THEORETICAL FRAMEWORK

In this theoretical framework various sociodental factors are integrated into the need assessment system, called a sociodental approach to assessing dental treatment need. As stated in Chapter 2, there is a difference in the dental treatment needs assessment between normative methods and sociodental approaches. Both the normative needs and sociodental needs are applied to the workforce planning model and these two results are compared to assess the extent of the differences.

4.1 A sociodental approach to assessing dental treatment needs

The approach starts from clinical impairments defined by dental professionals which are called Normative Needs (NN) (Figure 4.1). Then, the subjective concepts of perceived oral impacts are added into the sociodental approach as Impact-Related Needs (IRN). Lastly, the propensity factors of behaviour related with oral health are integrated into the sociodental approach and this is the Propensity-Related Needs (PRN). They are explained in detail in the following sections.

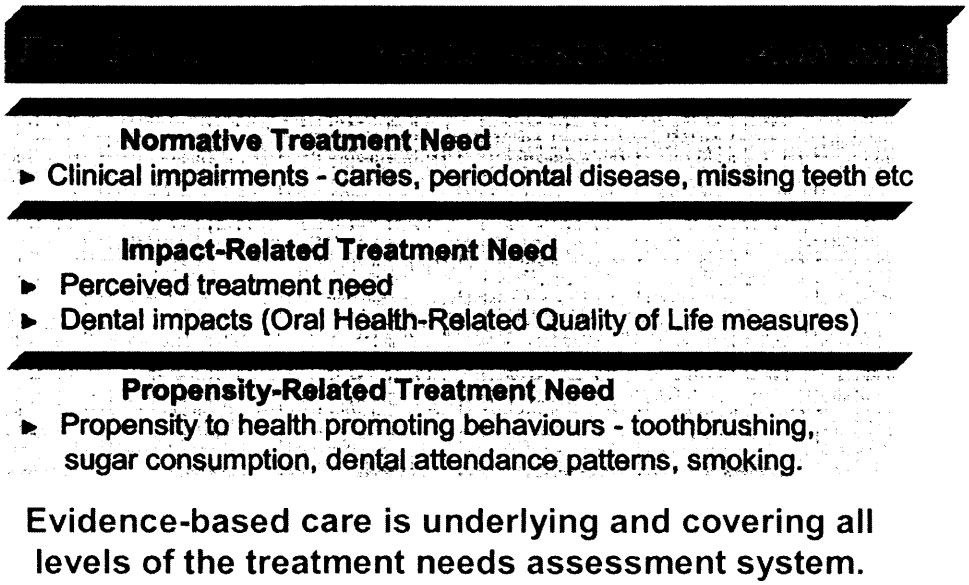


Figure 4.1 Levels of dental treatment needs and relevant key factors (Sheiham and Tsakos 2006)

4.1.1 Normative Needs (NN)

The first level is Normative Needs (NN) identified by professionals. This is defined as clinical impairments or the existence of diseases diagnosed by a dental professional as needing treatments.

After identification, normative need is divided into two models according to the natural history of diseases. One is for life-threatening and progressive oral conditions (Figure 4.2). The normative assessment has priority in this case and the subjective assessment such as oral impacts is not taken into account. Assessments go directly from Normative to the third level of assessing sociodental need, namely, Propensity-Related Needs (PRN). The other model is for assessing needs for non-life-threatening and non-progressive oral conditions (Figure 4.3). In this approach all stages of the sociodental approach are included; Normative Needs (NN), Impact-Related Needs (IRN) and Propensity-Related Needs (PRN).

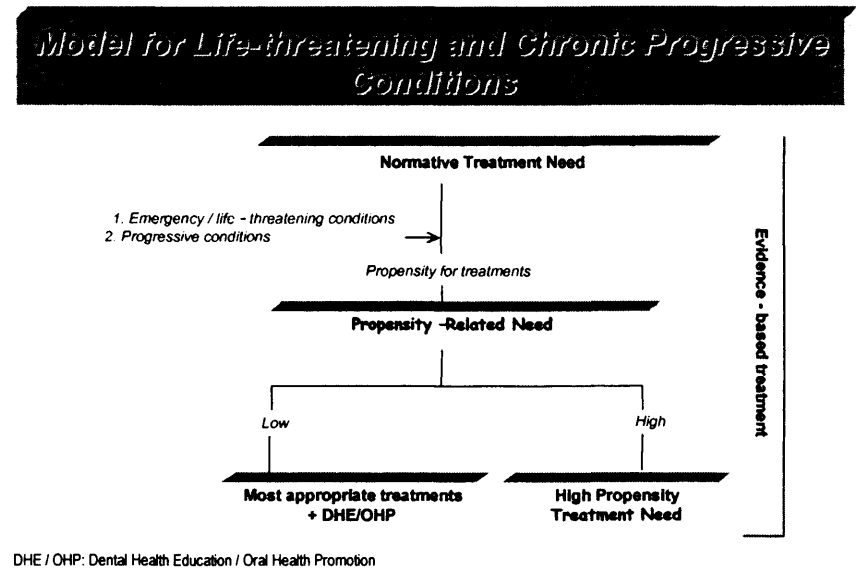


Figure 4.2 Model of Dental Treatment Needs for Life-threatening and Progressive Oral Conditions, modified (Sheiham and Tsakos 2006)

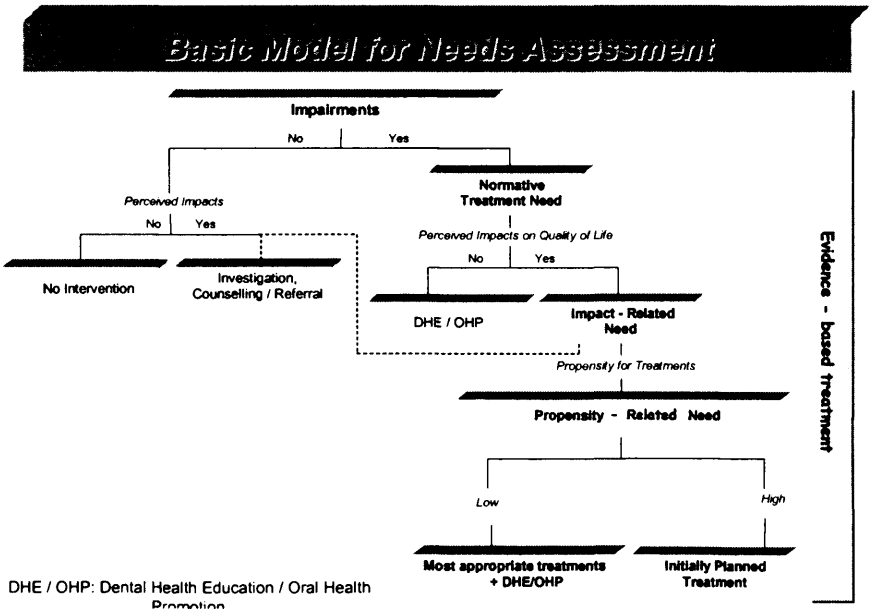


Figure 4.3 Basic Model for Dental Treatment Needs, referring to all other conditions, modified (Sheiham and Tsakos 2006)

4.1.2 Impact-Related Needs (IRN)

The second level of needs is for non-life-threatening and non-progressive oral conditions. It incorporates subjective perception, such as the Oral Impact on Daily Performance (OIDP), into the system. The people who have Normative Need (NN) and oral impacts are considered as having Impact-Related Need (IRN). People with Normative Need (NN) and without impacts are regarded as not having Impact-Related Need (IRN). The latter will have dental health education (DHE) or oral health promotion (OHP) rather than specific clinical treatment.

4.1.3 Propensity-Related Need (PRN)

The third level of need focuses on oral health behaviours for the effective treatments. Propensity factors related with dental treatments are integrated into models at the last stage. There are two groups of people, one from Impact-Related Need (IRN) for non-progressive conditions and the other from Normative Need (NN) for progressive conditions. Both of them are classified according to the possibility to gain benefits from treatments. Initially planned treatment can be offered to the people with a high propensity whereas the people with low propensity should have adjusted plans to provide the most appropriate dental care for them. The latter should, of course, have dental health education/oral health promotion (DHE/OHP).

4.2 Comparing differences between normative needs and sociodental needs and the application into the workforce model

As outlined above there are two different need measurements for dental treatment, normative need and sociodental need. First of all, the difference of needs between normative system and sociodental approach will be compared. Then these will be applied to the workforce model with other related factors to calculate total timing

for treatments. In this stage the data on times for each treatment are necessary as well. Total timings for dental treatment estimated from two different needs methods will be compared (Figure 4.4).

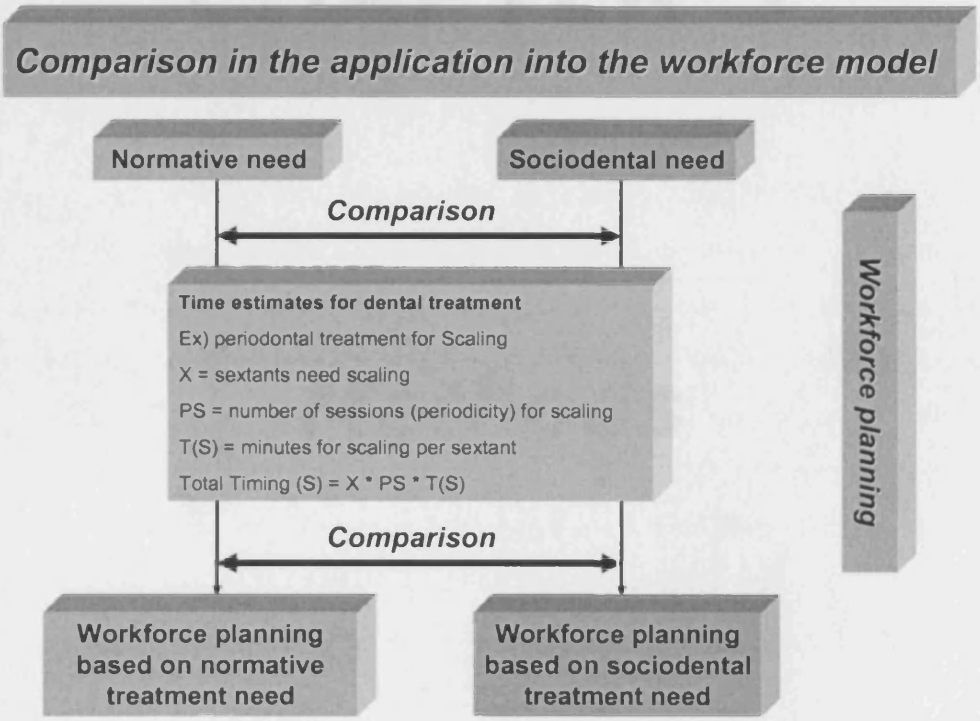


Figure 4.4 Comparing the difference in workforce planning model with Normative Needs and Socio-Dental Needs

CHAPTER 5

Methods

CHAPTER 5. METHODS

5.1 Sample

5.1.1 The National Sample

The study was nested within the Korean National Oral Health Survey (KNOHS) 2003. The population of the 2003 KNOHS referred to residents of South Korea aged 3 and over. They were stratified by area, sex, and age. The areas were divided into three: 1) metropolitan (or larger); 2) city (in each province); and 3) rural areas (smaller than GUN which is a district in a city). Both males and females were included in this survey. The ages ranged from 3 to over 75 and were clustered into 22 groups. Between 3 and 16 years, each age had its own group because they have mixed dentition (14 age groups). After 16 years the ages were grouped as 17-24, 25-29, 30-34, 35-44, 45-54, 55-64, 65-74, and over 75 age groups (8 age groups). The sample size of KNOHS for each site was 220 people (22 age groups × 2 sexes × 5 persons per category).

The sites were stratified by a two-stage sampling method. In the first-stage the area was divided into three according to the size; metropolitan, city and rural area. The three areas were stratified again in the second-stage by proximity between areas and total number of residents in 2002 registration. This led to the selection of 60 sites; 27 from metropolitan, 24 from city, and 9 from rural areas. One health centre or general hospital was used as the survey base for each study site. It was selected from the list of health institutions in each site by simple random sampling method. The sample of KNOHS was based on the 60 sites and the total size of KNOHS was 13,200 (60 sites × 220 people per site). Some people refused to participate and finally 12,925 people were examined in the National Survey 2003.

5.1.2 Study Sample

The present sub-study was a part of the National Survey. Six from the 60 sites of the National Survey were selected for this Socio-Dental Approach study (hereafter referred to as the SDA). The research sites for this study were located in the North-east of South Korea. Three of them were in Gangwon-Do Province and the rest in Gyeongsangbook-Do Province. Those areas were selected because of the permission to use additional measures that facilitated the research questions of this study. A major proportion of the study population was from cities and the people included were typical of these provinces. The centres in this SDA study were as follows:

a. Pohang, Gyeongsangbook-Do, (46-5): Sinsegaeyonhap Clinic, 50-2, Oksung 1 Li, Hunghae-Eup, Book-Gu, Pohang city, Gyeongsangbook-Do

b. Gumi, Gyeongsanbook-Do (47-5): Soonchynhyang Gumi Hospital, 250, Gongdan 2 Dong, Gumi city, Gyeongsangbook-Do

c. Chilgok, Gyeongsanbook-Do (58-5): Waegwan Hospital, 174-54, Waegwan Dong, Waegwan Eup, Chilgok Gun, Gyeongsanbook-Do

d. Wonju, Gangwon-Do (39-5): Sunggi Hospital, 264-21, In Dong, Wonju city, Gangwon-Do

e. Gangnung, Gangwon-Do (40-5): Gangnung Korea Hospital, 286-6, Okchun Dong, Gangnung city, Gangwon-Do

f. Hongcheon, Gangwon-Do (53-5): Asan Hospital in Hongcheon, 466-1, Galmagok Ni, Hongcheon Eup, Hongcheon Gun, Gangwon-Do

Subjects aged 30 to 64 years were selected as the study sample. The reasons for choosing this age group are as follows:

a. Most dental diseases and related treatment needs including periodontal problems and prosthetic need occur in this age group.

b. Previous studies about socio-dental needs have not dealt with this age group.

c. This age group predominantly covers the working population.

1,220 people were invited to participate in the SDA study. 190 of them refused to take part in the survey. Finally the number of people who participated in this study was 1030, a response rate of 84.4%.

5.1.3 Sampling method and sample size calculation

As this study was to compare two needs assessment approaches on the same subjects, the methods of obtaining the sample for the national representative study is not central to this study. Members of the National Survey team examined the SDA participants. Most of the participants were people who visited the clinics for annual medical examinations. It is a regulation, as a worker in Korea, to have routine medical screening once a year. Most were non-dental patients and others were their family members or friends who have no health problems. In the pilot study of the National Survey there was no significant difference in oral conditions between the people who visited general hospitals or health centres and the people who did not (Ministry of Health and Welfare 2004).

The sample size for this SDA study was calculated from Power and Sample Size Calculation program. In the program, the matched case-control study design using McNemar test was applied to see the difference between two different exposure prevalence rates. It uses the following formulae (Dupont 1988; Dupont and Plummer, Jr. 1990):

1st :

$$N = \frac{\left(Z_{\beta}\sqrt{\upsilon_{\psi}} + Z_{\alpha/2}\sqrt{\upsilon_1}\right)^2}{(e_1 - e_{\psi})^2} = 734$$

$$e_{\psi} = \sum_{m=1}^{M} \frac{mt_m\psi}{m\psi + M - m + 1} \qquad \upsilon_{\varphi} = \sum_{m=1}^{M} \frac{mt_m\psi(M - m + 1)}{(m\psi + M - m + 1)}$$

2nd : $734 * 1.2 = 881$

N : Case patients

ψ : Odds ratio

α : The Type I error probability for a two sided test; 0.01

1-β : Power, the probability of correctly rejecting the null hypothesis that the relative risk (odds ratio) equals 1 given *n* case patients, *m* control patients per experimental patient, and a Type I error probability α ; 0.90

P_0 : The event rate among controls, Normative Needs; 0.55

P_1 : The event rate among cases, Socio-Dental Needs; 0.45

Φ : Correlation coefficient for failure between paired subjects or for exposure between cases and controls or for exposure between matched cases and controls; 0.01

In the first stage the sample size was calculated as shown above and calculated to be 734. The proportion for the Normative Needs (NN) in this study was approximated at 0.55. It was based on the previous study (Srisilapanan 1997; Srisilapanan and Sheiham 2001; Gherunpong 2004). Then the prevalence of Socio-Dental Needs (SDN) was assumed to decrease by up to 0.45 after combining with sociodental indicators. Small proportion of decrease was applied because it is able to pick even small differences between Normative Needs (NN) and Socio-Dental Needs (SDN). The size from 1st stage calculation was multiplied by 1.2 accounting for possible loss of subjects or data that may occur during the examination (2nd stage). Therefore,

the minimum total sample size of this study was 881. The total number of sample examined in this study was 1030. That was above the minimum requirement. Besides National Survey sample, extra people were examined to satisfy this study sample size. It followed the same sampling method of the National Survey.

5.2 Data collection and categories

Data were collected using the Oral Health Assessment form (Appendix 1 and 2) including normative oral health status and treatment needs and the Oral Health Questionnaire (Appendix 4 and 5) that facilitated data collection on demographic information, general health related with oral health, oral health behaviours, and subjective socio-dental data. The codes and criteria of those data were explained in detail in Appendix 3.

- Normative oral health status and treatment needs (Appendix 1 and 2) and Criteria for oral examination (Appendix 3)
- Demographic information (Appendix 4 and 5 Form 1)
- General health related with oral health (Appendix 4 and 5 Form 1)
- Oral health behaviours (Appendix 4 and 5 Form 1)
- Subjective socio-dental data (Appendix 4 and 5 Form 2)

5.3 Study implementation

5.3.1 Permission

It followed the National Survey process. Information letters were sent to the selected health institutions at least one week prior to the date of the data collection.

The letter was constructed with the notification to be selected as survey place and a request for the administrative support. Diverse schemes of publicity were applied to inform the survey and the purpose of it; notice and handout for oral health survey (Appendix 11, 12 and 13). All examiners and interviewers briefed about the purpose and process of study. Consent was sought for oral examination and questionnaire-led interview. Subjects were free to withdraw from the study in any stage.

5.3.2 Preparation of documents

Most of the oral examination and questionnaire followed the National Survey form and the other necessary questions are added for the SDA study (Appendix 1, 2, 3, 4, and 5). All questionnaire survey forms were translated in both directions, English to Korean and back-translation from Korean to English. The result of the translation was checked by experts related with oral health and students who can speak both languages.

5.3.3 Personnel training

Two examiners were from the National Oral Health Survey, Professor Duk-sang Ma and Professor Sehwan Jung who worked in the dental college of Gangnung University. They were trained and calibrated for the 2000 and 2003 National Oral Health Survey. The form and criteria for the oral examination (Appendix 1, 2 and 3) was handed out to all examiners of National Surveys as a standard. Dr Ryu was trained by and calibrated with one of them, Professor Jung, who acted as gold standard and was responsible for training and calibration in the 2000 and 2003 National Surveys. Calibration data were calculated for condition of tooth surfaces and dental treatment need of a tooth. In view of the ethical issues of repeating an uncomfortable procedure that was not done for periodontal probing depths, and because of methodological issues, plaque levels were not retested.

For both clinical outcomes conditions of tooth surfaces and dental treatment need of a tooth, the kappa test was performed using a tooth surface for dental caries and separately, a tooth for dental treatment need, as the unit of analysis. Both dentists examined 24 teeth with 112 coronal surfaces and 24 treatment needs. The coronal surfaces were classified as decayed, filled or sound and the dental treatment needs as no treatment, one surface filling, 2 or more surface filling, crown for any reason, pulp care and restoration, or extraction. The kappa scores for the first exercise between the gold standard and Dr Ryu were 0.70 for coronal surfaces and 0.74 for dental treatment needs. That was considered not good enough for the national survey. After further training the calibration tests were repeated on another 20 teeth with 92 coronal surfaces and 20 treatment needs. The second kappa scores were 0.88 and 0.94, respectively, which is taken as representing excellent agreement (Kirkwood and Sterne 2003).

Two interviewers were trained for the National Oral Health Survey and were used in the SDA. They had experience of interviewing people for oral health related questionnaires and had worked in the Gangnung Dental College as researchers. The manual for the interviewers of oral health questionnaire (Appendix 6) was used to train them by Dr. Ryu and all the supplementary documents were distributed (Appendix 7 and 8).

5.3.4 Pilot study

The pilot study was carried out prior to the main study to test the feasibility of questionnaire administration under field conditions, as well as the understanding of the content of the questionnaire under investigation. Nine students from the dental college of Gangnung University participated in pilot testing of the oral health assessment and questionnaire forms.

The pilot study confirmed the feasibility of the methodology although some modifications were made. After the pilot study, the examiners and the interviewers had informal conversations with the participants about the study. Minor

modifications were made to the format of questionnaires and some of the wording for the dental conditions which are difficult to understand. Based on this study, the manual for the interviewers of oral health questionnaire (Appendix 6) was completed. The pilot study also gave an indication of the time required to interview each subject, which was approximately 15 to 20 minutes.

5.3.5 Main study

The survey study group prepared a booth in a health centre or general hospital (Appendix 9, 10, 11, 12 and 13). One examiner and one interviewer made up a team. The group for each SDA survey site consisted of 2 or more teams. First, interviewers and organising staff invited subjects to join the survey. If they agreed to participate, the dentist examined their oral health and filled in Oral Health Assessment Form 1 and 2 (Appendix 1 and 2). The examiner gave advice on simple issues about oral health such as tooth brushing method when the people enquired. After that, the interviewer surveyed them with questionnaires. A key-holder was given as a reward.

Re-examination session was carried out for the test-retest reliability, 3 weeks later the initial examination. 84 participants were included in this session, representing 8.2 percent of the sample. The kappa score for intra-examiner reliability ranged from 0.86 to 0.91 for oral examination, 0.74 to 0.82 for questionnaire, and 0.72 to 0.78 for OIDP index. In this study, the kappa statistics were good to excellent reliability (Kirkwood and Sterne 2003).

5.3.6 Data entry, verification, cleaning and consistency checks

Data were cleaned and verified in two stages.

a. All clinical and questionnaire forms were checked daily by the examiners and the interviewers after the survey. It was to ensure that every question

was completed and all the answers had been filled in correctly. Any unclear or missing data were discussed with the surveyors.

b. At the data entry stage all forms were entered by one secretary and crosschecked by the other. Any inconsistency between entries was corrected.

The document with guidelines for the review of oral examination forms (Appendix 14) was designed to assist the examiners and the interviewers.

The clinical data were firstly entered into FOXPROX programme and then the file was transformed for Statistical Package for Social Sciences (SPSS) version 10. The questionnaire data were entered directly into the SPSS version 10. The manual for data handling (Appendix 15) was made to be used by the recorder.

5.4 Data analysis

Adults can be separated into the edentate and the dentate in the analysis but in this study there was only one edentate person. The analysis was therefore processed excluding the edentate and the number of sample was 1029 in final.

SPSS version 13.0 for Windows and STATA version 8 were used for the analysis of data in this sample. The cut-off level for statistical significance is usually taken at 0.05 (Altman 1994) and that was applied to the most of the data in this study. However, especially in the comparison between Normative Needs (NN) and Impact-Related Needs (IRN)/ Propensity-Related Needs (PRN) the 0.01 level of significance was applied because those comparisons need to be more rigorously tested and show clear differences.

The variables and categories are listed below:

5.4.1 Demographic information

Age, sex, education and income level were selected as demographic factors related with analysis and the followings are the levels within each category.

5.4.1.1 Age

As following National Survey categorisation, the age was grouped into:

1) 30 to 34 years;
2) 35 to 44 years;
3) 45 to 54 years; and
4) 55 to 64 years.

5.4.1.2 Sex

1) Male; and
2) Female

5.4.1.3 Educational level

It is compulsory to finish elementary and middle school in Korea (Article 8 in Education Act). Free education up to middle school introduced recently in 1985. So educational levels were re-grouped into:

1) Having completed elementary school;
2) Having completed middle school; and

3) Having completed high school and over

5.4.1.4 Income level

The living cost of a single worker was surveyed by Ministry of Labour in Korea and it was 1,025,143 won on October 2004 (Minimum Wage Council in Korea 2006). So the income levels were re-grouped into:

1) Below 1,000,000 won; and

2) 1,000,000 and over.

5.4.2 Normative oral health status, by demographic information

The number of natural teeth, the DMFT score, and the number of sextant with CPI were examined and they were not normally distributed. As a result non-parametric tests were used to compare the means between different groups: 1) Kruskal-Wallis test for age and education; and 2) Mann and Whitney test for the gender and income. The distribution of normative oral health status among different categories of sociodemographic variables was analysed by chi-square.

5.4.2.1 The number of permanent natural teeth

The numbers of missing teeth were subtracted from the total number of teeth per person, 32, to calculate the number of permanent natural teeth.

5.4.2.2 The caries experience using DMFT index and it's separate components

The caries experience was examined with the index of DMFT (Decayed, Missing, and Filled Teeth). One tooth has four to five surfaces and each surface was recorded as decayed (D component), missing (M component), or filled (F component). The record of surfaces were converted into the unit of teeth and then summed up for the DMFT index.

5.4.2.3 Normative prosthetic status

Prosthetic status in upper and lower jaw were examined as follows: 1) no prosthesis (PS 0); 2) bridge (PS 1); 3) more than one bridge (PS 2); 4) partial denture (PS 3); 5) both bridge(s) and partial denture(s) (PS 4); and 5) full removable denture (PS 5).

5.4.2.4 Normative periodontal status, CPI (Community Periodontal Index) (World Health Organisation 1997)

The sextant was used as a unit to record the status of periodontal condition. One jaw divided into three sextants and each person has two jaws. In total the number of sextants was six in one person. Each sextant had a CPI (Community Periodontal Index) scored from 0 to 5. The last score, 5, was ruled out in the analysis because it means the excluded sextant with less than 2 index teeth.

5.4.3 Subjective oral health measures: overall results

The distribution of the subjective oral health measures between different categories of sociodemographic variables was analysed by chi-square and chi-square for trend.

5.4.3.1 Perceived oral health condition

The answer of perceived oral health condition was regrouped into 'yes (healthy)' or 'no (not healthy)': 1) yes for (1) very good, (2) good, and (3) fair grouped; and 2) no for (4) poor and (5) very poor.

5.4.3.2 Perceived need for dental treatment

The answer 'don't know' was regarded as missing variables and then only 'yes' and 'no' were used for analysis.

5.4.3.3 Evaluation of Oral Impact on Daily Performance (OIDP) psychometric properties

5.4.3.3.1 Reliability

Internal reliability of OIDP score for 10 performances was tested by: 1) inter-items correlation; and 2) corrected item-total correlation, alpha, standardised alpha and alpha if item deleted (Bowling 1995).

5.4.3.3.2 Validity

There are various validity tests. Face validity refers to whether the indicator, on the face of it, a reasonable one – do the items appear to be measuring the variables they claim to measure and the meaning and relevance of the indicator self-evident. With content validity each item falls into at least one of the content areas being tapped. It measures whether the components of the scale or item cover all aspects of the attribute to be measured or the content of the variable match the name which it has

been given (Bowling 1997b). Face and content validity were tested in the pilot study with regard to content, wording, scoring method, and easy or appropriate administration. The criterion validity is defined as the correlation of a scale with some other measure of the trait under study, ideally a 'gold standard' and the construct validity as probably important approach to validity (MacDowell and Newell 1987). The data related with perceived need for dental treatment was used for criterion validity test of OIDP index and satisfaction with oral health status and perceived oral health conditions for the construct test (Streiner and Norman 1998). The OIDP scores were not normally distributed and the following tests used for the analysing the relationship between OIDP scores and subjective questions: 1) Mann and Whitney test for perceived need for dental treatment (yes/ no) and perceived oral health conditions (poor/ good); and 2) Kruskal-Wallis test for satisfaction with oral health status (not at all satisfied/ not satisfied/ satisfied).

5.4.3.4 Distribution of OIDP index

The relationship between Oral Impacts on Daily Performance (OIDP) in a binary format and sociodemographic factors were analysed by chi-square and chi-square for trend tests. The distribution of percentage in each positive performance was displayed.

5.4.4 Categorisation of propensity levels

The study analysed general results of five main oral heath behaviours as propensity factors that have strong influence on oral health and treatment outcomes. The propensity levels were divided into poor or good as follows:

5.4.4.1 Tooth cleaning habits

At least two times per day is considered a good habit (Hausen et al. 2000) and irregular daily brushing was graded as poor habit for oral hygiene (Vanobbergen et al. 2001a; Taani et al. 2003). The toothbrushing habit was divided into: 1) poor, once or less a day; and 2) good, twice or more a day.

5.4.4.2 Use of fluoride toothpaste

According to the results shown in numerous systemic reviews (Marinho et al. 2003a; Marinho et al. 2003b; Marinho et al. 2004a; Marinho et al. 2004b) the people using fluoride toothpaste were graded as a good habitual group and the people not using it as poor group.

5.4.4.3 Sugary food and drinks consumption habit

There are two different sources of data about sugary food and drinks from this survey: a) lists of sugary food; and b) frequency of consumption. In the analysis 1) cookies, cake, and candy, 2) processed fruit (i.e. canned fruit), and 3) beverages (including soft drinks and juice) are used from the list of types of snack and soft drinks. High risk group for dental caries differentiated from low risk group in the frequency of sugars consumption; two or more a day (Vanobbergen et al. 2001a; Vanobbergen et al. 2001b) or three and more times (Faculty of Dental Surgery 1997; Sheiham 2001; Moynihan 2002). In this study the diet propensity group was divided into: 1) poor, 2 or more times a day; and 2) good, 0-1 times a day.

5.4.4.4 Dental Attendance Patterns

Most studies divide the groups into those visiting dentists only when having trouble or pain from the others in analysis (Sheiham et al. 1985; Todd and Lader 1991; Murray 1996; Bullock et al. 2001; Richards and Ameen 2002). In this study, attendance was graded as: 1) poor, only when trouble/pain; and 2) good, an occasional or regular check up.

5.4.4.5 Smoking habits

Several studies showed that there is a relation between smoking and the severity of periodontal disease and effectiveness of therapy (Bergstrom and Preber 1994; Ah et al. 1994; Martinez-Canut et al. 1995; Kinane and Chestnutt 2000; Winn 2001; Calsina et al. 2002; Reibel 2003; Petersen 2003; Do et al. 2003; Garcia 2005). Based on those research, the groups for smoking were divided into: 1) poor, smoker; and 2) good, non-smoker.

Table 5.1 Categorisation of propensity factors related to treatment needs

Propensity factors	**Propensity levels**	
	Poor	**Good**
1 Frequency of toothbrushing per day	Once or less a day	Twice or more a day
2 The use of fluoride toothpaste	No	Yes
3 Frequency of sugary intakes per day	2 or more	0-1
4 Pattern of dental attendance	Only when have trouble or pain / don't go	An occasional or regular check up
5 Smoking (currently)	Smoker	Non-smoker

5.4.5 Normative oral health treatment needs (NN), by demographic information

The number of normative needs for dental restorations (RN, tooth unit) and periodontal treatment (CPN, sextant unit) were examined and they were not normally distributed. As a result non-parametric tests were used to compare the

means between different groupings: 1) Kruskal-Wallis test for age and education groups; and 2) Mann and Whitney test for the gender and income groups. There is a point to be clear in this conversion that the treatment need in CPN 1 is the person unit rather than the sextant which is used for the CPN 2, 3, and 4. The chi-square and chi-square for trend tests were used for the analysis of CPN 1 with above reason rather than mean comparison. The distribution of normative needs for prosthetic treatment was analysed by chi-square with demographic variables.

5.4.5.1 Normative needs for dental restorations

Six different dental needs for restoration were summarised as follows: 1) one surface restoration (RN 1); 2) two or more surface restorations (RN 2); 3) crown for any reason (RN 3); 4) total filling combined one, two or more surface restorations, and crown (RN 4); 5) pulp care and restoration (RN 5); and 6) extraction (RN 6).

5.4.5.2 Normative needs for prosthetic treatment

Prosthetic treatment needs in upper and lower jaw were examined as follows: 1) no prosthesis needed (PN 0); 2) need for one-unit prosthesis (one tooth replacement) (PN 1); 3) need for multi-unit prosthesis (more than one tooth replacement) (PN 2); 4) need for a combination of one- and/or multi-unit prostheses (PN 3); and 4) need for full prostheses (replacement of all teeth) (PN 4).

5.4.5.3 Normative needs for periodontal treatment

The periodontal condition expressed as CPI score indicates the treatment needs and so the CPI was able to convert into CPN which gives the periodontal treatment need. The conversions for each score are as follows: 1) CPN 1 as Oral Hygiene Instruction (OHI) which has a prospect to be given to all the people who have at

least CPI 1 in one or more than one sextants. It means that if the lowest score of CPI in six sextants is one, the person needs to receive some instruction for controlling dental plaque; 2) CPI 2 into CPN 2 as scaling; 3) CPI 3 into CPN 3 as scaling and root planing; 4) CPI 4 into CPN 4 as scaling, root planing, and surgical procedure (complex treatment).

The CPN 1 as an Oral Hygiene Instruction (OHI) needs to differentiate from Dental Health Education (DHE) or Oral Health Promotion (OHP) which is given to the people with low propensity. Dental Health Education has traditionally concentrated on improving oral health through learning activities directed at promoting individual behaviour change, primarily through the acquisition of oral health knowledge (Watt et al. 2001). 'Oral Health Promotion is about making healthy choices easier choices' (Watt and Fuller 1999). It is a combination of Ottawa Charter's five different strategies (World Health Organisation 1987): creating supportive environments; building healthy public policies; strengthening community action; developing personal skills; and reorienting health services. Both of DHE and OHP are a type of tools to improve oral health but the latter aims to the population level. Oral Hygiene Instruction (OHI) works on individual level in clinical settings focused on hygiene behaviour. It describes 'the use of a mechanical toothbrush in addition to a single professional oral prophylaxis provided at baseline' (van der Weijden and Hioe 2005; Lang et al. 2005).

5.4.6 The relationship between normative and subjective oral health measures

The relationship between normative and subjective oral health measures was analysed by chi-square test.

- Normative oral health measures and perceived oral health condition
- Normative oral health measures and perceived need for dental treatment
- Normative oral health measures and Oral Impacts on Daily Performance (OIDP)

5.4.7 The relationship between normative oral health measures and propensity factors

The relationship between normative oral health measures and propensity factors was analysed by chi-square test.

- Normative oral health measures and frequency of toothbrushing per day
- Normative oral health measures and use of fluoride toothpaste
- Normative oral health measures and frequency of taking sugary snack per day
- Normative oral health measures and pattern of dental attendance
- Normative oral health measures and smoking

5.4.8 Impact-Related Treatment Need (IRN)

5.4.8.1 Impact-Related Treatment Needs (IRN) using Condition Specific OIDP (CS–OIDP): In relation to Specific Types of Dental Treatment

Several conditions related with each treatment need were chosen, based on the previous studies of Srisilapanan et al. (1997; 2001; 2003) and Gherunpong (2004) and the opinions from some experts in sociodental needs and clinics. Table 5.2 shows the indications for treatments. After deciding specific conditions, each OIDP score was summed up for CS-OIDP and then the sum was divided by total score, 250 (Appendix 16). The zero was the borderline score to separate no impact group from the people with Impact-Related Need.

Three kinds of treatment are discussed in Chapter 7 on the Normative treatment Need (NN). Among these only two types of treatment, prosthetic and periodontal

treatments, will be presented in Chapter 8, Impact-Related Need (IRN). Restorative treatment need is excluded because it is unnecessary to consider oral impacts and most of restorative treatment is from dental caries – a progressive condition for which IRN is not assessed. Even though the people do not have any impact on their daily life, such as pain with dental fillings, restorative treatment will be carried out. That is why only two types of treatment, prosthetics and periodontal therapy are discussed in the section of IRN.

The number of people used in the modelling calculation was 1000 instead of the 1029 in the sample. To do that, 1029 was converted to a percentage to make extrapolations to general population easier. As we shall see in the final results the numbers of dentists per 100,000 people were calculated. So using 1000s was more appropriate.

Table 5.2 Perceived impairments and perceived dental treatment need relating to specific types of dental treatment

Specific dental treatment	**Code**	**Possible perceived impairments/ perceived dental treatment needs**
Prosthesis (PN)	5	Tooth loss
	18	Defective filling or crown
	19	Loose ill fitting denture
Oral hygiene instruction (OHI) (CPN 1)	10	Bleeding gums
	11	Swollen gums, gum abscess
	12	Receding gums, periodontal disease
	15	Bad breath
Scaling (CPN 2)	10	Bleeding gums
	11	Swollen gums, gum abscess
	12	Receding gums, periodontal disease
	13	Calculus*
	15	Bad breath
Scaling + Root planning (CPN 3)/ Scaling + Root planning + periodontal surgery (CPN 4)	6	Loose tooth**
	10	Bleeding gums
	11	Swollen gums, gum abscess
	12	Receding gums, periodontal disease
	13	Calculus*
	15	Bad breath

* Added condition for CPN 2
** Added condition for CPN 3

5.4.8.2 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN): For Specific Types of Treatment

The Impact-Related Needs (IRN) will be compared with the Normative Needs (NN) for each type of treatment. McNemar test for paired binary outcomes is used in the comparison of the prosthetic and periodontal need per person and Wilcoxon signed ranks test for paired continuous outcomes with nonparametric distribution in the comparison of the sextant number per person.

5.4.8.3 The data for the timing of treatments

The timings of dental treatment are from the researches in Korean and Ontario Dental Associations (Kim et al. 1996; Ontario Dental Association 2001). Both studies have been based on Resource Based Relative Value Scale (RBRVS), developed by Hsiao et al (1987; 1988a; 1988b) as a measure of relative levels of resource input expended by physicians to produce services and procedures. This method has been used to assess the fee based on the physicians work load.

Four major dimensions of a physician's work are considered for the RBRVS process: 1) time; 2) mental effort and judgement; 3) technical skill and physical effort; and 4) psychological stress. The time was measured as actual timing for health service and the other three items about the intensity, called responsibility, were the scales of magnitude estimation. Average time factors (where established) are assigned to each dental service. These services are then classified into groups, according to the degree of responsibility involved and a responsibility factor is then assigned to each group. Multiplication of the pertinent time and responsibility factors yields a relative value for each service.

The data shown below are from Korea and Ontario studies about timings for treatment (Table 5.3). In case of periodontal treatment need, one specific practice is selected for the calculation of CPN 4, periodontal surgical procedure. The

periodontal flap operation was adapted to this method because it is one of the most simple and common practice in clinics.

Table 5.3 Timings for the different types of treatment from the study of Ontario Dental Association (ODA) and Korean studies (unit: mins)

Type of treatment			**Mean**
RN[a]	Amalgam, non-bonded, permanent bicuspids and anteriors	One surface	15.00
		Two surfaces	26.25
	Amalgam, non-bonded, permanent molars	One surface	18.75
		Two surfaces	30.00
	Crown, full, cast metal		135.00
	Pulp care treatment	One canal	120.00
		Two canals	150.00
		Three canals	195.00
		Four canals	225.00
	Extraction, erupted teeth, uncomplicated		15.00
PN[a]	Pontic, acrylic/composite/compomer, bonded to adjacent teeth direct		30.00
	Dentures, Partial, Tooth-Borne, Cast Frame/ connector, Clasps and Rests	Maxillary	195.00
		Mandibular	195.00
	Dentures, Complete, Standard	Maxillary	165.00
		Mandibular	210.00
CPN[b]	Oral Hygiene Instruction (OHI)[c]		7.18
	Scaling	Supra and subgingival in total[c]	61.09
	Root planing	Anterior teeth[d]	27.48
		Posterior teeth[d]	36.63
	Surgical procedures[e]	Anterior teeth[d]	56.95
		Posterior teeth[d]	70.42

RN Restorative treatment Needs
PN Prosthetic treatment Needs
CPN Periodontal treatment Needs
a Ontario Dental Association (Ontario Dental Association 2001)
b Korean study (Kim et al. 1996)
c Per person
d Per sextant
e Especially periodontal flap operation

5.4.8.4 The application of comparison of Normative Needs (NN) and Impact-Related Needs (IRN) to workforce planning: For Specific Types of Treatment

After applying the working times for each type of treatment, the total timings of NN and IRN were tested by the Wilcoxon signed rank test which is used for paired continuous outcomes with nonparametric distribution.

These times were converted into number of dentists per 100,000 people to illustrate the workforce needed. First of all, treatment timings for 100,000 people (Mo) were calculated through the ratio with total minutes from survey samples (Ms). Secondly, total working hours per year per dentist (Hy) were applied in 3 different ways suggested by a joint WHO/FDI working group (World Health Organisation 1989). They assumed that a dentist worked 2,000, 1,500, or 1,000 hours a year. Then it transforms into minutes per year (My) by multiply 60 to the hours worked. If a dentist works these minutes per year (My), we can get the number of dentists required per 100,000 people (Nd) from the ratio of total minutes for these people (Mo) at last.

1st:	Ns : Ms = 100,000 : Mo	$Mo = \frac{Ms \times 100{,}000}{Ns}$
2nd:	My = Hy × 60	Hy = 2000, 1500, or 1000
3rd:	My : 1 = Mo : Nd	$Nd = \frac{Mo}{My} = \frac{Ms \times 100{,}000}{Hy \times 60 \times Ns}$

Ns: Number of sample
Ms: Minutes for treatment in sample
Hy: Hours of a dentist working per year
Mo: Minutes for treatment in 100,000
Nd: Number of dentists per 100,000 people
My: Minutes of a dentist working per year

5.4.9 Propensity-Related Treatment Need (PRN)

Some of the treatments such as one or two and more surface restoration and extraction which are discussed in Chapter 7 on the Normative treatment Needs (NN) are excluded in Chapter 9, Propensity-Related Need (PRN) because it is not

appropriate to consider oral health behaviour for this treatment. Even though the people do not have proper propensity related with these treatments, they will be considered as in need. That is why only limited types of restorative treatments are discussed in the section of PRN.

There are two models in the periodontal treatment needs: One model starts from Normative Needs (NN) and did not included Impact-Related Needs (IRN); and the other included Impact-Related Needs (IRN). Two models are presented to give the options to select with different assumptions whether they take into account the impact from dental conditions.

The number of people used in the modelling calculation was 1000 instead of the 1029 in the sample. To do that, 1029 was converted to a percentage to make extrapolations to general population easier. As we shall see in the final results the numbers of dentists per 100,000 people were calculated. So using 1000s was more appropriate.

5.4.9.1 Treatment-Specific propensity factors: Frequency of toothbrushing per day

Appropriate propensity factors based on previous studies (Srisilapanan 1997; Gherunpong 2004; Gherunpong et al. 2006b) were applied for each type of treatments. In this study, frequency of toothbrushing per day was selected as a measure of the propensity factor which affects outcome of dental treatments, especially restorative, prosthetic, and periodontal treatments.

5.4.9.2 Comparison of Normative Needs (NN) and Propensity-Related Needs (PRN): For Specific Types of Treatment

Propensity-Related Needs (PRN) were compared with Normative Needs (NN) for each type of treatment. McNemar test for paired binary outcomes was used in the

comparison of the prosthetic and periodontal need per person, Wilcoxon signed ranks test for paired continuous outcomes with nonparametric distribution in the comparison of the number sextant per person.

5.4.9.3 The application of comparison in Normative Needs (NN) and Propensity-related Needs (PRN) to workforce planning: For Specific Types of Treatment

After applying the working times for each type of treatment, the total timings with NN and PRN were compared with the Wilcoxon signed rank test which is used for paired continuous outcomes with nonparametric distribution.

Total timings were converted into number of dentists per 100,000 people to illustrate the size of differences between NN and PRN. The calculation procedures are the same as those with Impact-Related Needs (IRN).

CHAPTER 6

Descriptive Results

CHAPTER 6. DESCRIPTIVE RESULTS: INFORMATION ON SAMPLES AND RELATED FACTORS

This chapter presents the sociodemographic information and related factors for assessing sociodental treatment needs of the study sample; subjective measures, such as oral impact on daily performance (OIDP), perceived oral health status, and perceived treatment needs; and oral health behaviour as propensity factors.

6.1 Socio-demographic information of the sample

Among the 1030 participants, 1029 people were included in this analysis (1 edentulous person was excluded). The sociodemographic distribution of the 1029 sample is shown in Table 6.1. The age group of 35-44 year-olds was slightly higher proportion than the other age groups. There were slightly more males than females. Most participants had finished high school (77.0%) and earned 1,000,000 won or more which is minimum living cost (77.6%). Labourer was the most common occupation (36.9%). Nearly all of the participants had health insurance programme (99.9%).

The relationships of age and sex with education and income are analysed in detail (Table 6.2). Both education and income showed clear difference according to the age and sex ($p<0.001$). Younger people were more likely to have higher education than older people; 96.6% in the group of aged 30 to 34 years finished high school and higher education, respectively 30.1% in the group aged 55 to 64 years. Also the income level showed significant difference by age; 96.2% of the youngest earned 1,000,000 won per month, compared with 43.4% of the older aged 55 to 64 years did. Women were less likely to have finished high school and higher education and to have higher income compare to men: slightly more than half of the women (59.4%) finished high school and higher education compared to the men who did

three quarters of the them (73.6%). 66.9% of women and 86.7% of men earned 1,000,000 won and more every month.

Table 6.1 Distribution of total sample by age, sex, education, income, occupation and National Health Insurance (N=1029)

Demographic information		**Frequency**	**Percent**
Total		1029	100.0
Age	30-34 years	263	25.6
	35-44 years	335	32.5
	45-54 years	254	24.7
	55-64 years	177	17.2
Sex	Male	551	53.5
	Female	478	46.5
Education	No response	6	
	Elementary School	142	13.9
	Middle School	195	19.1
	High School and over	686	77.0
Income	No response	22	
	Below 1,000,000 won	226	22.4
	1,000,000 won and over	781	77.6
Occupation	No response	30	
	Professional (non-manual)	170	17.0
	Desk worker	62	6.2
	Sales and service	38	3.8
	Agricultural	46	4.6
	Labourer (manual)	368	36.9
	Unemployed	51	5.1
	Housewife	264	26.4
National Health Insurance (NHI)	No response	11	
	Labour NHI	693	68.1
	Regional NHI	259	25.4
	National Medical Aid	65	6.4
	No insurance	1	0.1

Table 6.2 Cross-tab of education and income by age and sex (N=1029)

			Education [c]			Income (1,000 won) [d]	
			Elementary	Middle	High +	< 1,000	≥1,000
Age [a]	30-34	N	0	9	253	10	251
		%	0.0	3.4	96.6	3.8	96.2
	35-44	N	11	47	276	47	277
		%	3.3	14.1	82.6	14.5	85.5
	45-54	N	52	95	104	70	177
		%	20.7	37.8	41.4	28.3	71.7
	55-64	N	79	44	53	99	76
		%	44.9	25.0	30.1	56.6	43.4
Sex [b]	Male	N	44	101	405	72	470
		%	8.0	18.4	73.6	13.3	86.7
	Female	N	98	94	281	154	311
		%	20.7	19.9	59.4	33.1	66.9
* chi^2 (for trend)			a*c	a*d	b*c	b*d	
p value			**<0.001**	**<0.001**	**<0.001**	**<0.001**	

6.2 Normative oral health status: overall results

6.2.1 The number of permanent natural teeth

The total mean number of natural teeth was 27.1 ± 4.31 (95% CI = 26.81 to 27.34) (Table 6.3). The tests showed statistically significant differences between number of teeth and all demographic information groupings ($p<0.001$). There was a reverse association between age groups and the number of permanent natural teeth. There was little difference between genders but the difference was statistically significant. The number of natural teeth showed a linear relationship with education and income; higher education and income level showed higher number of natural teeth.

Table 6.3 The number of permanent natural teeth of the dentate sample, by demographic variables (N=1029)

The number of permanent natural teeth		**N**	**Mean**	**(SD)**	**95% C. I.**	
					Upper	**Lower**
Total sample		1029	27.1	(4.31)	26.81	27.34
Age[a]	30-34	263	28.8	(1.81)	28.59	29.03
	35-44	335	28.1	(2.74)	27.83	28.41
	45-54	254	26.7	(4.06)	26.16	27.16
	55-64	177	23.1	(6.57)	22.14	24.09
Sex[b]	Male	551	27.7	(3.50)	27.41	28.00
	Female	478	26.4	(4.99)	25.90	26.80
Education[a]	Elementary School	142	22.9	(6.77)	21.61	23.90
	Middle School	195	26.5	(4.33)	25.76	27.01
	High School and over	686	28.2	(2.68)	27.97	28.38
Income[b] (1,000 won)	Under 1,000	226	24.6	(6.20)	23.98	25.59
	1,000 and over	781	27.8	(3.31)	27.51	27.98

* a Kruskal-Wallis test **$p < 0.001$**
b Mann-Whitney test **$p < 0.001$**

6.2.2 Caries experience; DMFT index and its separate components

Overall the mean DMFT score in this sample was 7.6 (SD: 5.40) (95% CI: 7.29 to 7.95) (Table 6.4). There were statistically significant relationship between the DMFT and demographic groups ($p<0.001$). The 30-34 and 35-44 years had quite similar means. The 55-64 year-old group had a slightly higher average score than the others. Females had higher score than males. Education levels showed downward linear trends for the DMFT index; higher education group had lower DMFT. The income group showed similar trend with education; higher income had lower DMFT mean.

Table 6.4 The caries experience (DMFT) of the total sample, by demographic variables (N=1029)

DMFT		N	Mean	(SD)	95% C. I.	
					Upper	Lower
Total sample		1029	7.6	(5.40)	7.29	7.95
Age[a]	30-34	263	6.7	(4.23)	6.20	7.23
	35-44	335	6.4	(4.43)	5.95	6.90
	45-54	254	7.7	(4.98)	7.07	8.30
	55-64	177	11.2	(7.38)	10.06	12.25
Sex[b]	Male	551	6.2	(4.68)	5.81	6.59
	Female	478	9.3	(5.72)	8.75	9.78
Education[a]	Elementary School	142	11.2	(7.33)	10.06	12.53
	Middle School	195	8.1	(5.63)	7.40	9.03
	High School and over	686	6.7	(4.36)	6.34	7.00
Income[b]	Under 1,000	226	10.1	(6.99)	8.98	10.80
(1,000 won)	1,000 and over	781	6.9	(4.64)	6.62	7.27

* a Kruskal-Wallis test **$p < 0.001$**
b Mann-Whitney test **$p < 0.001$**

Comparison of the DT, MT, and FT, with those of DMFT index showed the greater contribution made by the category 'missing teeth' among adults. Overall the mean number of teeth with decay was 1.30 (Table 6.5). There was an overall decline with age in the mean number of decayed teeth but increase in missing teeth ($p<0.001$). Women had twice levels of missing teeth than men. Filled teeth were more prevalent among women than men ($p<0.001$). The difference in the mean number of missing teeth between education and income groups was large ($p<0.05$). The average number of missing teeth decreased steadily with higher education and income level but increased for decayed teeth ($p=0.096$).

Table 6.5 Mean DMFT, DT, MT and FT, by demographic variables (N=1029)

Separate components of DMFT			**DT**	**MT**	**FT**
Total		Mean	1.30	3.45	2.88
		(SD)	(1.82)	(4.44)	(3.22)
Age[a]	30-34	Mean	1.82	1.65	3.24
		(SD)	(2.06)	(1.71)	(3.56)
	35-44	Mean	1.35	2.30	2.78
		(SD)	(1.76)	(2.79)	(3.15)
	45-54	Mean	1.07	4.00	2.61
		(SD)	(1.66)	(4.12)	(3.01)
	55-64	Mean	0.75	7.51	2.90
		(SD)	(1.53)	(6.86)	(3.06)
Sex[b]	Male	Mean	1.25	2.86	2.09
		(SD)	(1.81)	(3.57)	(2.76)
	Female	Mean	1.36	4.13	3.78
		(SD)	(1.83)	(5.18)	(3.46)
Education[c]	Elementary School	Mean	0.89	7.63	2.63
		(SD)	(1.63)	(7.15)	(2.96)
	Middle School	Mean	1.21	4.21	2.71
		(SD)	(1.96)	(4.47)	(3.01)
	High School and over	Mean	1.41	2.31	2.95
		(SD)	(1.79)	(2.71)	(3.31)
Income[d] (1,000 won)	Under 1,000	Mean	1.12	6.08	2.86
		(SD)	(1.79)	(6.47)	(3.12)
	1,000 and over	Mean	1.33	2.73	2.88
		(SD)	(1.81)	(3.32)	(3.25)

* a	Kruskal-Wallis Test	**DT, MT**	**p<0.001**	FT	p=0.305
b	Mann-Whitney Test	**MT, FT**	**p<0.001**	DT	p=0.333
c	Kruskal-Wallis Test	**DT, MT**	**p<0.001**	FT	p=0.893
d	Mann-Whitney Test	**DT, MT**	**p<0.050**	FT	p=0.626

6.2.3 Normative prosthetic status

Three quarters of the participants belonged to none prosthetic status group: 76.5% in upper jaw and 73.9% in lower jaw (Table 6.6 and Table 6.7). Most frequent type of the prosthesis was a bridge: upper prosthesis (PSU1), 14.0%; and lower prosthesis (PSL1), 14.5%. More than one bridge (PS2) was the second most frequent type of prosthetics; the percentages of them were 5.5% in upper jaw and 6.9% in lower jaw. The people who have one and more bridges were more than twenty per cent in this sample. The numbers of people who had quite severe types of prosthetics were relatively small: the percentages of the people who had partial

denture only were 1.7% in upper and 2.9% in lower jaw; partial denture(s) and bridge(s) showed similar pattern; even smaller number of people had full denture; seven (0.7%) in upper jaw and two (0.2%) in lower jaw among 1029 people of this sample. All of the demographic information showed statistical significance for the distribution of prosthetics status; the older, female, less educated, and less incomer were more likely to have complicated prosthesis.

Table 6.6 Percentage of people with different types of prosthesis in upper jaw, by demographic variables (N=1029)

Types of Prosthesis			**PSU 0**	**PSU 1**	**PSU 2**	**PSU 3**	**PSU 4**	**PSU 5**
Total		N	787	144	57	17	17	7
		%	76.5	14.0	5.5	1.7	1.7	0.7
Age[a]	30-34	N	240	21	2	0	0	0
		%	91.3	8.0	0.8	0.0	0.0	0.0
	35-44	N	291	29	12	0	3	0
		%	86.9	8.7	3.6	0.0	0.9	0.0
	45-54	N	170	56	18	1	7	2
		%	66.9	22.0	7.1	0.4	2.8	0.8
	55-64	N	86	38	25	16	7	5
		%	48.6	21.5	14.1	9.0	4.0	2.8
Sex[b]	Male	N	437	76	23	4	8	3
		%	79.3	13.8	4.2	0.7	1.5	0.5
	Female	N	350	68	34	13	9	4
		%	73.2	14.2	7.1	2.7	1.9	0.8
Education[c]	Elementary School	N	68	34	17	10	8	5
		%	47.9	23.9	12.0	7.0	5.6	3.5
	Middle School	N	132	36	15	4	7	1
		%	67.7	18.5	7.7	2.1	3.6	0.5
	High School and over	N	583	73	25	2	2	1
		%	85.0	10.6	3.6	0.3	0.3	0.1
Income[d] (1,000 won)	Under 1,000	N	137	43	21	13	7	5
		%	60.6	19.0	9.3	5.8	3.1	2.2
	1,000 and over	N	633	97	35	4	10	2
		%	81.0	12.4	4.5	0.5	1.3	0.3

* chi^2 **a p<0.001 b p=0.034 c p<0.001 d p<0.001**

Table 6.7 Percentage of people with different types of prosthesis in lower jaw, by demographic variables (N=1029)

Types of Prosthesis			PSL 0	PSL 1	PSL 2	PSL 3	PSL 4	PSL 5
Total		N	760	149	71	30	17	2
		%	73.9	14.5	6.9	2.9	1.7	0.2
Age[a]	30-34	N	232	22	8	0	1	0
		%	88.2	8.4	3.0	0.0	0.4	0.0
	35-44	N	270	41	20	2	2	0
		%	80.6	12.2	6.0	0.6	0.6	0.0
	45-54	N	173	44	24	7	5	1
		%	68.1	17.3	9.4	2.8	2.0	0.4
	55-64	N	85	42	19	21	9	1
		%	48.0	23.7	10.7	11.9	5.1	0.6
Sex[b]	Male	N	433	72	31	11	4	0
		%	78.6	13.1	5.6	2.0	0.7	0.0
	Female	N	327	77	40	19	13	2
		%	68.4	16.1	8.4	4.0	2.7	0.4
Education[c]	Elementary School	N	67	34	14	15	10	2
		%	47.2	23.9	9.9	10.6	7.0	1.4
	Middle School	N	135	28	20	9	3	0
		%	69.2	14.4	10.3	4.6	1.5	0.0
	High School and over	N	554	87	37	4	4	0
		%	80.8	12.7	5.4	0.6	0.6	0.0
Income[d] (1,000 won)	Under 1,000	N	134	42	23	19	6	2
		%	59.3	18.6	10.2	8.4	2.7	0.9
	1,000 and over	N	606	106	48	11	10	0
		%	77.6	13.6	6.1	1.4	1.3	0.0

* chi ^{2} **a p<0.001 b p=0.001 c p<0.001 d p<0.001**

6.2.4 Normative periodontal status, CPI (Community Periodontal Index)

An average of 4.32 sextants was healthy without any pathological condition (Table 6.8). Healthy gingiva, CPI 0, was showing significantly different pattern with all sociodemographic variables; the younger, female, higher education, or higher income had much higher number of healthy sextant. There was no statistically significant difference for CPI 1 which was bleeding in gingiva during examination with demographic distribution. Only the age group showed statistical significance but the pattern was not logical. Calculus (CPI 2) and 4-5 mm shallow pockets (CPI 3) showed significant patterns as expected direction with sociodemographic

information, apart from income where there is no significance: the older adults had more sextants with pathological periodontal status; men were more likely to have periodontal pathology than women; and adults with lower education were more likely to have gingival bleeding, calculus, and shallow periodontal pockets than those with lower education ($p<0.05$). No statistical difference was found between all demographic information and 6mm or more deep pocket (CPI 4) as there were very few people with that periodontal condition.

Table 6.8 Mean number of sextants by CPI levels, by demographic variables (N=1029)

The CPI score			**CPI 0**	**CPI 1**	**CPI 2**	**CPI 3**	**CPI 4**
Total		Mean	4.32	0.41	0.70	0.35	0.02
		(SD)	(1.91)	(1.13)	(0.95)	(1.01)	(0.24)
Age[a]	30-34	Mean	5.01	0.38	0.53	0.08	0.01
		(SD)	(1.50)	(1.22)	(0.73)	(0.50)	(0.09)
	35-44	Mean	4.64	0.33	0.67	0.31	0.01
		(SD)	(1.68)	(1.03)	(0.83)	(1.00)	(0.12)
	45-54	Mean	4.02	0.44	0.78	0.54	0.03
		(SD)	(1.96)	(1.08)	(1.06)	(1.16)	(0.29)
	55-64	Mean	3.14	0.55	0.92	0.58	0.06
		(SD)	(2.18)	(1.25)	(1.22)	(1.23)	(0.42)
Sex[b]	Male	Mean	4.23	0.41	0.72	0.48	0.03
		(SD)	(1.91)	(1.13)	(0.91)	(1.14)	(0.31)
	Female	Mean	4.44	0.38	0.68	0.21	0.01
		(SD)	(1.90)	(1.11)	(1.00)	(0.80)	(0.11)
Education[c]	Elementary School	Mean	3.22	0.51	0.89	0.61	0.03
		(SD)	(2.24)	(1.21)	(1.21)	(1.35)	(0.27)
	Middle School	Mean	4.04	0.44	0.78	0.50	0.01
		(SD)	(1.91)	(1.11)	(1.02)	(1.08)	(0.14)
	High School and over	Mean	4.65	0.38	0.64	0.26	0.02
		(SD)	(1.72)	(1.13)	(0.84)	(0.89)	(0.26)
Income[d] (1,000 won)	Under 1,000	Mean	3.87	0.37	0.81	0.38	0.04
		(SD)	(2.15)	(1.02)	(1.22)	(0.98)	(0.34)
	1,000 and over	Mean	4.46	0.43	0.65	0.35	0.02
		(SD)	(1.82)	(1.18)	(0.82)	(1.03)	(0.21)

* a	Kruskal-Wallis Test	**cpi0, 1, 2, 3 p<0.01**		cpi4 p=0.134
b	Mann-Whitney Test	**cpi0, 2, 3 p<0.05**	cpi1 p=0.489	cpi4 p=0.133
c	Kruskal-Wallis Test	**cpi0, 2, 3 p<0.05**	cpi1 p=0.099	cpi4 p=0.634
d	Mann-Whitney Test	**cpi0 p< 0.001**	cpi1, 2, 3, 4 p> 0.250	

6.3 Subjective oral health measures: overall results

6.3.1 Perceived oral health condition

There were significant differences by all demographic factors on whether people thought they had a healthy oral condition (Table 6.9). 41.8% of the 55-64 age group answered they perceived their oral condition to be healthy compared to 59.3% of 30-34 age group who did. Compared to men, women were less likely to think they had good oral condition. Highly educated people tended to consider their oral health as good. Income was also a significant predictor of perceived oral health condition; people who earned 1,000,000 won and more were more likely to think they had a healthy oral condition.

Table 6.9 Percentage of people who perceived their oral condition to be healthy, by demographic variables (N=1027)

			Perceived oral condition	
			No	**Yes**
Total		N	444	583
		%	43.2	56.8
Age[a]	30-34	N	107	156
		%	40.7	59.3
	35-44	N	129	206
		%	38.5	61.5
	45-54	N	105	147
		%	41.7	58.3
	55-64	N	103	74
		%	58.2	41.8
Sex[b]	Male	N	197	354
		%	35.8	64.2
	Female	N	247	229
		%	51.9	48.1
Education[c]	Elementary School	N	80	61
		%	56.7	43.3
	Middle School	N	82	113
		%	42.1	57.9
	High School and over	N	277	408
		%	40.4	59.6
Income[d] (1,000 won)	Under 1,000	N	117	107
		%	52.2	47.8
	1,000 and over	N	316	465
		%	40.5	59.5

* chi^2 for trend **a** **p<0.001** * chi^2 **b** **p<0.001**
c **p<0.001** **d** **p=0.002**

6.3.2 Perceived need for dental treatment

Significant differences were observed in the relationship of perceived dental treatment needs by age and income groups (Table 6.10): the 55 to 64 year-old group was less likely to think they needed dental treatment than the youngest age group, 30 to 34 years; and the group of people who earned 1,000,000 won and more thought they were more in need for dental treatment than the group who earned less than 1,000,000 won.

Table 6.10 Percentage of people who perceived they need dental treatment, by demographic variables (N=943)

			Perceived dental needs	
			No	**Yes**
Total		N	260	683
		%	27.6	72.4
Age[a]	30-34	N	59	178
		%	24.9	75.1
	35-44	N	77	225
		%	25.5	74.5
	45-54	N	62	172
		%	26.5	73.5
	55-64	N	62	108
		%	36.5	63.5
Sex[b]	Male	N	143	353
		%	28.8	71.2
	Female	N	117	330
		%	26.2	73.8
Education[c]	Elementary School	N	44	90
		%	32.8	67.2
	Middle School	N	54	129
		%	29.5	70.5
	High School and over	N	160	460
		%	25.8	74.2
Income[d] (1,000 won)	Under 1,000	N	72	140
		%	34.0	66.0
	1,000 and over	N	184	528
		%	25.8	74.2

* chi^2 for trend **a** **p=0.018** * chi^2 b p=0.362
c p=0.075 **d** **p=0.020**

6.3.3 Evaluation of psychometric properties of the Oral Impact on Daily Performance (OIDP)

To assess Impact-Related treatment Needs (IRN), the Oral Impacts on Daily Performance (OIDP) as an instrument to measure impacts had to be translated and its properties evaluated.

6.3.3.1 Reliability of OIDP score

Table 6.11 shows that the inter-item correlation coefficients among the 10 items scores of the OIDP index ranged from 0.10 (relationship between 'smiling' and 'relaxing') to 0.56 (relationship between 'speaking' and 'emotional status'). None of the scores were negative suggesting that the items were homogenous.

Table 6.11 Psychometric properties of the OIDP index used in the study; Internal reliability analysis: Items Correlation Matrix (N=1029)

Performances*	1. eating	2. speaking	3. cleaning	4. light physical activities	5. daily activity	6. sleeping	7. relaxing	8. smiling	9. emotional state	10. enjoying contact
1. eating	1.0									
2. speaking	0.32	1.0								
3. cleaning	0.33	0.34	1.0							
4. light physical activities	0.20	0.30	0.26	1.0						
5. daily activities	0.23	0.28	0.27	0.50	1.0					
6. sleeping	0.27	0.33	0.25	0.27	0.14	1.0				
7. relaxing	0.22	0.35	0.33	0.24	0.17	0.52	1.0			
8. smiling	0.29	0.35	0.28	0.30	0.37	0.12	0.10	1.0		
9. emotional state	0.27	0.56	0.29	0.46	0.39	0.29	0.35	0.32	1.0	
10. enjoying contact	0.23	0.39	0.41	0.38	0.54	0.12	0.14	0.48	0.48	1.0

Corrected item-total correlations ranged from 0.38 to 0.57. All of them satisfied the minimum recommended level, 0.20 (Kline 1986) for including an item in a scale (Table 6.12). Cronbach's alpha coefficient was 0.77 and the standardised alpha was 0.82. When any of the items was deleted the alpha coefficients did not override the standardized alpha.

Table 6.12 Psychometric properties of the OIDP index in the study; Internal reliability analysis: Corrected Item-Total Correlation, Alpha, Standardised Alpha and Alpha if item deleted (N=1029)

Performance*	Corrected item-total correlation	Alpha if item deleted
1. Eating	0.43	0.78
2. Speaking	0.56	0.73
3. Cleaning	0.49	0.74
4. Light physical activity	0.48	0.75
5. Daily activities	0.50	0.75
6. Sleeping	0.38	0.76
7. Relaxing	0.40	0.76
8. Smiling	0.48	0.74
9. Emotional state	0.57	0.74
10. Enjoying contact	0.57	0.74
Alpha	= 0.77	
Standardised item Alpha	= 0.82	

6.3.3.2 Validity of OIDP index

Face and content validity were tested before the main study. During the pilot study each item of OIDP index was tested with nine students. Also the relevance and understanding of the questionnaire was discussed with those students and relevant staffs. All necessary changes were introduced prior to the main study.

The criterion and construct validity of OIDP index was assessed by three variables; perceived oral health need, satisfaction with oral health status, and perceived oral health conditions (Table 6.13). In the criterion test the people who answered that they had perceived needs for oral health had much higher OIDP scores than those who did not have perceived need for treatments. In the construct test the variables of satisfaction with oral health status and perceived oral health conditions showed highly significant differences in OIDP scores between answers. Lower level of satisfaction and perceived conception in oral health had lower level of OIDP scores.

Table 6.13 Psychometric properties of the OIDP index in the study; Criterion and construct validity

Variables	Categories	No.	Mean	SD	Percentile	P value
Perceived oral health tx need (N=943)	1) Yes	683	3.76	(8.76)	(0, 0, 4.0)	<0.001 [a]
	2) No	260	0.83	(2.56)	(0, 0, 0)	
Perceived oral health conditions (N=1027)	1) Poor	444	5.22	(10.42)	(0,0.8, 6.0)	<0.001 [a]
	2) Good	583	0.93	(2.64)	(0, 0, 0.4)	
Satisfaction with oral health status (N=1026)	1) Not at all satisfied	73	7.16	(8.19)	(0,4.8,11.4)	<0.001 [b]
	2) Not satisfied	431	4.10	(9.68)	(0,0.4, 4.0)	
	3) Satisfied	522	1.12	(3.94)	(0,0 , 0.1)	

* a Mann-Whitney Test
b Kruskal-Wallis Test

6.3.4 Distribution of the OIDP index

The OIDP scores in this study were not normally distributed. The overall mean of the OIDP score was 2.79 (±7.44). The total score ranged from 0 to 100 and the quartile was 0 (25), 0 (50), and 2 (75).

A relatively high number of people had oral impacts; 39.9% of adults had oral impacts relating to one or more performances (Table 6.14). Among sociodemographic information only gender and income group showed statistical significance to have impacts from oral condition on daily performance; female and less earning people were more likely to have oral impacts on their daily life.

The distribution of people with different positive performance is shown in Table 6.15. The most frequently affected performance from oral status was eating food (28.0%). The next most common problems were with cleaning teeth or dentures (16.2%) and smiling, laughing and showing teeth without embarrassment (10.6%).

Table 6.14 Percentage of people who had sociodental impacts from oral health conditions, by demographic variables (N=1029)

Oral Impacts on Daily Performance (OIDP)			**No**	**Yes**
Total		N	618	411
		%	60.1	39.9
Age[a]	30-34	N	158	105
		%	60.1	39.9
	35-44	N	207	128
		%	61.8	38.2
	45-54	N	166	88
		%	65.4	34.6
	55-64	N	87	90
		%	49.2	50.8
Sex[b]	Male	N	369	182
		%	67.0	33.0
	Female	N	249	229
		%	52.1	47.9
Education[c]	Elementary School	N	72	70
		%	50.7	49.3
	Middle School	N	125	70
		%	64.1	35.9
	High School and over	N	420	266
		%	61.2	38.8
Income[d] (1,000 won)	Under 1,000	N	113	113
		%	50.0	50.0
	1,000 and over	N	492	289
		%	63.0	37.0

* chi^2 for trend a p=0.123 * chi^2 **b** **p<0.001**
c p=0.080 **d** **p<0.001**

Table 6.15 Percentage distribution of people with different positive performances of OIDP (N=1029)

Positive OIDP performance			
1	Eating food	N	288
		%	28.0
2	Speaking clearly	N	62
		%	6.0
3	Cleaning your teeth (or dentures)	N	167
		%	16.2
4	Doing light physical activities	N	14
	(e.g. household cleaning and maintenance, walking, playing games)	%	1.4
5	Usual daily activities	N	40
	(e.g. going out to school, shop, work, visit friends etc.)	%	3.9
6	Sleeping	N	30
		%	2.9
7	Relaxing	N	14
	(e.g. reading, watching TV, listening to music)	%	1.4
8	Smiling, laughing and showing teeth without embarrassment	N	109
		%	10.6
9	With your emotional state	N	37
	(e.g. becoming more easily upset than usual)	%	3.6
10	Enjoying the contact of other people,	N	48
	such as relatives, friends or neighbours	%	4.7

6.4 Oral health behaviours (Propensity factors)

To assess Propensity-Related treatment Needs (PRN) the oral health behaviours used as propensity factors were asked. Propensity was divided into two groups; poor and good.

6.4.1 Frequency of toothbrushing per day

All adults were asked how often they cleaned their teeth. 78.9% of adults claimed to clean their teeth at least twice a day (Table 6.16). Adults with higher education (81.5%, graduates from high school and over) were more likely than those from lower educational level (73.9%, elementary school) to clean their teeth twice or more times a day.

Table 6.16 Frequency of toothbrushing per day, by demographic variables (N=1029)

Frequency of toothbrushing per day			Poor	Good
			Once or less a day	Twice or more a day
Total		N	217	812
		%	21.1	78.9
Age[a]	30-34	N	52	211
		%	19.8	80.2
	35-44	N	62	273
		%	18.5	81.5
	45-54	N	64	190
		%	25.2	74.8
	55-64	N	39	138
		%	22.0	78.0
Sex[b]	Male	N	115	436
		%	20.9	79.1
	Female	N	102	376
		%	21.3	78.7
Education[c]	Elementary School	N	37	105
		%	26.1	73.9
	Middle School	N	51	144
		%	26.2	73.8
	High School and over	N	127	559
		%	18.5	81.5
Income[d] (1,000 won)	Under 1,000	N	55	171
		%	24.3	75.7
	1,000 and over	N	158	623
		%	20.2	79.8

* chi^2 for trend a p=0.205 * chi^2 b p=0.854
c **p=0.010** d p=0.183

6.4.2 The use of fluoride toothpaste

A high percentage of people (94.1%) used fluoride toothpaste (Table 6.17). The proportion of adults who used fluoride toothpaste decreased with age. The youngest adults (aged 30-34) were the most likely to use fluoride toothpaste (97.0%). There was no difference among different groups by sex, education, and income.

Table 6.17 The use of fluoride toothpaste, by demographic variables (N=1029)

The use of fluoride toothpaste			Poor	Good
			No	Yes
Total	(1029)	N	61	968
		%	5.9	94.1
Age[a]	30-34	N	8	255
		%	3.0	97.0
	35-44	N	23	312
		%	6.9	93.1
	45-54	N	15	239
		%	5.9	94.1
	55-64	N	15	162
		%	8.5	91.5
Sex[b]	Male	N	33	518
		%	6.0	94.0
	Female	N	28	450
		%	5.9	94.1
Education[c]	Elementary School	N	9	133
		%	6.3	93.7
	Middle School	N	12	183
		%	6.2	93.8
	High School and over	N	40	646
		%	5.8	94.2
Income[d] (1,000 won)	Under 1,000	N	14	212
		%	6.2	93.8
	1,000 and over	N	41	740
		%	5.2	94.8

* chi^2 for trend **a** **p=0.035** * chi^2 b p=0.929
c p=0.966 d p=0.582

6.4.3 Frequency of taking sugary snacks per day

Eighty-one per cent of adults said that they took sugary snacks once or less than once a day (Table 6.18). There were variations in the frequency by all demographic factors with which people said that they ate sugary snacks ($p<0.001$); the younger, female, the highly educated group, or higher incomer were more likely to have poor habits, taking sugary snack two or more a day.

Table 6.18 Frequency of taking sugary snacks per day, by demographic variables (N=1029)

Frequency of taking sugary snack per day			**Poor**	**Good**
			2 or more	**0-1**
Total		N	195	834
		%	19.0	81.0
Age[a]	30-34	N	85	178
		%	32.3	67.7
	35-44	N	56	279
		%	16.7	83.3
	45-54	N	37	217
		%	14.6	85.4
	55-64	N	17	160
		%	9.6	90.4
Sex[b]	Male	N	81	470
		%	14.7	85.3
	Female	N	114	364
		%	23.8	76.2
Education[c]	Elementary School	N	13	129
		%	9.2	90.8
	Middle School	N	26	169
		%	13.3	86.7
	High School and over	N	154	532
		%	22.4	77.6
Income[d] (1,000 won)	Under 1,000	N	23	203
		%	10.2	89.8
	1,000 and over	N	169	612
		%	21.6	78.4

* chi^2 for trend **a** **p<0.001** * chi^2 **b** **p<0.001**
c **p<0.001** **d** **p<0.001**

6.4.4 Pattern of dental attendance

Most of the people (76.7%) said that they go to the dental clinic only when they have trouble or pain with their teeth or don't go (Table 6.19). Higher education or income groups had a tendency to see a dentist regularly or occasionally than lower education or income group ($p<0.05$).

Table 6.19 Pattern of visiting dentists, by demographic variables (N=1029)

Pattern of visiting dental clinics			**Poor**	**Good**
			Only when trouble or pain/ don't go	**An occasional or regular check-up**
Total	(1029)	N	789	240
		%	76.7	23.3
Age[a]	30-34	N	202	61
		%	76.8	23.2
	35-44	N	248	87
		%	74.0	26.0
	45-54	N	192	62
		%	75.6	24.4
	55-64	N	147	30
		%	83.1	16.9
Sex[b]	Male	N	419	132
		%	76.0	24.0
	Female	N	370	108
		%	77.4	22.6
Education[c]	Elementary School	N	114	28
		%	80.3	19.7
	Middle School	N	160	35
		%	82.1	17.9
	High School and over	N	510	176
		%	74.3	25.7
Income[d] (1,000 won)	Under 1,000	N	194	32
		%	85.8	14.2
	1,000 and over	N	578	203
		%	74.0	26.0

* chi^2 for trend a p=0.167 * chi^2 b p=0.606
c p=0.033 **d p<0.001**

6.4.5 Smoking

Overall 70.6% of dentate adults never smoked and all the demographic variables showed differences between groups (Table 6.20). Older adults were the less likely to smoke; 78.5% of those aged 55-64 said they never smoke in comparison with 65.7% of those aged 35 to 44 years old. There was a large difference between sexes; 53.2% of men smoked compared with 2.1% of women did. Highly educated people were more likely to smoke than those who finished elementary school; 32.2% of the former smoked and 20.4% of the latter did. Lower income group who earned less

than 1,000,000 won less likely smoked than the other group; 81.4% of the former were non-smoker compared to 67.5% of the latter were.

Table 6.20 Smoking, by demographic variables (N=1029)

Smoking			**Poor**	**Good**
			Smoker	**Non-smoker**
Total		N	303	726
		%	29.4	70.6
Age[a]	30-34	N	86	177
		%	32.7	67.3
	35-44	N	115	220
		%	34.3	65.7
	45-54	N	64	190
		%	25.2	74.8
	55-64	N	38	139
		%	21.5	78.5
Sex[b]	Male	N	293	258
		%	53.2	46.8
	Female	N	10	468
		%	2.1	97.9
Education[c]	Elementary School	N	29	113
		%	20.4	79.6
	Middle School	N	52	143
		%	26.7	73.3
	High School and over	N	221	465
		%	32.2	67.8
Income[d] (1,000 won)	Under 1,000	N	42	184
		%	18.6	81.4
	1,000 and over	N	254	527
		%	32.5	67.5

* chi^2 for trend **a** **p=0.002** * chi^2 **b** **p<0.001**
c **p=0.003** **d** **p<0.001**

CHAPTER 7

Results:

Normative Need

CHAPTER 7. NORMATIVE DENTAL TREATMENT NEEDS (NN) OF THE STUDY SAMPLE

7.1 Normative treatment Needs (NN): In Relation to Specific Types of Dental Treatment

7.1.1 Normative Needs for Dental Restorations

An average of 0.73 teeth per person had a normative need for any kind of filling (RN 4), of which 0.47 were one surface (RN 1), 0.24 were two or more surfaces (RN 2) and 0.02 were crowns (RN 3) (Table 7.1). On average, people had 0.03 teeth needing pulp care plus restoration (RN 5) and 0.53 teeth needing extractions (RN 6). The relationship between age and all the restorative needs was statistically significant except pulp care and restoration: compared to the older group who had higher mean of treatment needs for crown, the younger people were more likely to need one or two and more surface and extraction. There was no significant difference between male and female in these treatments. The mean number of teeth requiring fillings was varied by educational and income level. The people who graduated from university or who earned more showed a higher mean of treatment needs for surface fillings and extraction than those who finished elementary school or who earned less.

Table 7.1 Mean number of teeth per person with a normative need for restorative treatment, by demographic variables (N=1029)

Treatment Types			**RN1**	**RN2**	**RN3**	**RN4**	**RN5**	**RN6**
Total		Mean	0.47	0.24	0.02	0.73	0.03	0.53
		(SD)	(0.98)	(0.67)	(0.20)	(1.26)	(0.20)	(1.09)
Age[a]	30-34	Mean	0.66	0.41	0.01	1.08	0.03	0.68
		(SD)	(1.15)	(0.96)	(0.09)	(1.60)	(0.27)	(1.05)
	35-44	Mean	0.56	0.23	0.01	0.80	0.02	0.53
		(SD)	(1.06)	(0.60)	(0.11)	(1.28)	(0.15)	(1.01)
	45-54	Mean	0.40	0.16	0.00	0.56	0.03	0.47
		(SD)	(0.93)	(0.44)	(0.00)	(1.02)	(0.20)	(1.08)
	55-64	Mean	0.11	0.15	0.06	0.31	0.02	0.40
		(SD)	(0.33)	(0.43)	(0.44)	(0.69)	(0.15)	(1.30)
Sex[b]	Male	Mean	0.43	0.23	0.01	0.68	0.03	0.54
		(SD)	(0.96)	(0.67)	(0.15)	(1.25)	(0.23)	(1.08)
	Female	Mean	0.51	0.26	0.02	0.79	0.02	0.52
		(SD)	(1.01)	(0.67)	(0.25)	(1.27)	(0.16)	(1.11)
Education[c]	Elementary School	Mean	0.22	0.16	0.04	0.42	0.04	0.39
		(SD)	(0.62)	(0.42)	(0.43)	(0.89)	(0.23)	(1.18)
	Middle School	Mean	0.43	0.18	0.02	0.63	0.03	0.54
		(SD)	(1.06)	(0.50)	(0.16)	(1.23)	(0.17)	(1.30)
	High School and over	Mean	0.53	0.28	0.01	0.83	0.02	0.55
		(SD)	(1.02)	(0.74)	(0.12)	(1.33)	(0.20)	(0.98)
Income[d] (1,000 won)	Under 1,000	Mean	0.29	0.26	0.04	0.58	0.05	0.48
		(SD)	(0.68)	(0.60)	(0.36)	(1.00)	(0.34)	(1.23)
	1,000 and over	Mean	0.51	0.24	0.01	0.75	0.02	0.55
		(SD)	(1.04)	(0.68)	(0.11)	(1.32)	(0.14)	(1.05)

* a	Kruskal-Wallis Test	**RN 1, 2, 3, 4, 6**	**p<0.05**	RN 5	p=0.81
b	Mann-Whitney Test			RN 1, 2, 3, 4, 5, 6	p>0.05
c	Kruskal-Wallis Test	**RN 1, 4, 6**	**p<0.01**	RN 2, 3, 5	p>0.25
d	Mann-Whitney Test	**RN 1, 6**	**p<0.05**	RN 2, 3, 4, 5	p>0.05

7.1.2 Normative Needs for Prosthodontic Treatment

Overall, 5.9% (upper jaw) and 10.8% (lower jaw) of people needed a one-unit prosthesis for one tooth replacement, 3.2% (upper jaw) and 3.9% (lower jaw) for multi-unit prosthesis (more than one tooth replacement), 3.7% (upper jaw) and 5.2% (lower jaw) for a combination of one- and/or multi-unit prostheses, and 0.3% (upper jaw) and 0.1% (lower jaw) for full prosthesis (replacement of all teeth) (Table 7.2 and Table 7.3). Age, education and income showed statistical

significance for the distribution of prosthetics needs; the older, less educated, and less incomer were more likely to require for complicated prosthesis.

Table 7.2 Percentage of people with normative need for any prosthetic treatment in upper jaw, by demographic variables (N=1029)

Type of prosthesis			**PNU 0**	**PNU 1**	**PNU 2**	**PNU 3**	**PNU 4**
		N	894	61	33	38	3
		%	86.9	5.9	3.2	3.7	0.3
Age[a]	30-34	N	248	12	0	3	0
		%	94.3	4.6	0.0	1.1	0.0
	35-44	N	302	19	5	9	0
		%	90.1	5.7	1.5	2.7	0.0
	45-54	N	204	20	17	12	1
		%	80.3	7.9	6.7	4.7	0.4
	55-64	N	140	10	11	14	2
		%	79.1	5.6	6.2	7.9	1.1
Sex[b]	Male	N	472	39	20	20	0
		%	85.7	7.1	3.6	3.6	0.0
	Female	N	422	22	13	18	3
		%	88.3	4.6	2.7	3.8	0.6
Education[c]	Elementary School	N	107	11	11	11	2
		%	75.4	7.7	7.7	7.7	1.4
	Middle School	N	158	15	9	13	0
		%	81.0	7.7	4.6	6.7	0.0
	High School and over	N	624	35	13	14	0
		%	91.0	5.1	1.9	2.0	0.0
Income[d] (1,000 won)	Under 1,000	N	183	17	11	12	3
		%	81.0	7.5	4.9	5.3	1.3
	1,000 and over	N	691	43	21	26	0
		%	88.5	5.5	2.7	3.3	0.0

* chi^2 **a p<0.001** b p=0.137 **c p<0.001** **d p=0.002**

Table 7.3 Percentage of people with normative need for any prosthetic treatment in lower jaw, by demographic variables (N=1029)

Type of prosthesis			PNL 0	PNL 1	PNL 2	PNL 3	PNL 4
		N	824	111	40	53	1
		%	80.1	10.8	3.9	5.2	0.1
Age[a]	30-34	N	229	22	3	9	0
		%	87.1	8.4	1.1	3.4	0.0
	35-44	N	281	30	8	16	0
		%	83.9	9.0	2.4	4.8	0.0
	45-54	N	189	37	17	11	0
		%	74.4	14.6	6.7	4.3	0.0
	55-64	N	125	22	12	17	1
		%	70.6	12.4	6.8	9.6	0.6
Sex[b]	Male	N	443	68	20	20	0
		%	80.4	12.3	3.6	3.6	0.0
	Female	N	381	43	20	33	1
		%	79.7	9.0	4.2	6.9	0.2
Education[c]	Elementary School	N	99	18	12	12	1
		%	69.7	12.7	8.5	8.5	0.7
	Middle School	N	144	27	10	14	0
		%	73.8	13.8	5.1	7.2	0.0
	High School and over	N	577	66	17	26	0
		%	84.1	9.6	2.5	3.8	0.0
Income[d] (1,000 won)	Under 1,000	N	160	26	15	24	1
		%	70.8	11.5	6.6	10.6	0.4
	1,000 and over	N	647	82	24	28	0
		%	82.8	10.5	3.1	3.6	0.0

* chi^2 **a p<0.001** b p=0.053 **c p<0.001** **d p<0.001**

7.1.3 Normative Needs for Periodontal Treatment

66.5% of the people required Oral Hygiene Instruction (OHI) as a principal periodontal treatment need (Table 7.4). There were significant differences by age, sex, and education for the principal periodontal treatment needs for OHI (CPI 1); the older, the men, and the less educated people were more likely to require this instruction.

An average of 0.70 sextants required scaling (CPN 2), 0.35 sextants for scaling and root planning (CPN 3), 0.02 sextants for scaling, root planing, and surgical procedure (CPN 4) and all of those treatments are also required OHI (Table 7.5).

There was difference with respect to age, sex, and education in the mean number of sextants for adults needing periodontal treatment need, except CPN 4 for complex therapy; the older, male, or less educated people had higher mean of periodontal treatment needs. Income groups did not show any statistical difference in the mean number of periodontal treatment needs.

Table 7.4 Percentage of people who required Oral Hygiene Instruction (OHI), by demographic variables (N=1029)

Oral Hygiene Instruction (CPN 1)			**No**	**Yes**
Total		N	345	684
		%	33.5	66.5
Age[a]	30-34	N	118	145
		%	44.9	55.1
	35-44	N	117	218
		%	34.9	65.1
	45-54	N	67	187
		%	26.4	73.6
	55-64	N	43	134
		%	24.3	75.7
Sex[b]	Male	N	159	392
		%	28.9	71.1
	Female	N	186	292
		%	38.9	61.1
Education[c]	Elementary School	N	35	107
		%	24.6	75.4
	Middle School	N	60	135
		%	30.8	69.2
	High School and over	N	249	437
		%	36.3	63.7
Income[d] (1,000 won)	Under 1,000	N	75	151
		%	33.2	66.8
	1,000 and over	N	265	516
		%	33.9	66.1

* chi^2 for trend **a** **p<0.001** * chi^2 **b** **p=0.001**
c **p=0.005** d p=0.835

Table 7.5 Mean number of sextants with normative need for periodontal treatment, by demographic variables (N=1029)

Type of treatment			**CPN 2**	**CPN 3**	**CPN 4**
Total		Mean	0.70	0.35	0.02
		(SD)	(0.95)	(1.01)	(0.24)
Age[a]	30-34	Mean	0.53	0.08	0.01
		(SD)	(0.73)	(0.50)	(0.09)
	35-44	Mean	0.67	0.31	0.01
		(SD)	(0.83)	(1.00)	(0.12)
	45-54	Mean	0.78	0.54	0.03
		(SD)	(1.06)	(1.16)	(0.29)
	55-64	Mean	0.92	0.58	0.06
		(SD)	(1.22)	(1.23)	(0.42)
Sex[b]	Male	Mean	0.72	0.48	0.03
		(SD)	(0.91)	(1.14)	(0.31)
	Female	Mean	0.68	0.21	0.01
		(SD)	(1.00)	(0.80)	(0.11)
Education[c]	Elementary School	Mean	0.89	0.61	0.03
		(SD)	(1.21)	(1.35)	(0.27)
	Middle School	Mean	0.78	0.50	0.01
		(SD)	(1.02)	(1.08)	(0.14)
	High School and over	Mean	0.64	0.26	0.02
		(SD)	(0.84)	(0.89)	(0.26)
Income[d] (1,000 won)	Under 1,000	Mean	0.81	0.38	0.04
		(SD)	(1.22)	(0.98)	(0.34)
	1,000 and over	Mean	0.65	0.35	0.02
		(SD)	(0.82)	(1.03)	(0.21)

* a	Kruskal-Wallis Test	**CPN 2, 3**	**p<0.01**	CPN 4	p=0.134
b	Mann-Whitney Test	**CPN 2, 3**	**p<0.05**	CPN 4	p=0.133
c	Kruskal-Wallis Test	**CPN 2, 3**	**p<0.05**	CPN 4	p=0.634
d	Mann-Whitney Test	CPN 2, 3, 4	p>0.25		

7.2 Normative and subjective oral health measures

The relationship between normative and subjective oral health measures was assessed. The existence of decayed teeth, missing teeth, filled teeth, prosthetics in upper and lower jaw were used as indicators of normative oral health status for assessment; and restorative treatment need, prosthetic treatment needs in upper and lower jaw, and periodontal treatment needs as indicators of normative dental treatment needs for assessment. Perceived oral health status, perceived dental

treatment needs, and perceived oral impact from Oral Impacts on Daily Performances (OIDP) were three indicators of subjective oral health measures.

7.2.1 Normative oral health measures and perceived oral health

Those who had missing teeth, filled teeth, prostheses in upper or lower jaw were less likely to perceive their oral conditions as healthy ($p<0.001$) (Table 7.6). The existence of decayed teeth did not affect the perception of their oral health ($p=0.156$). The people assessed as needing prosthetic treatments in upper jaw or lower jaw were much less likely to think that their oral health condition was good ($p<0.001$) than those who did not need prosthetic treatment. Those who have other treatment needs did not show any difference in the perception of oral health.

Table 7.6 Relationship between normative oral health measures and perceived oral health condition (N=1027)

		Perceived oral condition healthy				N	chi^2
		no		yes			p value
Total		444	(43.2%)	583	(56.8%)	1027	
Normative oral health status							
Decayed teeth	no	198	(40.9%)	286	(59.1%)	484	=0.156
	yes	246	(45.3%)	297	(54.7%)	543	
Missing teeth	no	59	(24.4%)	183	(75.6%)	242	**<0.001**
	yes	385	(49.0%)	400	(51.0%)	785	
Filled teeth	no	111	(33.7%)	218	(66.3%)	329	**<0.001**
	yes	333	(47.7%)	365	(52.3%)	698	
Prosthetics in upper jaw	no	306	(38.9%)	480	(61.1%)	786	**<0.001**
	yes	138	(57.3%)	103	(42.7%)	241	
Prosthetics in lower jaw	no	280	(36.9%)	479	(63.1%)	759	**<0.001**
	yes	164	(61.2%)	104	(38.8%)	268	
Normative dental treatment needs							
Restorative treatment need	no	204	(41.5%)	287	(58.5%)	491	=0.297
	yes	240	(44.8%)	296	(55.2%)	536	
Prosthetic need in upper jaw	no	351	(39.3%)	541	(60.7%)	892	**<0.001**
	yes	93	(68.9%)	42	(31.1%)	135	
Prosthetic need in lower jaw	no	319	(38.8%)	504	(61.2%)	823	**<0.001**
	yes	125	(61.3%)	79	(38.7%)	204	
Periodontal treatment need	no	145	(42.2%)	199	(57.8%)	344	=0.620
	yes	299	(43.8%)	384	(56.2%)	683	

7.2.2 Normative oral health measures and perceived dental treatment need

Those who had decayed teeth and filled teeth thought they needed dental treatment in higher proportion rather than the other who did not have those teeth conditions ($p<0.001$ and $p=0.047$) (Table 7.7). The other variables related to oral health status did not show any significant difference in perception of need for dental treatment. Those who had normative need for restorative and prosthetic treatment were more likely to answer positively for their need for dental treatment than the other group who did not need treatment ($p<0.001$). The existence of a treatment need for periodontal condition did not make any difference to perceived need for dental treatment.

Table 7.7 Relationship between normative oral health measures and perceived need for dental treatment (N=943)

		Perceived need dental treatment				N	chi² p value
		no		yes			
Total		260	(27.6%)	683	(72.4%)	943	
Normative oral health status							
Decayed teeth	no	156	(35.1%)	289	(64.9%)	345	**<0.001**
	yes	104	(20.9%)	394	(79.1%)	681	
Missing teeth	no	70	(32.1%)	148	(67.9%)	218	=0.087
	yes	190	(26.2%)	535	(73.8%)	725	
Filled teeth	no	94	(31.9%)	201	(68.1%)	295	**=0.047**
	yes	166	(25.6%)	482	(74.4%)	648	
Prosthetics in upper jaw	no	193	(26.9%)	524	(73.1%)	717	=0.424
	yes	67	(29.6%)	159	(70.4%)	226	
Prosthetics in lower jaw	no	182	(26.4%)	507	(73.6%)	689	=0.191
	yes	78	(30.7%)	176	(69.3%)	254	
Normative dental treatment needs							
Restorative treatment need	No	159	(35.2%)	293	(64.8%)	452	**<0.001**
	Yes	101	(20.6%)	390	(79.4%)	491	
Prosthetic need in upper jaw	No	241	(29.7%)	570	(70.3%)	811	**<0.001**
	Yes	19	(14.4%)	113	(85.6%)	132	
Prosthetic need in lower jaw	No	229	(30.6%)	519	(69.4%)	748	**<0.001**
	Yes	31	(15.9%)	164	(84.1%)	195	
Periodontal treatment need	No	86	(27.6%)	226	(72.4%)	312	=0.997
	Yes	174	(27.6%)	457	(72.4%)	631	

7.2.3 Normative oral health measures and oral impacts on daily performance (OIDP)

Among the clinical indices of status the existence of missing teeth and filled teeth showed difference in the oral impacts on daily performance; the people who had above oral health conditions showed higher probability to have oral impacts on their daily life ($p<0.05$) (Table 7.8). The people who needed prosthetic treatment in upper or lower jaw were more likely to answer positively for the impact from oral condition rather than the other who did not have treatment needs ($p=0.008$ and $p=0.001$). The other types of dental treatment need were not showing the difference in the proportion to have impacts from their oral health.

Table 7.8 Relationship between normative oral health measures and Oral Impacts on Daily Performance (OIDP) (N=1029)

		Oral impacts on daily performance				N	chi^2
		no		yes			p value
Total		618	(60.1%)	411	(39.9%)	1029	
Normative oral health status							
Decayed teeth	no	303	(62.3%)	183	(37.7%)	486	=0.156
	yes	315	(58.0%)	228	(42.0%)	543	
Missing teeth	no	166	(68.6%)	76	(31.4%)	242	**=0.002**
	yes	452	(57.4%)	335	(42.6%)	787	
Filled teeth	no	213	(64.7%)	116	(35.3%)	329	**=0.035**
	yes	405	(57.9%)	295	(42.1%)	700	
Prosthetics in upper jaw	no	482	(61.2%)	305	(38.8%)	787	=0.161
	yes	136	(56.2%)	106	(43.8%)	242	
Prosthetics in lower jaw	no	468	(61.6%)	292	(38.4%)	760	=0.094
	yes	150	(55.8%)	119	(44.2%)	269	
Normative dental treatment needs							
Restorative treatment need	no	308	(62.5%)	185	(37.5%)	493	=0.129
	yes	310	(57.8%)	226	(42.2%)	336	
Prosthetic need in upper jaw	no	551	(61.6%)	343	(38.4%)	894	**=0.008**
	yes	67	(49.6%)	68	(50.4%)	135	
Prosthetic need in lower jaw	no	515	(62.5%)	309	(37.5%)	824	**=0.001**
	yes	103	(50.2%)	102	(49.8%)	205	
Periodontal treatment need	no	204	(59.1%)	141	(40.9%)	245	=0.666
	yes	414	(60.5%)	270	(39.5%)	684	

7.3 Normative oral health measures and propensity factors

The relationship between normative oral health measures and propensity factors was assessed. The existence of decayed teeth, missing teeth, filled teeth, prosthetics in upper and lower jaw were used as indicators of normative oral health status for assessment; and restorative treatment need, prosthetic treatment needs in upper and lower jaw, and periodontal treatment needs as indicators of normative dental treatment needs for assessment. Frequency of toothbrushing per day, use of fluoride toothpaste, frequency of taking sugary snack per day, pattern of dental attendance, and smoking were five indicators of oral health behaviour.

7.3.1 Normative oral health measures and frequency of toothbrushing per day

There was no significant relationship between normative status and frequency of toothbrushing per day. However three treatment need variables showed significant relationship with tooth cleaning habits ($p<0.05$); the group of people who brushed more often were less likely to have prosthetic treatment needs in upper or lower jaw or periodontal need for treatment than the other who did not brush often (Table 7.9).

Table 7.9 Relationship between normative oral health measures and frequency of toothbrushing per day (N=1029)

		Frequency of toothbrushing per day				N	chi²
		0 - 1 / day		2+ / day			
		poor		good			p value
Total		217	(100.0%)	812	(100.0%)	1029	
Normative oral health status							
Decayed teeth	no	96	(44.2%)	390	(48.0%)	486	=0.321
	yes	121	(55.8%)	422	(52.0%)	543	
Missing teeth	no	44	(20.3%)	198	(24.4%)	242	=0.205
	yes	173	(79.7%)	614	(75.6%)	787	
Filled teeth	no	73	(33.6%)	256	(31.5%)	329	=0.553
	yes	144	(66.4%)	556	(68.5%)	700	
Prosthetics in upper jaw	no	162	(74.7%)	625	(77.0%)	787	=0.475
	yes	55	(25.3%)	187	(23.0%)	242	
Prosthetics in lower jaw	no	157	(72.4%)	603	(74.3%)	760	=0.569
	yes	60	(27.6%)	209	(25.7%)	269	
Normative dental treatment needs							
Restorative treatment need	no	97	(44.7%)	396	(48.8%)	493	=0.287
	yes	120	(55.3%)	416	(51.2%)	536	
Prosthetic need in upper jaw	no	176	(81.1%)	718	(88.4%)	894	**=0.005**
	yes	41	(18.9%)	94	(11.6%)	135	
Prosthetic need in lower jaw	no	163	(75.1%)	661	(81.4%)	824	**=0.039**
	yes	54	(24.9%)	151	(18.6%)	205	
Periodontal treatment need	no	56	(25.8%)	289	(35.6%)	345	**=0.007**
	yes	161	(74.2%)	523	(64.4%)	684	

7.3.2 Normative oral health measures and use of fluoride toothpaste

Using fluoride toothpaste did not relate with any normative measure of oral health ($p>0.05$) (Table 7.10).

Table 7.10 Relationship between normative oral health measures and use of fluoride toothpaste (N=1029)

		Use of fluoride toothpaste				N	chi^2
		no		yes			
		poor		good			p value
Total		61	(100.0%)	968	(100.0%)	1029	
Normative oral health status							
Decayed teeth	no	34	(55.7%)	452	(46.7%)	486	=0.170
	yes	27	(44.3%)	516	(53.3%)	543	
Missing teeth	no	19	(31.1%)	223	(23.0%)	242	=0.147
	yes	42	(68.9%)	745	(77.0%)	787	
Filled teeth	no	20	(32.8%)	309	(31.9%)	329	=0.888
	yes	41	(67.2%)	659	(68.1%)	700	
Prosthetics in upper jaw	no	49	(80.3%)	738	(76.2%)	787	=0.465
	yes	12	(19.7%)	230	(23.8%)	242	
Prosthetics in lower jaw	no	49	(80.3%)	711	(73.5%)	760	=0.236
	yes	12	(19.7%)	257	(26.5%)	269	
Normative dental treatment needs							
Restorative treatment need	no	34	(55.7%)	459	(47.4%)	493	=0.207
	yes	27	(44.3%)	509	(52.6%)	536	
Prosthetic need in upper jaw	no	55	(90.2%)	839	(86.7%)	894	=0.434
	yes	6	(9.8%)	129	(13.3%)	135	
Prosthetic need in lower jaw	no	54	(88.5%)	770	(79.5%)	824	=0.089
	yes	7	(11.5%)	198	(20.5%)	205	
Periodontal treatment need	no	17	(27.9%)	328	(33.9%)	345	=0.334
	yes	44	(72.1%)	640	(66.1%)	684	

7.3.3 Normative oral health measures and frequency of taking sugary snack per day

The group of people who have sugary snacks twice or more per day had higher potential to have decayed teeth and restorative treatment needs than the other who never take them or once a day ($p \leq 0.001$) (Table 7.11). The other conditions of oral health did not show any difference by the frequency of taking sugary snack.

Table 7.11 Relationship between normative oral health measures and frequency of taking sugary snacks per day (N=1029)

		Frequency of taking sugary snack				N	chi²
		2 or more		0-1			
		poor		good			p value
Total		195	(100.0%)	834	(100.0%)	1029	
Normative oral health status							
Decayed teeth	no	69	(35.4%)	417	(50.0%)	486	**<0.001**
	yes	126	(64.6%)	417	(50.0%)	543	
Missing teeth	no	45	(23.1%)	197	(23.6%)	242	=0.872
	yes	150	(76.9%)	637	(76.4%)	787	
Filled teeth	no	51	(26.2%)	278	(33.3%)	329	=0.053
	yes	144	(73.8%)	556	(66.7%)	700	
Prosthetics in upper jaw	no	158	(81.0%)	629	(75.4%)	787	=0.097
	yes	37	(19.0%)	205	(24.6%)	242	
Prosthetics in lower jaw	no	151	(77.4%)	609	(73.0%)	760	=0.207
	yes	44	(22.6%)	225	(27.0%)	269	
Normative dental treatment needs							
Restorative treatment need	no	72	(36.9%)	421	(50.5%)	493	**=0.001**
	yes	123	(63.1%)	413	(49.5%)	536	
Prosthetic need in upper jaw	no	173	(88.7%)	721	(86.5%)	894	=0.399
	yes	22	(11.3%)	113	(13.5%)	135	
Prosthetic need in lower jaw	no	159	(81.5%)	665	(79.7%)	824	=0.571
	yes	36	(18.5%)	169	(20.3%)	205	
Periodontal treatment need	no	71	(36.4%)	274	(32.9%)	345	=0.344
	yes	124	(63.6%)	560	(67.1%)	684	

7.3.4 Normative oral health measures and pattern of dental attendance

The pattern of dental attendance was related to missing teeth only; regular attenders were more likely to have missing teeth (p=0.047) (Table 7.12).

Table 7.12 Relationship between normative oral measures and pattern of dental attendance (N=1029)

		Pattern of dental attendance				N	chi^2
		only when trouble or pain/don't go		occasional or regular check-up			
		poor		good			p value
Total		789	(100.0%)	240	(100.0%)	1029	
Normative oral health status							
Decayed teeth	no	362	(45.9%)	124	(51.7%)	486	=0.116
	yes	427	(54.1%)	116	(48.3%)	543	
Missing teeth	no	197	(25.0%)	45	(18.8%)	242	**=0.047**
	yes	592	(75.0%)	195	(81.3%)	787	
Filled teeth	no	263	(33.3%)	66	(27.5%)	329	=0.090
	yes	526	(66.7%)	174	(72.5%)	700	
Prosthetics in upper jaw	no	601	(76.2%)	186	(77.5%)	787	=0.671
	yes	188	(23.8%)	54	(22.5%)	242	
Prosthetics in lower jaw	no	579	(73.4%)	181	(75.4%)	760	=0.530
	yes	210	(26.6%)	59	(24.6%)	269	
Normative dental treatment needs							
Restorative treatment need	no	367	(46.5%)	126	(52.5%)	493	=0.104
	yes	422	(53.5%)	114	(47.5%)	536	
Prosthetic need in upper jaw	no	684	(86.7%)	210	(87.5%)	894	=0.745
	yes	105	(13.3%)	30	(12.5%)	135	
Prosthetic need in lower jaw	no	631	(80.0%)	193	(80.4%)	824	=0.881
	yes	158	(20.0%)	47	(19.6%)	205	
Periodontal treatment need	no	252	(31.9%)	93	(38.8%)	345	=0.050
	yes	537	(68.1%)	147	(61.3%)	684	

7.3.5 Normative oral health measures and smoking

The group who did not smoke were more likely to have filled teeth and a prosthesis in the lower jaw ($p<0.01$) (Table 7.13). People who smoked had higher proportion to have needs for prosthesis in upper jaw and periodontal treatment compared to the people who did not smoke ($p \leq 0.05$).

Table 7.13 Relationship between normative oral health measures and smoking (N=1029)

		Smoking				N	chi²
		smoker		non-smoker			
		poor		good			p value
Total		303	(100.0%)	726	(100.0%)	1029	
Normative oral health status							
Natural teeth < 20	no	291	(96.0%)	681	(93.8%)	787	=0.153
	yes	12	(4.0%)	45	(6.2%)	242	
Decayed teeth	no	135	(44.6%)	351	(48.3%)	329	=0.267
	yes	168	(55.4%)	375	(51.7%)	700	
Missing teeth	no	82	(27.1%)	160	(22.0%)	71	=0.083
	yes	221	(72.9%)	566	(78.0%)	958	
Filled teeth	no	128	(42.2%)	201	(27.7%)	486	**<0.001**
	yes	175	(57.8%)	525	(72.3%)	543	
Prosthetics in upper jaw	no	237	(78.2%)	550	(75.8%)	787	=0.396
	yes	66	(21.8%)	176	(24.2%)	242	
Prosthetics in lower jaw	no	243	(80.2%)	517	(71.2%)	760	**=0.003**
	yes	60	(19.8%)	209	(28.8%)	269	
Normative dental treatment needs							
Restorative treatment need	no	131	(43.2%)	362	(49.9%)	493	=0.052
	yes	172	(56.8%)	364	(50.1%)	536	
Prosthetic need in upper jaw	no	253	(83.5%)	641	(88.3%)	894	**=0.038**
	yes	50	(16.5%)	85	(11.7%)	135	
Prosthetic need in lower jaw	no	242	(79.9%)	582	(80.2%)	824	=0.913
	yes	61	(20.1%)	144	(19.8%)	205	
Periodontal treatment need	no	81	(26.7%)	264	(36.4%)	345	**=0.003**
	yes	222	(73.3%)	462	(63.6%)	684	

7.4 Summary

- Fillings were the most frequent type of treatment needs and extraction was the next most frequent; the mean of total fillings including one, two or more, and crown any reason was 0.73 teeth and on average 0.53 teeth needed to be extracted.

- The prosthetic treatment needs was similarly distributed as prosthetic status but there were less; 5.9% in upper jaw and 10.8% in lower jaw of this sample needed one-unit prosthesis for one tooth replacement. The other

types of treatment needs were less than these. In particular, replacement for all teeth was the rarest need in this sample.

- Age, education, and income in relation to upper jaw and lower jaw, were indicators predicting needs for prosthetic appliances.

- More than half of the people in this study group had at least one of pathological periodontal conditions such as bleeding, calculus or gingival pockets which needed Oral Hygiene Instruction (OHI) as basic controlling method. The mean number of sextants needing scaling with OHI was 0.70. The needs for complex treatment including OHI, scaling, root planing and surgical procedure was rare (average 0.02 sextants).

- The relationships between normative measures and subjective measures or propensity measures were analysed. The people who needed restorative treatment were highly significant in the percentage for the perceived need for dental treatments ($p<0.001$).

- Prosthetic needs in upper or lower jaw were significantly related with all of subjective measures, perceived oral health condition, perceived dental treatment needs, and perceived oral health impact with OIDP ($p<0.01$).

- There was no significant relationship between perceived and normative periodontal needs.

- People who had sugary snacks more often were more likely to have needs for restorative treatment ($p=0.001$).

- Prosthetic needs in upper and lower jaw were related with frequency of daily toothbrushing ($p<0.05$); the group who brushed their teeth more often were less likely to have prosthetic need in upper and lower jaw. Smoking was related only with prosthetic needs in upper jaw ($p=0.038$).

- The propensity factors which showed a strong relationship with treatment needs for periodontal condition were: frequency of toothbrushing a day

(p=0.007) and smoking (p=0.003). The people had less chance of needing periodontal treatment if they brushed their teeth more often and did not smoke.

CHAPTER 8

Results:

Impact-Related Need

CHAPTER 8. IMPACT-RELATED NEEDS (IRN) AND COMPARISON WITH NORMATIVE NEEDS (NN)

8.1 Impact-Related Treatment Needs (IRN): In Relation to Specific Types of Dental Treatment

In the following section how Impact-Related treatment Need (IRN) was assessed for specific types of treatment is explained.

There is a point to note before looking into the modelling of Impact-Related Needs (IRN) for treatments. The number of people used in the modelling calculation was 1000 instead of the 1029 in the sample. To do that, 1029 was converted to a percentage to make extrapolations to general population easier. As we shall see in the final results the numbers of dentists per 100,000 people were calculated. So using 1000s was more appropriate. The prosthetic treatment needs are calculated separately for upper and lower jaw. For periodontal treatment, the sum of the need is not 1000 because each person can have several types of treatment needs.

8.1.1 Impact-Related Needs for Prosthodontic Treatment

The data related to Prosthetic need only applies to people who had missing teeth. Teeth indicated for extraction were not included. The number of people with a normative need for prosthetic treatment was 164 people for prosthesis in upper jaw and 253 people for prosthesis in lower jaw per 1000 people (Figure 8.1 and Figure 8.2).

Using the measure for Condition Specific Oral Impacts on Daily Performances (CS-OIDP) relating to missing teeth in the upper jaw, the following estimates per 1000 people with one or more missing teeth were derived:

- 14 people had IRN in relation to one-unit prosthesis for one tooth replacement (PN 1);
- 12 IRN for multi-unit prosthesis (more than one tooth replacement) (PN 2);
- 16 for IRN for a combination of one- and/or multi-unit prostheses (PN 3); and
- 2 IRN for full prosthesis (replacement of all teeth) (PN 4).

Overall, 44 people had an IRN for any kind of prosthetic need in this upper jaw model (Figure 8.1).

For the lower jaw, 61 people had an IRN for any kind of prosthetic need among 1000 people with missing teeth (Figure 8.2):

- 23 for PN 1;
- 15 for PN 2;
- 22 for PN 3; and
- 1 for PN 4.

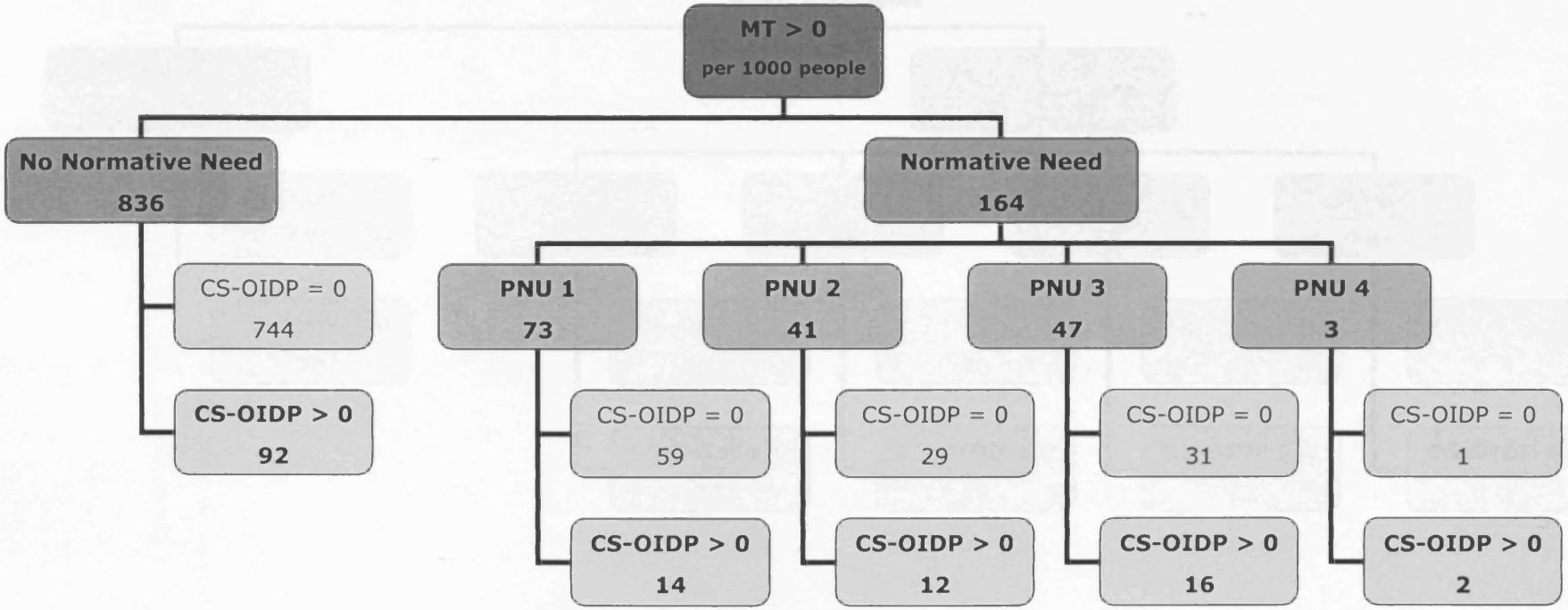


Figure 8.1 The model for Impact-Related Need (IRN) of prosthetic treatment in upper jaw per 1000 people with missing teeth

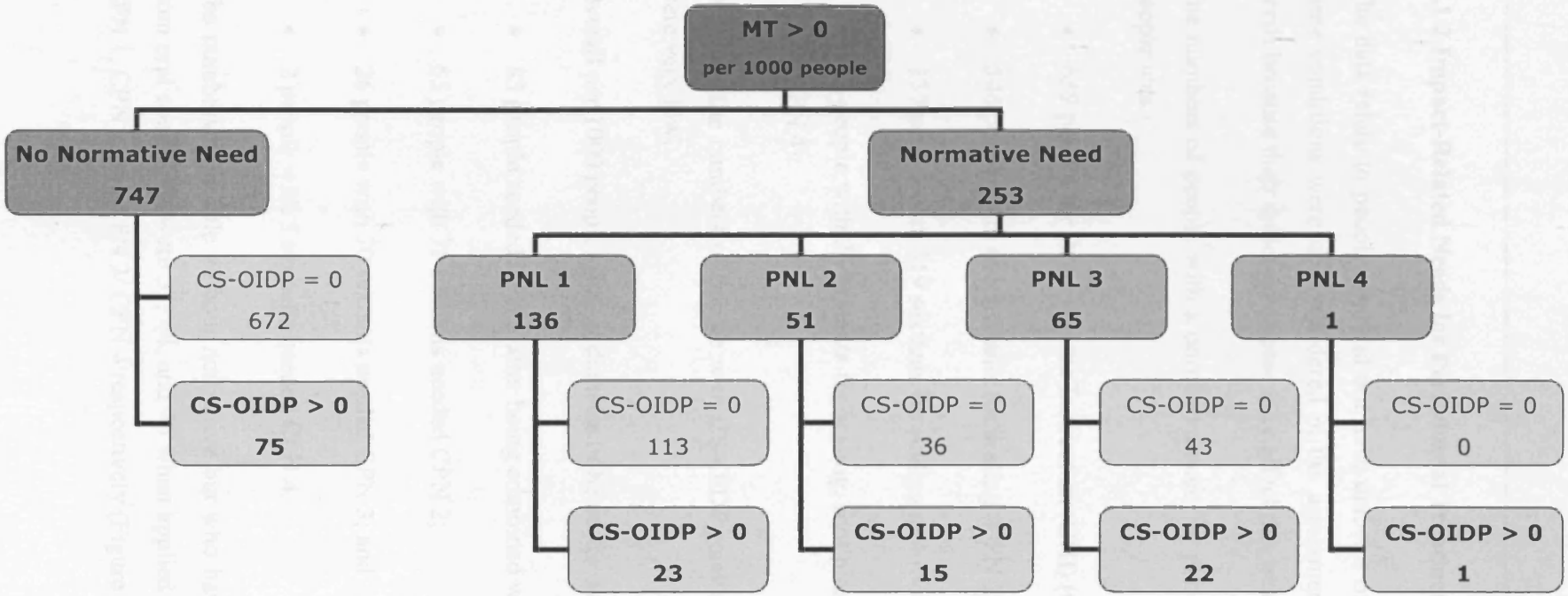


Figure 8.2 The model for Impact-Related Need (IRN) of prosthetic treatment in lower jaw per 1000 people with missing teeth

8.1.2 Impact-Related Needs for Periodontal Treatment

The data relate to people who did not have diabetes or heart disease. People with these conditions were not considered in the assessment for periodontal treatment needs because their systemic disease may affect this treatment.

The numbers of people with a normative need for periodontal treatment per 1,000 people was:

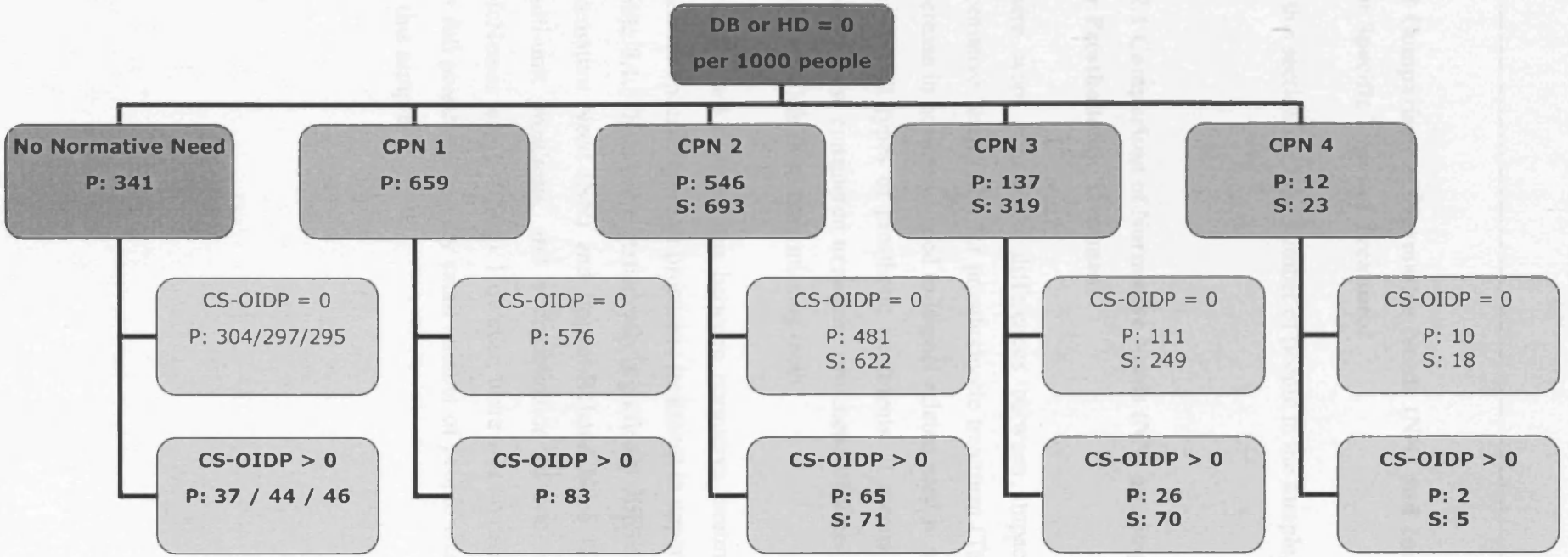
- 659 people for Oral Hygiene Instruction (OHI) (CPN 1);
- 546 people with 693 sextants for scaling (CPN 2);
- 137 people with 319 sextants for scaling and root planing (CPN 3); and
- 12 people with 23 sextants for scaling, root planing, and surgical procedure (CPN 4).

Of those, the numbers of people with CS-OIDP relating to periodontal conditions were very low.

Overall per 1000 people without diabetes or heart disease:

- 83 people needed CPN 1 after being combined with CS-OIDP;
- 65 people with 71 sextants needed CPN 2;
- 26 people with 70 sextants needed CPN 3; and
- 2 people with 5 sextants needed CPN 4.

The numbers of people without normative but who have felt that they had impact from oral conditions were 37, 44, and 46 when applied with different CS-OIDP for CPN 1, CPN 2, and CPN 3/ CPN 4 respectively (Figure 8.3).



P: Number of people

S: Number of sextants

Figure 8.3 The model for Impact-Related Need (IRN) of periodontal treatment per 1000 people without Diabetics or heart disease

8.2 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN): For Specific Types of Treatment

In this section the total number of people in the sample, 1029, was used.

8.2.1 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN) for Prosthodontic Treatment

There were significant differences between Impact-Related Need (IRN) and Normative Need (NN) for prosthodontic treatment (Table 8.1). There was a 72.9% decrease in normative need to impact-related need in upper jaw and 75.9% in lower jaw for all types of prosthetic treatments. It means around three fourths of the people to be considered to require prosthetic treatment did not have any impact on their daily life from their missing teeth.

The detailed comparisons between normative treatment need and impact-related need for specific types of prosthetic treatment in upper and lower jaws are shown in Table 8.1. There were statistically significant difference between the people with Normative Need (NN) and Impact-Related Need (IRN) for one-unit prosthesis, multi-unit prosthesis, and a combination of one- and/or multi-unit prostheses (McNemar test: $p<0.001$). However, there was no difference between NN and IRN for full prosthesis as very small number of people was affected from this condition in this sample.

Table 8.1 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN) for prosthetic treatment in 1029 subjects

Prosthetic treatment		NN	IRN	Decrease %	P value [a]
Total	Upper	129	35	72.9	**<0.001**
	Lower	199	48	75.9	**<0.001**
PN 1	Upper	57	11	80.7	**<0.001**
	Lower	107	18	83.2	**<0.001**
PN 2	Upper	32	9	71.9	**<0.001**
	Lower	40	12	70.0	**<0.001**
PN 3	Upper	37	13	64.9	**<0.001**
	Lower	51	17	66.7	**<0.001**
PN 4	Upper	3	2	33.3	=1.000
	Lower	1	1	0.0	=1.000

* a McNemar Test

8.2.2 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN) for Periodontal Treatment

There was a marked difference between Normative Need and Impact-Related Need for periodontal treatments (Table 8.2). Seventy to eighty per cent of people and teeth examined as normatively needing periodontal treatment did not have IRN.

For specific types of periodontal treatment, there were statistically significant differences between the people with Normative Need (NN) and Impact-Related Need (IRN) for periodontal treatments: 1) Oral Hygiene Instruction (OHI); 2) scaling; 3) scaling and root planing (all of them: $p<0.001$); and 4) scaling, root planing, and a surgical procedure ($p=0.002$). Also, the numbers of sextants with Impact-Related Need (IRN) for all kinds of periodontal treatments were significantly lower compared to the respective figures for Normative Need (NN) (Wilcoxon Signed Ranks test: $p<0.001$ and $p=0.004$).

Table 8.2 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN) for periodontal treatment in 1029 subjects

Periodontal treatment		NN	IRN	Decrease %	P value
CPN 1	People	633	80	87.4	**<0.001** [a]
CPN 2	People	525	63	88.0	**<0.001** [a]
	Sextants	671	69	89.7	**<0.001** [b]
CPN 3	People	132	25	81.1	**<0.001** [a]
	Sextants	309	68	78.0	**<0.001** [b]
CPN 4	People	12	2	83.3	**=0.002** [a]
	Sextants	23	5	78.3	**=0.004** [b]

* a McNemar Test
b Wilcoxon Signed Ranks Test

8.3 The application of comparison in Normative Needs (NN) and Impact-Related Needs (IRN) to workforce planning: For Specific Types of Dental Treatment

The timing for specific types of treatment was calculated from the data of the Korean research and the Ontario Dental Association (Canada) study (Kim et al. 1996; Ontario Dental Association 2001). They were rounded to the nearest decimal place.

8.3.1 The application of comparison in Normative Needs (NN) and Impact-Related Needs (IRN) to workforce planning for Prosthodontic Treatment

The timings for prosthetic treatment need are calculated with the data in the table from Chapter Five on Methods (Table 5.3). In the previous section treatment needs were illustrated separately, as upper jaw and lower jaw, but those were summed up in this part to compare timings by types of treatment per person (Table 8.3).

Table 8.3 The timings used for prosthetic treatments

Type of treatment			**Timing (mins)**	
PN 1	1 bridge: 2 crowns + 1 pontic		2×135 + 1×30	= 300
PN 2	1 partial denture		1×195	= 195
PN 3	1 partial denture + 1 bridge		1×195 + 1×(2×135 + 1×30)	= 495
PN 4	1 complete denture	Upper	1×165	= 165
		Lower	1×210	= 210
Total	N1×300 + N2×195 + N3×495 + N4U×165 + N4L×210			

N1	Number of PN 1	N4U	Number of PN 4 in upper jaw
N2	Number of PN 2	N4L	Number of PN 4 in lower jaw
N3	Number of PN 3		

The results showed that there were significant differences between NN and IRN (Table 8.4: $p<0.001$) except for prosthetic need of complete dentures ($p=0.317$). The latter finding for complete denture was in line with previous results, namely, that there was no difference between NN and IRN, due to the extremely low prevalence of NN for complete dentures in this study.

In total there was a 74% decrease in the time for the treatment of IRN compared with those with NN. The decreases in each type of prosthetic treatments are as follows:

- 82.3% in one-unit prosthesis (Bridges);
- 70.8% in multi-unit prosthesis (Partial dentures);
- 65.9% in one and/or multi-unit prostheses (Bridges and Partial dentures); and
- 23.4% in full prosthesis (Complete dentures).

Table 8.4 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN) for prosthetic treatment in total timings (unit: mins) (N=1029)

	NN	IRN	Difference		P value [a]
			NN – IRN	Decrease %	
Total	107505	28185	79320	73.8	**< 0.001**
PN 1	49200	8700	40500	82.3	**< 0.001**
PN 2	14040	4095	9945	70.8	**< 0.001**
PN 3	43560	14850	28710	65.9	**< 0.001**
PN 4	705	540	165	23.4	= 0.317

* a Wilcoxon Signed Ranks Test

Total timing data from the survey of 1029 were converted into the hours of prosthetic treatment for 100,000 people (Table 8.5). Thus 107,505 minutes in the sample for NN was converted into the 174,125 hours per 100,000 people and 28,185 minutes for Impact-Related Need (IRN) into 45,651 hours.

Table 8.5 Conversion of timings of Normative Needs (NN) and Impact-Related Needs (IRN) for prosthetic treatment into per 100,000 people

Prosthetic treatment	**Minutes**		**Hours**
	N=1029	**N=100,000**	**N=100,000**
NN	107,505	10,447,522	174,125
IRN	28,185	2,739,067	45,651

Then these results were transformed into the number of dentists required per 100,000 people using several assumptions for the annual working hours of a dentist, namely 2,000, 1,500, and 1,200 hours per year (Table 8.6). There was a decrease in number of dentists needed:

- 22.8 dentists are required to treat prosthetic conditions with Impact-Related Needs (IRN) per 100,000 people rather than 87.1 based on Normative Need (NN) if a dentist is assumed to work 2,000 hours per year.

Table 8.4 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN) for prosthetic treatment in total timings (unit: mins) (N=1029)

	NN	IRN	Difference		P value [a]
			NN – IRN	Decrease %	
Total	107505	28185	79320	73.8	**< 0.001**
PN 1	49200	8700	40500	82.3	**< 0.001**
PN 2	14040	4095	9945	70.8	**< 0.001**
PN 3	43560	14850	28710	65.9	**< 0.001**
PN 4	705	540	165	23.4	= 0.317

* a Wilcoxon Signed Ranks Test

Total timing data from the survey of 1029 were converted into the hours of prosthetic treatment for 100,000 people (Table 8.5). Thus 107,505 minutes in the sample for NN was converted into the 174,125 hours per 100,000 people and 28,185 minutes for Impact-Related Need (IRN) into 45,651 hours.

Table 8.5 Conversion of timings of Normative Needs (NN) and Impact-Related Needs (IRN) for prosthetic treatment into per 100,000 people

Prosthetic treatment	**Minutes**		**Hours**
	N=1029	**N=100,000**	**N=100,000**
NN	107,505	10,447,522	174,125
IRN	28,185	2,739,067	45,651

Then these results were transformed into the number of dentists required per 100,000 people using several assumptions for the annual working hours of a dentist, namely 2,000, 1,500, and 1,200 hours per year (Table 8.6). There was a decrease in number of dentists needed:

- 22.8 dentists are required to treat prosthetic conditions with Impact-Related Needs (IRN) per 100,000 people rather than 87.1 based on Normative Need (NN) if a dentist is assumed to work 2,000 hours per year.

- The numbers of dentists decreased from 116.1 for NN to 30.4 for IRN on the assumption of 1,500 hours working and
- 145.1 for NN to 38.0 for IRN with 1,200 hours working.

Table 8.6 Effect of varying assumptions for dentists working hours per year on the ratio of people and dentists in prosthetic treatment

Prosthetic treatment		Working time per dentist per year (hours)		
		2,000	1,500	1,200
Number of dentist per 100,000 people	NN	87.1	116.1	145.1
	IRN	22.8	30.4	38.0

8.3.2 The application of comparison in Normative Needs (NN) and Impact-Related Needs (IRN) to workforce planning for Periodontal Treatment

The treatment timings were multiplied by the number of sextants except for the Oral Hygiene Instruction (OHI), which is counted per person rather than per sextant. Then they were summed up as total timings of need for one person (Table 8.7).

Table 8.7 The timings used for periodontal treatments

Type of treatment		Timing
CPN1	OHI[b]	7
CPN2	Scaling[a]	10×N2
CPN3	Scaling[a] + Root planing[a] (Anterior teeth)[a]	(10+27=37)×N3A
	Scaling[a] + Root planing[a] (Posterior teeth)[a]	(10+37=47)×N3P
CPN4	Scaling[a] + Root planing[a] + Surgical procedure[a] (Ant)	(10+27+57=94)×N4A
	Scaling[a] + Root planing[a] + Surgical procedure[a] (Pos)	(10+37+70=117)×N4P
Total[b]	7×(1/0) + 10×N2 + 37×N3A + 47×N3P + 94×N4A + 117×N4P	

a Per sextant
b Per person

1/0 1: If the highest CPI score 1 or more than 1
0: If the highest CPI score is less than 1

N2 Number of sextant with CPN2
N3A Number of sextant with CPN3 in anterior teeth
N3P Number of sextant with CPN3 in posterior teeth
N4A Number of sextant with CPN4 in anterior teeth
N4P Number of sextant with CPN4 in posterior teeth

The results of calculation showed statistically significant differences between NN and IRN for periodontal treatments (Table 8.8: $p<0.001$ and $p=0.005$). There was overall 82% decrease in the timing for the treatment of IRN compared with those for NN. The decreases in each type of treatments are as follows:

- 87.4% in Oral Hygiene Instruction (OHI);
- 89.7% in scaling;
- 77.9% in scaling and root planing; and
- 77.5% in scaling, root planing, and surgical procedure.

Table 8.8 Comparison of Normative Needs (NN) and Impact-Related Needs (IRN) for periodontal treatment in total timings (unit: mins) (N=1029)

	NN	IRN	Difference		P value [a]
			NN - IRN	Decrease %	
Total	27783	4941	22842	82.2	**<0.001**
CPN 1	4431	560	3871	87.4	**<0.001**
CPN 2	6710	690	6020	89.7	**<0.001**
CPN 3	14043	3106	10937	77.9	**<0.001**
CPN 4	2599	585	2014	77.5	**=0.005**

* a Wilcoxon Signed Ranks Test

Total timing data from the survey of 1029 were converted into the hours of periodontal treatment for 100,000 people (Table 8.9). Thus 27,783 minutes in the sample for Normative Needs (NN) became 45,000 hours per 100,000 people and 4,941 minutes for Impact-Related Needs (IRN) into 8,003 hours.

Table 8.9 Conversion of timings of Normative Needs (NN) and Impact-Related Needs (IRN) for periodontal treatment into per 100,000 people

Periodontal treatment	Minutes		Hours
	N=1029	N=100,000	N=100,000
NN	27,783	2,700,000	45,000
IRN	4,941	480,175	8,003

Then these results were transformed into the number of dentists required per 100,000 people using several assumptions for the working hours per year of dentist: 2,000, 1,500, and 1,200 hours per year (Table 8.10). There was decrease from 22.5 dentists using Normative Needs (NN) to 4.0 dentists to treat periodontal conditions with Impact-Related Needs (IRN) if a dentist is assumed to work 2,000 hours per year. The numbers of dentists decreased from 30.0 to 5.3 using the assumption of 1,500 hours working and from 37.5 to 6.7 with 1,200 hours working per year.

Table 8.10 Effect of varying assumptions for dentists working hours per year on the ratio of people and dentists in periodontal treatment

Periodontal treatment		Working time per dentist per year (hours)		
		2,000	1,500	1,200
Number of dentists	NN	22.5	30.0	37.5
per 100,000 people	IRN	4.0	5.3	6.7

CHAPTER 9

Results: Propensity-Related Need

CHAPTER 9. PROPENSITY-RELATED NEEDS (PRN) AND COMPARISON WITH NORMATIVE NEEDS (NN)

Assessing the propensities of people in relation to key behaviours is essential for calculating their treatment needs. Results (Chapter 6) were presented for the prevalence of the propensities in the study population and then the propensities are incorporated into the sociodental needs model. Then Propensity-Related Needs (PRN) are compared with Normative Needs (NN) estimates which do not include propensity into the assessment of needs.

9.1 Propensity-Related Treatment Needs (PRN): In Relation to Specific Types of Dental Treatment

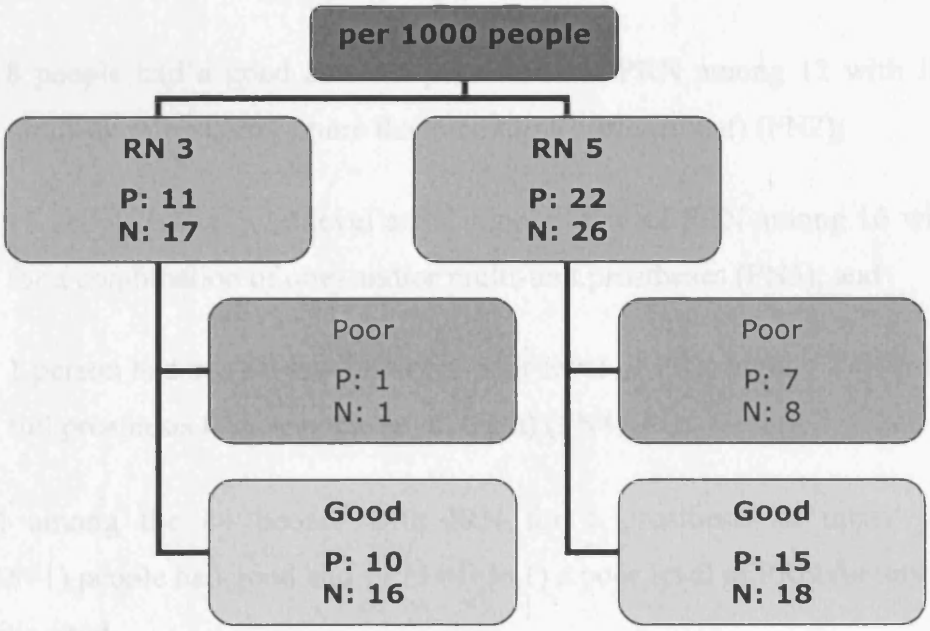
In the following section explanations are given of how Propensity-Related Treatment Need (PRN) was assessed for specific types of treatment, restorative, prosthetic, and periodontal treatment.

The number of people used in the modelling calculation was 1000 instead of the 1029 in the sample. To do that, 1029 was converted to a percentage to make extrapolations to general population easier. As we shall see in the final results the numbers of dentists per 100,000 people were calculated. So using 1000s was more appropriate. The prosthetic treatment needs are calculated separately for upper and lower jaws. For restorative and periodontal treatment, the sum of the need is not 1000 because one person can have several types of treatment needs.

9.1.1 Propensity-Related Needs for Restorative Treatment

Per 1000 people with using the index for the grade of propensity factor (poor or good) the restorative treatment needs were (Figure 9.1):

- 10 people with 16 teeth needing crown for any reason treatment had good level of PRN, and 1 person with 1 tooth in poor level of PRN (RN 3);
- 15 people with 18 teeth needing pulp care and restoration treatment were in good level of PRN, and 7 people with 8 teeth needing pulp care and restoration treatment were in poor level (RN 5).



P: Number of people

N: Number of teeth

Figure 9.1 The model for Propensity-Related Needs (PRN) of restorative treatment

9.1.2 Propensity-Related Needs (PRN) for Prosthetic Treatment

The data related to prosthetic needs obviously only applies to people with missing teeth.

Per 1000 people with one or more missing teeth using the index for the grade of propensity factors in relation to need for prosthesis in upper jaw (Figure 9.2):

- 9 people had a good level and 5 a poor level of PRN in one-unit prosthesis need for one tooth replacement (PN1) among 14 people with IRN ;
- 8 people had a good and 4 a poor level of PRN among 12 with IRN for multi-unit prosthesis (more than one tooth replacement) (PN2);
- 15 people had a good level and 1 a poor level of PRN among 16 with IRN for a combination of one- and/or multi-unit prostheses (PN3); and
- 1 person had a good level and 1 a poor level of PRN among 2 with IRN for full prosthesis (replacement of all teeth) (PN4).

Overall among the 44 people with IRN for a prosthesis in upper jaw, 33 (9+8+15+1) people had good and 11 (5+4+1+1) a poor level of PRN for any kind of prosthetic need.

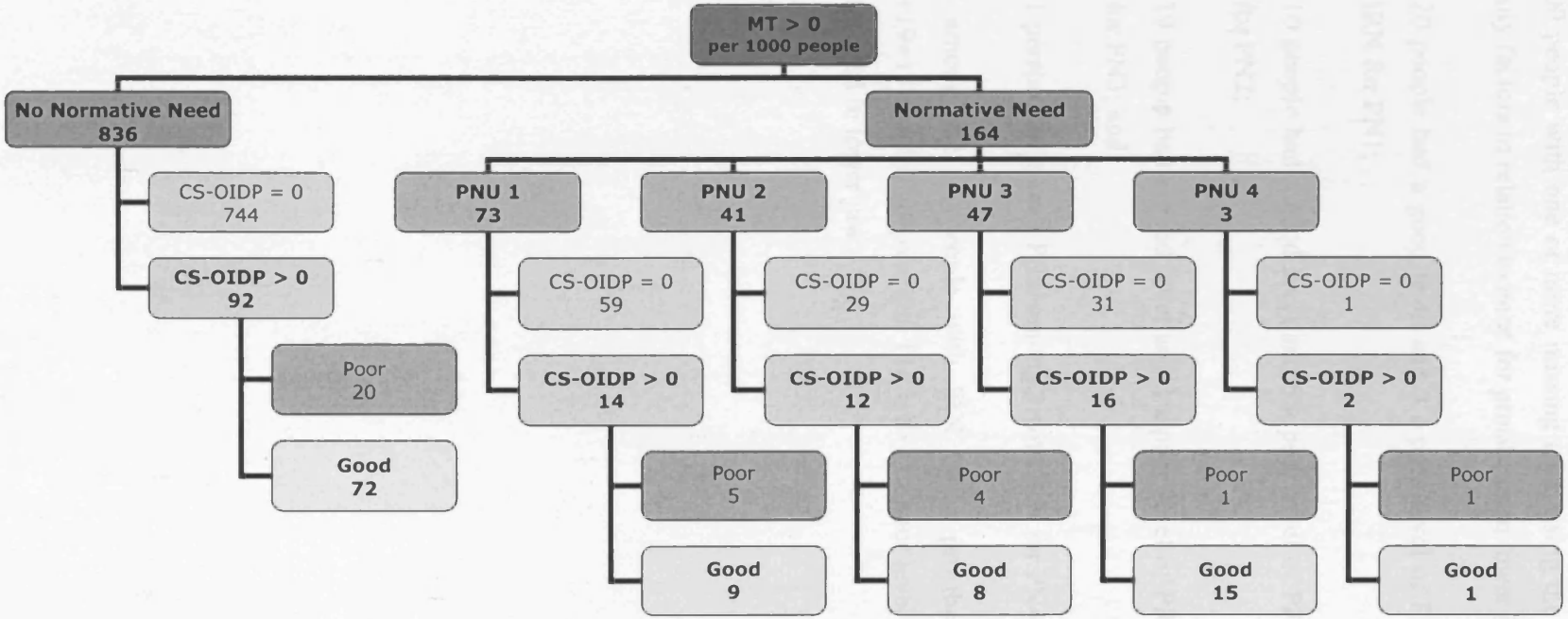


Figure 9.2 The model for Propensity-Related Needs (PRN) of prosthetic treatment in upper jaw per 1000 people with missing teeth

Per 1000 people with one or more missing teeth using the index for the grade of propensity factors in relation to need for prosthesis in lower jaw (Figure 9.3):

- 20 people had a good level and 3 a poor level of PRN among the 23 with IRN for PN1;
- 10 people had a good level and 5 a poor level of PRN among 15 with IRN for PN2;
- 19 people had a good level and 3 a poor level of PRN among 22 with IRN for PN3; and
- 1 person had a good PRN among 1 with IRN for PN4.

Overall among the 61 people with IRN for a prosthesis in lower jaw, 50 (20+10+19+1) people had good and 11 (3+5+3) a poor level of PRN for any kind of prosthetic need in lower jaw.

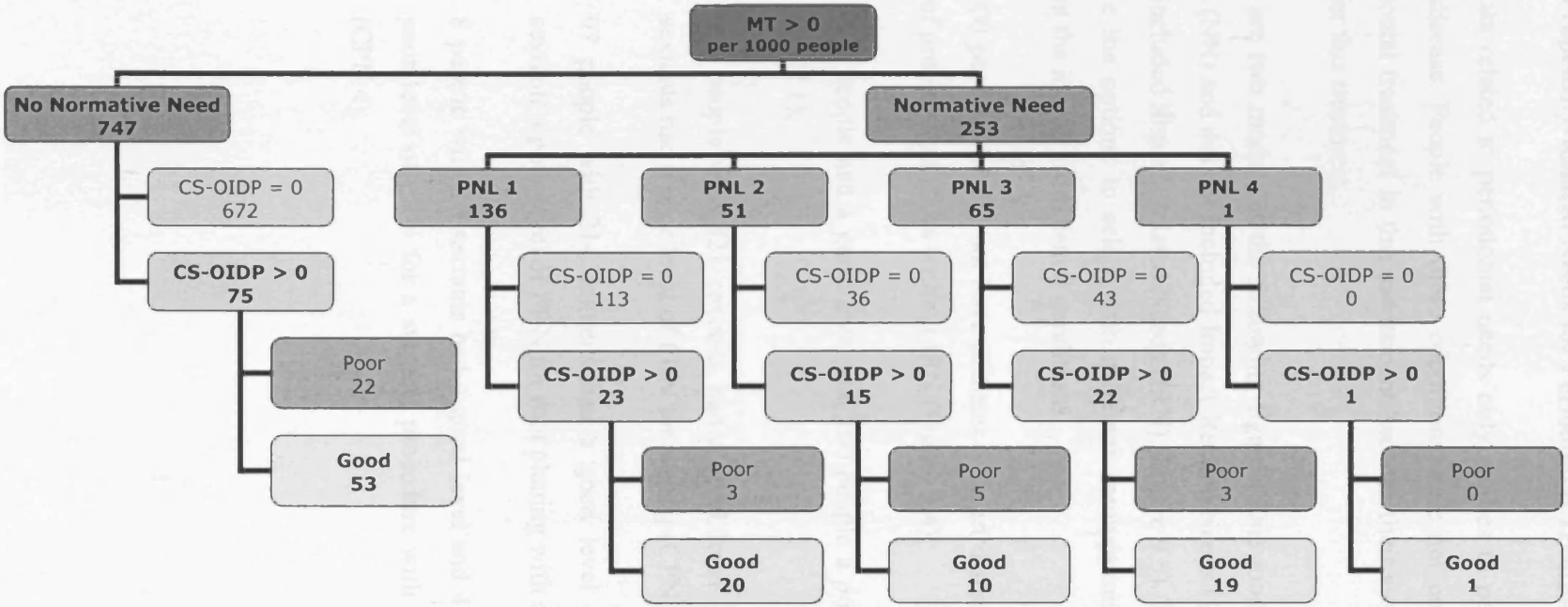


Figure 9.3 The model for Propensity-Related Needs (PRN) of prosthetic treatment in lower jaw per 1000 people with missing teeth

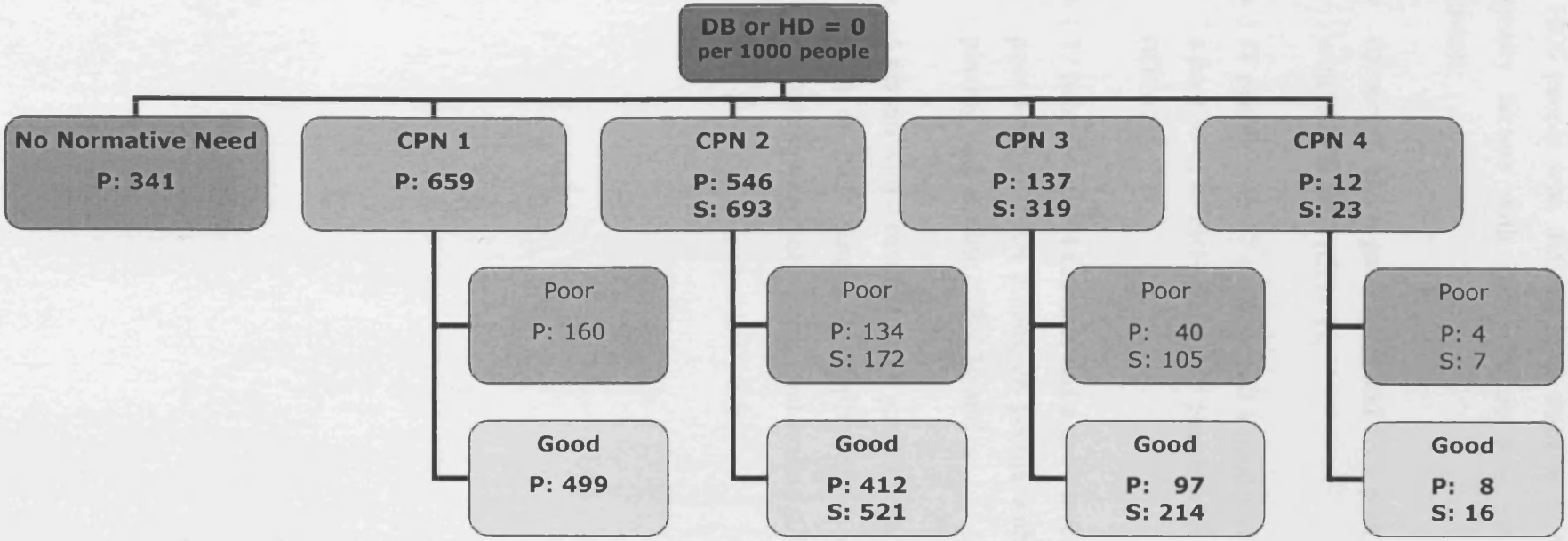
9.1.3 Propensity-Related Needs for Periodontal Treatment

The data related to periodontal needs only applies to people without diabetes or heart disease. People with these conditions were not considered for impacts for periodontal treatment in this assessment because their systemic disease may affect need for this treatment.

There are two models in the following figures: One model starts from Normative Needs (NN) and did not included Impact-Related Needs (IRN) (Figure 9.4); and the other included Impact-Related Needs (IRN) (Figure 9.5). Two models are presented to give the options to select with different assumptions whether they take into account the impact from dental conditions.

Per 1000 people who did not have diabetes or heart disease using the index for the grade of propensity factors without IRN (Figure 9.4):

- 499 people had a good level and 160 people a poor level of PRN for OHI (CPN 1);
- 412 people with 521 sextants had a good level and 134 people with 172 sextants had a poor level of PRN for scaling (CPN 2);
- 97 people with 214 sextants had a good level and 40 people with 105 sextants a poor level of PRN for root planing with scaling (CPN 3); and
- 8 people with 16 sextants had a good level and 4 people with 7 sextants a poor level of PRN for a surgical procedure with root planing, and scaling (CPN 4).



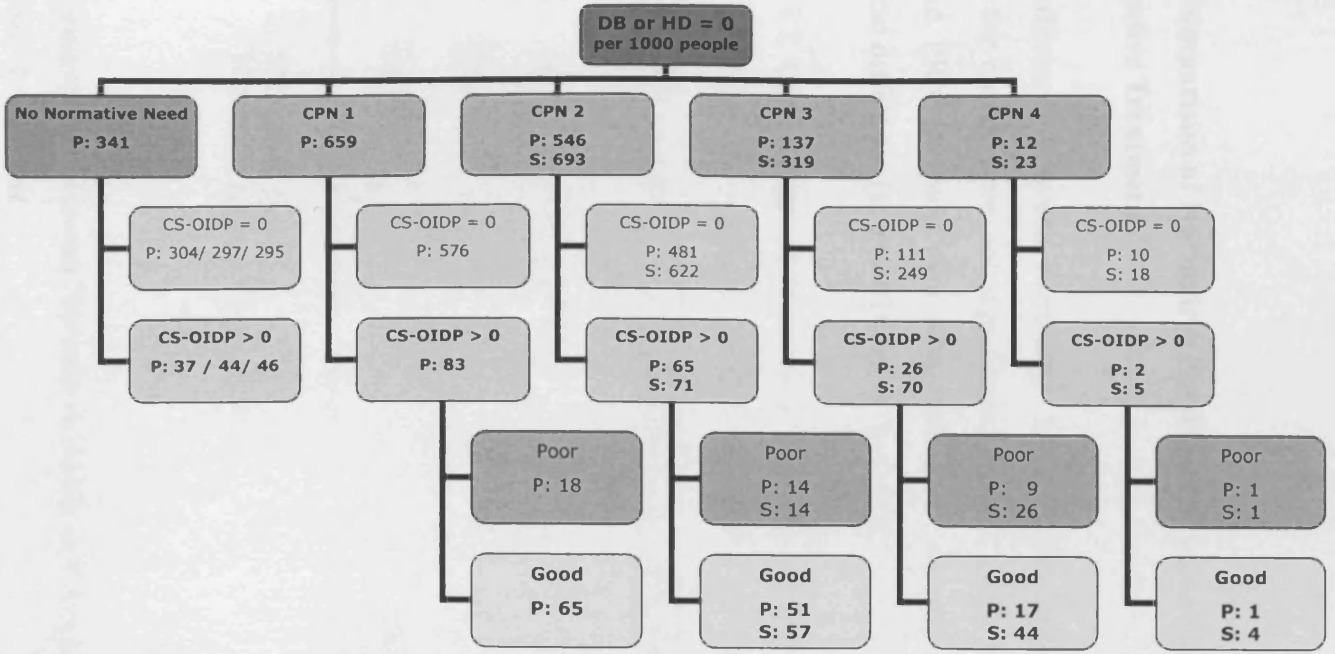
P: Number of people

S: Number of sextants

Figure 9.4 The model for Propensity-Related Need (PRN) of periodontal treatment per 1000 people without Diabetics or heart disease (without IRN)

Per 1000 people who did not have diabetes or heart disease using the grade of propensity factors with IRN (Figure 9.5) the following needed periodontal treatments:

- 65 people had a good level and 18 a poor level of PRN among 83 people with IRN in OHI (CPN 1);
- 51 people with 57 sextants had a good level and 14 people with 14 sextants a poor level of PRN among 65 people with 71 sextants with IRN for scaling (CPN 2);
- 17 people with 44 sextants had a good level and 9 people with 26 sextants a poor level of PRN among 26 people with 70 sextants with IRN for root planing with scaling (CPN 3); and
- 1 person with 4 sextants had a good level and 1 person with 1 sextant a poor level of PRN among 2 people with 5 sextants with IRN for surgical procedure with root planing, and scaling (CPN 4).



P: Number of people

S: Number of sextants

Figure 9.5 The model for Propensity-Related Needs (PRN) of periodontal treatment per 1000 people without Diabetics or heart disease (with IRN)

9.2 Comparison of Normative Needs (NN) and Propensity-Related Needs (PRN) For Specific Types of Treatment

In this section the total number of people in the sample, 1029, was used.

9.2.1 Comparison of Normative Needs and Propensity-Related Needs for Restorative Treatment

The differences between Normative Needs (NN) and Propensity-Related Needs (PRN) for crown were not significant (Table 9.1). Only the comparison between NN and PRN for pulp care plus restoration showed borderline significance in statistical difference (a: p=0.016 and b: p=0.011).

Table 9.1 Comparison of Normative Need (NN) and Propensity-Related Need (PRN) for restorative treatment in 1029 people and teeth units

Restorative treatment			Need	Decrease %	P value
RN 3	NN	People	11	-	-
		Teeth	17	-	-
	PRN	People	10	9.1	=1.000 [a]
		Teeth	16	5.9	=0.317 [b]
RN 5	NN	People	23	-	-
		Teeth	27	-	-
	PRN	People	16	30.4	=0.016 [a]
		Teeth	19	29.6	=0.011 [b]

* a McNemar Test
b Wilcoxon Signed Ranks Test

9.2.2 Comparison between Normative Needs and Propensity-Related Needs for Prosthetic Treatment

The difference between Normative Needs (NN) and Propensity-Related Needs (PRN) for prosthetic treatment was statistically significant (p<0.001) (Table 9.2). The decrease was around 79% in total. Each type of prosthetic need had significant

differences for the comparison between NN and PRN ($p<0.001$) except full prosthesis ($p>0.05$). The comparison between Impact-Related Needs (IRN) and Propensity-Related Needs (PRN) was significant only for total prosthetic counts ($p=0.004$ and $p=0.008$). None of the specific treatments showed a statistical significance between IRN and PRN.

Table 9.2 Comparison of Propensity-Related Needs (PRN) with Normative Needs (NN) and Impact-Related Needs (IRN) for prosthetic treatment in 1029 subjects

Prosthetic treatment			**Need**	**% Decrease from**		**P value (PRN:) [a]**	
				NN	**IRN**	**NN**	**IRN**
Total	NN	Upper	129	-		-	-
		lower	199	-		-	-
	IRN	Upper	35	72.9	-	**<0.001**	-
		lower	48	75.9	-	**<0.001**	-
	PRN	Upper	26	79.8	25.7	**<0.001**	**=0.004**
		lower	40	79.9	16.7	**<0.001**	**=0.008**
PN 1	NN	Upper	57	-		-	-
		lower	107	-		-	-
	IRN	Upper	11	80.7	-	**<0.001**	-
		lower	18	83.2	-	**<0.001**	-
	PRN	Upper	7	87.7	36.4	**<0.001**	=0.125
		lower	16	85.0	11.1	**<0.001**	=0.500
PN 2	NN	Upper	32	-		-	-
		lower	40	-		-	-
	IRN	Upper	9	71.9	-	**<0.001**	-
		lower	12	70.0	-	**<0.001**	-
	PRN	Upper	6	81.3	33.3	**<0.001**	=0.250
		lower	8	80.0	33.3	**<0.001**	=0.125
PN 3	NN	Upper	37	-		-	-
		lower	51	-		-	-
	IRN	Upper	13	64.9	-	**<0.001**	
		lower	17	66.7	-	**<0.001**	
	PRN	Upper	12	67.6	7.7	**<0.001**	=1.000
		lower	15	70.6	11.8	**<0.001**	=0.500
PN 4	NN	Upper	3	-		-	-
		lower	1	-		-	-
	IRN	Upper	2	33.3	-	=1.000	-
		lower	1	0.0	-	=1.000	-
	PRN	Upper	1	66.7	50.0	=0.500	=1.000
		lower	1	0.0	0.0	N.A.	N.A.

* a McNemar Test

9.2.3 Comparison of Normative Needs and Propensity-Related Needs for Periodontal Treatment

There were marked differences between Normative Needs and Propensity-Related Needs for periodontal treatment. The gap between these two needs varied from 24.3% to 91.8% (Table 9.3).

For specific types of periodontal treatment, there were statistically significant differences between the people and the number of sextants with Normative Needs (NN) and Propensity-Related Needs (PRN) (Table 9.3): 1) oral hygiene instruction (OHI); 2) scaling; 3) scaling and root planing; and 4) scaling, root planing, and a surgical procedure ($p<0.01$) except PRN without IRN in CPN 4 for complex therapy ($p=0.125$ and $p=0.066$). Also the Propensity-Related Needs (PRN) for most of periodontal treatments were significantly lower than the figures for Impact-Related Needs (IRN) ($p<0.01$) except PRN with IRN in CPN 4 ($p=1.000$ and 0.317).

Table 9.3 Comparison of Propensity-Related Needs (PRN) with Normative Needs (NN) and Impact-Related Needs (IRN) for periodontal treatment in 1029 people and sextants units

Periodontal treatment			Need	%Decrease from		P value	
				NN	IRN	NN:	IRN:
CPN 1	NN	people	633		-	-	-
	PRN without IRN	people	479	24.3	-	**<0.001** [a]	-
	IRN	people	80	87.4	-	**<0.001** [a]	-
	PRN with IRN	people	63	90.0	21.3	**<0.001** [a]	**<0.001** [a]
CPN 2	NN	people	525		-	-	-
		sextants	671		-	-	-
	PRN without IRN	people	396	24.6	-	**<0.001** [a]	-
		sextants	505	24.7	-	**<0.001** [b]	-
	IRN	people	63	88.0	-	**<0.001** [a]	-
		sextants	69	89.7	-	**<0.001** [b]	-
	PRN with IRN	people	49	90.7	22.2	**<0.001** [a]	**<0.001** [a]
		sextants	55	91.8	20.3	**<0.001** [b]	**<0.001** [b]
CPN 3	NN	people	132		-	-	-
		sextants	309		-	-	-
	PRN without IRN	people	93	29.5	-	**<0.001** [a]	-
		sextants	206	33.3	-	**<0.001** [b]	-
	IRN	people	25	81.1	-	**<0.001** [a]	-
		sextants	68	78.0	-	**<0.001** [b]	-
	PRN with IRN	people	16	87.9	36.0	**<0.001** [a]	**=0.004** [a]
		sextants	42	86.4	38.2	**<0.001** [b]	**=0.007** [b]
CPN 4	NN	people	12		-	-	-
		sextants	23		-	-	-
	PRN without IRN	people	8	33.3	-	=0.125 [a]	-
		sextants	16	30.4	-	=0.066 [b]	-
	IRN	people	2	83.3	-	**=0.002** [a]	-
		sextants	5	78.3	-	**=0.004** [b]	-
	PRN with IRN	people	1	91.7	50.0	**=0.001** [a]	=1.000 [a]
		sextants	4	82.6	20.0	**=0.003** [b]	=0.317 [b]

* a McNemar Test
b Wilcoxon-Signed Rank Test

9.3 The application of comparison in Normative Needs (NN) and Propensity-Related Needs (PRN) to workforce planning: For Specific Types of Treatment

The timing for specific types of treatment was calculated from the data of the Korean research and the Ontario Dental Association (Canada) study (Kim et al.

1996; Ontario Dental Association 2001). The numbers of minutes were rounded to nearest decimal place.

9.3.1 The application of comparison in Normative Needs and Propensity-Related Needs for Restorative Treatment

The timings for restorative treatment needs are calculated with the data in the Table 5.3 from Chapter Five, on Methods (Table 5.3). The treatment timings were multiplied by number of teeth and then they were summed up as total timings for one person (Table 9.4).

Table 9.4 The timings used for restorative treatments

	Type of treatment			Timing (mins)		
RN 3	1 crown			1×135	=	135
RN 5	1 pulp care + 1 crown	1 canal	Incisors, canine, and lower premolar	1×120 + 1×135	=	225
		2 canal	Upper premolar	1×150 + 1×135	=	285
		3 canal	Upper molar	1×195 + 1×135	=	330
		4 canal	Lower molar	1×225 + 1×135	=	360
Total	= N3×135 + N51×165 + N52×225 + N53×330 + N54×360					

N3 Number of RN3
N51 Number of RN5 in incisors, canine, and lower premolar
N52 Number of RN5 in upper premolar
N53 Number of RN5 in upper molar
N54 Number of RN5 in lower molar

The calculation did not show significant differences between NN and PRN ($p<0.05$) (Table 9.5). In total there were 25 % decreases in treatment timings for PRN compared with that of NN. For the specific types of treatment the decreases were: 5.9% in crown for any reason; and 30.4% in pulp care with restoration.

Table 9.5 Comparison of Normative Needs (NN) and Propensity-Related Needs (PRN) for restorative treatment in total timings (N=1029)

Restorative treatment		Timings (mins)	Differences		P value [a]
			NN-PRN	%	
Total	NN	10890	-	-	
	PRN	8145	2745	25.2	= 0.011
RN 3	NN	2295	-	-	
	PRN	2160	135	5.9	= 0.317
RN 5	NN	8595	-	-	
	PRN	5985	2610	30.4	= 0.017

* a Wilcoxon Signed Ranks Test

Total timing data from the survey of 1029 were converted into hours of restorative treatment for 100,000 people (Table 9.6). Thus 10,890 minutes to treat NN was changed to 17,638 hours per 100,000 people; and 8,145 minutes for PRN into 13,192 hours respectively.

Table 9.6 Conversion of timings of Normative Needs (NN) and Propensity-Related Needs (PRN) for restorative treatment into per 100,000 people

Restorative treatment	Minutes		Hours
	N=1029	N=100,000	N=100,000
NN	10,890	1,058,309	17,638
PRN	8,145	791,545	13,192

Then these results were transformed into the numbers of dentists required per 100,000 people and several assumptions for the working hours per year of a dentist were applied namely that dentists could work 2,000, 1,500, and 1,200 hours a year (Table 9.7). There were slight decreases in dentists required to treat restorative conditions using Propensity-Related Needs (PRN) compared to Normative Need (NN); 6.6 compared to 8.8 if a dentist is assumed to work 2,000 hours per year. The

numbers of dentists needed decreased from 11.8 to 8.8 with the assumption of 1,500 hours working and 14.7 to 11.0 with 1,200 hours working.

Table 9.7 Effect of varying assumptions for dentists working hours per year on the ratio of people and dentists in restorative treatment

Restorative treatment		Working time per dentist per year (hours)		
		2,000	1,500	1,200
Number of dentists per 100,000 people	NN	8.8	11.8	14.7
	PRN	6.6	8.8	11.0

9.3.2 The application of comparison in Normative Needs and Propensity-Related Needs for Prosthetic Treatment

The timings for prosthetic treatment need are calculated with the data in the table from Chapter 5, on Methods. Upper and lower jaw timings were summed to compare by types of treatment per person, as in Chapter 8 (Table 8.3).

The comparison of timings between Normative Needs (NN) and Propensity-Related Needs (PRN) were statistically different ($p<0.001$) except the treatment for full prosthetic needs (Table 9.8). Overall the timing decreased by 78.3% when one compared PRN with NN. Almost half of the comparisons between Impact-Related Needs (IRN) and Propensity-Related Needs (PRN) were not statistically different for specific types of treatment. Only PRN in total, PN 1, and PN 2 had significant differences to IRN ($p<0.05$).

Table 9.8 Comparison of Propensity-Related Needs (PRN) with Normative Needs (NN) and Impact-Related Needs (IRN) for prosthetic treatment in total timings (N=1029)

Prosthetic treatment		**Timings (mins)**	**% Decrease from**		**P value[a]**	
			NN	**IRN**	**NN:**	**IRN:**
Total	NN	107505	-		-	
	IRN	28185	73.8	-	**<0.001**	-
	PRN	23370	78.3	17.1	**<0.001**	**=0.001**
PN 1	NN	49200	-		-	
	IRN	8700	82.3	-	**<0.001**	-
	PRN	6900	86.0	20.2	**<0.001**	**=0.034**
PN 2	NN	14040	-		-	
	IRN	4095	70.8	-	**<0.001**	-
	PRN	2730	80.6	33.3	**<0.001**	**=0.008**
PN 3	NN	43560	-		-	
	IRN	14850	65.9	-	**<0.001**	-
	PRN	13365	69.3	10.0	**<0.001**	=0.083
PN 4	NN	705	-		-	
	IRN	540	23.4	-	=0.317	-
	PRN	375	46.8	30.6	=0.157	=0.317

* a Wilcoxon Signed Ranks Test

Total timing data from the survey of 1029 for PRN were converted into hours of prosthetic treatment need for 100,000 people (Table 9.9). Thus 23,370 minutes for PRN of the people in the sample were equivalent to 37,852 hours per 100,000 people.

Table 9.9 Conversion of timings of Propensity-Related Needs (PRN) with Normative Needs (NN) and Impact-Related Needs (IRN) for prosthetic treatment into per 100,000 people

Prosthetic treatment	**Minutes**		**Hours**
	N=1029	**N=100,000**	**N=100,000**
NN	107,505	10,447,522	174,125
IRN	28,185	2,739,067	45,651
PRN	23,370	2,271,137	37,852

The timings were transformed into the number of dentists required per 100,000 people and several assumptions for the working hours per year of a dentist were applied; 2,000, 1,500, and 1,200 hours per year (Table 9.10). 87.1 dentists needed to treat Normative Needs (NN) for prosthetic conditions decreased to 18.9 dentists for PRN if a dentist is assumed to work 2,000 hours per year. The numbers of dentists also decreased; from 116.1 dentists to 25.2 when the assumption of 1,500 hours per year was applied and from 145.1 dentists to 31.5 dentists when 1,200 hours working assumed.

Table 9.10 Effect of varying assumptions for dentists working hours per year on the ratio of people and dentists in prosthetic treatment

Prosthetic treatment		**Working time per dentist per year (hours)**		
		2,000	**1,500**	**1,200**
Number of dentists needed per 100,000 people	NN	87.1	116.1	145.1
	IRN	22.8	30.4	38.0
	PRN	18.9	25.2	31.5

9.3.3 The application of comparison in Normative Needs and Propensity-Related Needs for Periodontal Treatment

The treatment timings were multiplied by number of sextants except for oral hygiene instruction (OHI), which is counted as person units rather than sextants. Then they were summed up as total timings within one person, as in Chapter 8 (Table 8.7).

The results of calculation showed statistically significant differences between NN and PRN (Table 9.11, a) except for CPN 4 without IRN. The decreases were 29.5% for PRN without IRN and 87.9% for PRN with IRN compared with those for NN. They ranged from 24.3% to 91.8% in timing for specific types of treatment (Table 9.11).

Table 9.11 Comparison of Propensity-Related Needs (PRN) with Normative Needs (NN) and Impact-Related Needs (IRN) for periodontal treatment in total timings (N=1029)

Periodontal treatment		**Timings (mins)**	**% Decrease from**		**P value[a]**	
			NN	**IRN**	**NN:**	**IRN:**
Total	NN	27783	-		-	
	PRN without IRN	19598	29.5	-	**< 0.001**	-
	IRN	4941	82.2	-	**< 0.001**	-
	PRN with IRN	3373	87.9	31.7	**< 0.001**	**<0.001**
CPN 1	NN	4431	-		-	
	PRN without IRN	3353	24.3	-	**< 0.001**	-
	IRN	560	87.4	-	**< 0.001**	-
	PRN with IRN	441	90.0	21.3	**< 0.001**	**<0.001**
CPN 2	NN	6710	-		-	
	PRN without IRN	5050	24.7	-	**< 0.001**	-
	IRN	690	89.7	-	**< 0.001**	-
	PRN with IRN	550	91.8	20.3	**< 0.001**	**<0.001**
CPN 3	NN	14043	-		-	
	PRN without IRN	9392	33.1	-	**< 0.001**	-
	IRN	3106	77.9	-	**< 0.001**	-
	PRN with IRN	1914	86.4	38.4	**< 0.001**	**=0.007**
CPN 4	NN	2599	-		-	
	PRN without IRN	1803	30.6	-	= 0.066	-
	IRN	585	77.5	-	**= 0.005**	-
	PRN with IRN	468	82.0	20.0	**= 0.003**	=0.317

* a Wilcoxon Signed Ranks Test

Total timing data from the survey of 1029 for Propensity-Related Needs (PRN) were converted into hours of periodontal treatment need for 100,000 people using the method described in Chapter 8 (Table 9.12). Thus 19,598 minutes for the sample of PRN without Impact-Related Needs (IRN) was equivalent to 31,743 hours per 100,000 people and 3,373 minutes PRN with IRN into 5,463 hours per 100,000 people.

Table 9.12 Conversion of timings of Propensity-Related Needs (PRN) with Normative Needs (NN) and Impact-Related Needs (IRN) for periodontal treatment into per 100,000 people

Periodontal treatment	**Minutes**		**Hours**
	N=1029	**N=100,000**	**N=100,000**
NN	27,783	2,700,000	45,000
PRN without IRN	19,598	1,904,568	31,743
IRN	4,941	480,175	8,003
PRN with IRN	3,373	327,794	5,463

The timings were transformed into the number of dentists required per 100,000 people and several assumptions for the working hours per year of a dentist were applied; 2,000, 1,500, and 1,200 hours worked per year (Table 9.13). 22.5 dentists for Normative Needs (NN) to treat periodontal conditions decreased to 15.9 for PRN without IRN and to 2.7 dentists for PRN with IRN, if a dentist is assumed to work 2,000 hours per year. The numbers of dentists also decreased when the assumption of 1,500 hours per year applied; from 30.0 dentists of NN to 21.2 in PRN without IRN and 3.6 in PRN with IRN. Assuming 1,200 hours working a dentist per year the number of dentists needed was 37.5 dentists for NN and it decreased into 26.5 in PRN without IRN and 4.6 in PRN with IRN.

Table 9.13 Effect of varying assumptions for dentists working hours per year on the ratio of people and dentists in periodontal treatment

Periodontal treatment		**Working time per dentist per year (hours)**		
		2,000	**1,500**	**1,200**
Number of dentists needed to treat per 100,000 people	NN	22.5	30.0	37.5
	PRN without IRN	15.9	21.2	26.5
	IRN	4.0	5.3	6.7
	PRN with IRN	2.7	3.6	4.6

9.4 Summary

- The results of applying concepts commonly used in workforce planning showed significant differences between Normative Needs (NN) and Sociodental Needs, Impact-Related Needs (IRN) and Propensity-Related Needs (PRN) except restorative treatment needs which is borderline significance (Table 9.14).

- In total there was a 74% decrease in the time needed for the prosthetic treatment of Impact-Related Needs (IRN) compared with those for Normative Needs. For periodontal treatment there was an almost 82% decrease in the timing of IRN.

- In restorative treatment, there were 25% decreases in restorative treatment timings for PRN compared with those of NN; and 78.3 per cent for prosthetic treatment; and 29.5% for PRN without IRN or 87.9% for PRN with IRN in periodontal treatment.

Table 9.14 Summary Comparison of Sociodental Needs by total timings; Normative Needs (NN), Impact-Related Needs (IRN), and Propensity-Related Needs (PRN) (N=1029)

	Timings (mins)	**Difference % from**		**P value [a]**	
		NN	**IRN**	**NN:**	**IRN:**
Restorative treatment					
NN	10890	-	-	-	-
PRN without IRN	8145	25.2	-	=0.011	-
Prosthetic treatment					
NN	107505	-	-	-	-
IRN	28185	73.8	-	**<0.001**	-
PRN with IRN	23370	78.3	17.1	**<0.001**	**=0.001**
Periodontal treatment					
NN	27783	-	-	-	-
PRN without IRN	19598	29.5	-	**<0.001**	-
IRN	4941	82.2	-	**<0.001**	-
PRN with IRN	3373	87.9	31.7	**<0.001**	**<0.001**

* a Wilcoxon Signed Ranks Test

- There was a decrease in the number of dentists required to treat 100,000 people using several assumptions for the annual working hours of a dentist, namely 2,000, 1,500, and 1,200 hours per year (Table 9.15).

- There was slight decrease in restorative treatment needs; from 8.8 for NN to 6.6 for PRN assuming they worked 2,000 hours per year per dentist.

- Most significant differences were found in the prosthetic and periodontal treatment needs in this working hour assumption. The number of dentists required was 87.1 for NN in prosthetic treatment. That decreased to: 1) 22.8 dentists for IRN; and 2) 18.9 dentists for PRN with IRN.

- The change in dentists needed to treat periodontal conditions was similar but complicated because of several options. 22.5 dentists per 100,000 people for NN decreased to: 1) 15.9 dentists for PRN without IRN; 2) 4.0 dentists for IRN; and 3) 2.7 dentists for PRN with IRN. Similar decreases were found using varying assumptions for working hours of dentists.

Table 9.15 Summary: Effects of varying assumptions for dentists working hours on the ratio people and dentists needed

Number of dentists needed per 100,000 people	**Working hours per dentist per year**		
	2,000	**1,500**	**1,200**
Restorative treatment			
NN	8.8	11.8	14.7
PRN without IRN	6.6	8.8	11.0
Prosthetic treatment			
NN	87.1	116.1	145.1
IRN	22.8	30.4	38.0
PRN with IRN	18.9	25.2	31.5
Periodontal treatment			
NN	22.5	30.0	37.5
PRN without IRN	15.9	21.2	26.5
IRN	4.0	5.3	6.7
PRN with IRN	2.7	3.6	4.6

CHAPTER 10

Discussion

CHAPTER 10. DISCUSSION

There is a large difference between normative dental needs and perceived or sociodental dental needs in both child and adult populations (Adulyanon 1996; Srisilapanan 1997; Srisilapanan and Sheiham 2001; Srisilapanan et al. 2003; Gherunpong 2004; Gherunpong et al. 2006a; Gherunpong et al. 2006b). This study attempted to further contribute to knowledge on this issue by: 1) using a part of a large national survey to establish the demonstration of the differences between normative and sociodental needs; and 2) identifying the consequences of the differences between the two approaches for needs assessment in terms of personnel requirements.

This is the first study to apply some of the concepts from such important comparisons of normative and perceived needs to a sub-sample of a national survey population by linking this study as a part of a large National Oral Health Survey in South Korea. Moreover, the present study set out to assess the extent of the differences for the different types of dental treatment needs in adults; restorative, prosthetic and periodontal needs. In addition, the consequences of the differences in terms of timings (work hours) for dentists for doing the treatment between the two different approaches, normative and sociodental approaches were calculated to find out whether the gap in amounts of needs resulted in significant differences in numbers of dentists required to treat the needs.

Workforce estimates is one of the most necessary, but difficult, issues to solve in health care and dental planning (New Zealand Dental Association 2006; Deacon 2006; Hornby et al. 2006). There are at least four different workforce planning models (DeFriese and Barker 1982; Maupome et al. 2001): 1) need-based projection from manpower-to-population ratio; 2) demand-based manpower capacity utilisation survey; 3) econometric practice-productivity studies; and 4) need-based demand-weighted approach. However, not any of the four methods deals in detail with what we consider to be a vital aspect of manpower planning,

namely, how dental needs are assessed. Even the recent World Health Organisation model (1989) which uses the need-based demand-weighted approach, has serious limitations (Bronkhorst et al. 1991; Bourgeois et al. 1993; Morgan et al. 1994). Indeed, one of the problems with the WHO model is the lack of consideration of sociodental needs which include propensity and other important socio-environmental factors because estimates of demand are highly likely to be flawed by not considering perceived needs and social factors (Andersen and Newman 1973; McGrath and Bedi 1999; Scheutz and Heidmann 2001). Anderson (1973; 1995) suggested a 'Behavioural Model' which included environment, population characteristics, health behaviours and outcomes in health service utilisation. There are some studies which explore dental utilisation patterns according to Anderson's Model (Scheutz and Heidmann 2001; Gilbert et al. 2003). However, there has not been a study to apply those concepts into the assessment of oral health needs and workforce planning using the data from national dental surveys. The sociodental approach proposed by Sheiham and Spencer (2002) combines some of the above mentioned factors into assessment oral health needs. They overcome the shortcomings of professionally defined conventional needs assessment for health care and developed the broader measurements of dental health needs that include psychological and social dimensions (Section 2.3.1 and Figure 2.4). It thereby combines professional normative judgements as well as related sociodental impacts and behavioural propensity factors to assess appropriate dental treatment needs. The new comprehensive system was called the Socio-Dental Approach (SDA) to assessing dental needs (Sheiham and Spencer 2002; Gherunpong et al. 2006b).

A number of researchers have used the sociodental assessment tool (Srisilapanan and Sheiham 2001; de Oliveira and Sheiham 2003; Srisilapanan et al. 2003; Gherunpong 2004). They revealed that there is a 40 to 70 percent reduction in need using the sociodental approach compared to normative needs (Table 2.3). The findings in the present study support the findings from other studies that there is a large difference in dental assessment using the Normative Needs (NN) and the Socio-Dental Needs (SDN) such as Impact-Related Needs (IRN) and Propensity-Related Needs (PRN) (Chapters 8 and 9).

In the present Korean Study there were significant differences between Normative Needs (NN) and Impact-Related Needs (IRN) for prosthodontic and periodontal treatments. For prosthodontic treatment, there was a 72.9% decrease in needs for any type of prosthetic treatments in the upper jaw and 75.9% in lower jaw from Normative Needs to Impact-Related Needs (Table 8.1). In addition, almost 70 to 90 per cent of people and teeth examined as needing periodontal treatments did not have IRN (Table 8.2). That indicates that around three quarters of the people with normatively defined periodontal treatment need did not have any oral impact from those conditions on their daily life.

It is very important to include behavioural propensity when considering need, for as recommended by Matthew (1971) that need is based on the concept of ability to benefit. The differences between Normative Needs (NN) and Socio-Dental Needs (SDN) were much larger when propensity was included in the needs assessment. Propensity-Related Needs (PRN) was reflecting good level of behavioural propensity. The results were similar to those reported in previous studies (Adulyanon 1996; Srisilapanan 1997; 2003; Gherunpong 2004; 2006).

The difference between Normative Needs (NN) and Propensity-Related Needs (PRN) for restorative treatment was significant in borderline only for pulp care and restoration (Table 9.1). For prosthetic and periodontal treatment there were marked differences between NN and PRN. There was a 79% decrease in need for dentures in upper jaw and lower jaw (Table 9.2). However, the decrease in PRN of periodontal treatment was different whether Impact-Related Needs (IRN) were considered or not. The differences between NN and PRN ranged from 82.6% to 91.8% with IRN, while they were 24.3% to 33.3% without IRN (Table 9.3).

The timings were calculated based on minutes for each treatment. Those minutes were multiplied by the number of need types and summed up as total timings. The difference of the timings between Normative Needs (NN) and Impact-Related Needs (IRN) in this study sample was significant (Table 9.14). For the prosthetic treatment 107,505 minutes were required to satisfy the Normative Needs, but only 28,185 minutes for Impact-Related Needs on overall. The decrease was 79,320

minutes (73.8%) which is 1,322 hours. The difference in periodontal treatment was even more than prosthetics; 22,842 minutes (from 27,783 of NN to 4,941 of IRN, 82.2% decrease). The difference became wider when Propensity-Related Needs (PRN) was also considered; 84,135 minutes (from 107,505 to 23,370, 78.3%) in prosthetic treatment; and 24,410 minutes (from 27,783 to 3,373, 87.9%) in periodontal treatment. However, the difference between NN and PRN without IRN was not big as the difference with IRN. It was significant in periodontal treatment but not in restorative treatment even though the degree of decreased percentage was similar: 25.2% (from 10,890 to 8,145 minutes) in restorative treatment; and 29.5% (from 27,783 to 19,598 minutes) for periodontal treatment.

The timings required for treatment needs were converted into the number of dentists per 100,000 people (Table 9.15). The differences also showed up in planning for each specific type of treatment. For example, 8.8 dentists were needed to satisfy Normative Needs of restoration when assuming a dentist worked 2,000 hours per year. Then the number decreased into 6.6 with Propensity-Related Needs. The gap was more significant for prosthodontic and periodontal treatments. The required number of dentists for 100,000 people was 87.1 for Normative Needs (NN) of prosthodontic treatment. It decreased to 22.8 dentists after including oral impacts, and then to 18.9 with propensity factors. For periodontal treatment, 22.5 dentists per 100,000 people were needed to fulfil the normatively assessed needs. An even bigger difference was found between Normative Needs and Impact-Related Needs; only 4.0 dentists were necessary if one used Impact-Related Needs, a reduction of 18.5 dentists per 100,000 people. The gap between NN and PRN with IRN was wider than that between NN and IRN; 19.8 dentists. The difference between NN and PRN without IRN was smaller but significant, 6.6 dentists.

10.1 Descriptive results

The mean number of permanent natural teeth present was 27.1 (95% CI: 26.81 to 27.34). It was higher than those in the Korean National Oral Health Survey 2000

and 2003 (Table 10.1). The mean DMFT in this sample was 7.6 (95% CI: 7.29 to 7.95). This index was quite low in comparison with most other countries and the World Health Organisation (WHO) standard (2005). However it was slightly higher than the mean of the National Oral Health Survey 2000 and 2003 (Ministry of Health and Welfare 2001; 2004).

Table 10.1 Mean of the number of permanent natural teeth and DMFT index by age, Korean National Oral Health Survey 2000 and 2003 (Ministry of Health and Welfare 2001; 2004)

		2000		2003		This study	
		N	Mean	N	Mean	N	Mean
The number of permanent natural teeth							
Total		5764	26.1 *	2264	24.7 *	1029	27.1
Age	30-34	881	29.0	570	27.8	263	28.8
	35-44	1874	28.3	569	26.9	335	28.1
	45-54	1473	26.2	568	24.6	254	26.7
	55-64	1536	21.8	557	19.2	177	23.1
DMFT index							
Total		5764	6.0 *	2264	6.7 *	1029	7.6
Age	30-34	881	4.5	570	6.1	263	6.7
	35-44	1874	4.6	569	6.0	335	6.4
	45-54	1473	5.9	568	6.5	254	7.7
	55-64	1536	8.6	557	8.1	177	11.2

* approximate means from sub-sample of National Oral Health Survey data

Missing teeth was the main contributor to the DMFT index; the mean MT was 3.45, which was almost half (45.4%) the DMFT. Bridges were the most common prosthetic replacement in this sample. One fifth of the people had at least one bridge in upper (29.5%) or lower jaw (21.4%). All of the sociodemographic information showed statistically significant difference for the prosthetic status both in upper and lower dentures.

To assess sociodental treatment needs, the subjective measures and propensity factors were assessed by questionnaire. The overall prevalence of Oral Impacts on Daily Performance (OIDP) was nearly 40%. It was lower than in a previous Thai study for a similar age group, (35 to 44 year olds). They reported a prevalence of

73.6% (Adulyanon et al. 1996). But it was higher than in a Norwegian study for 45 to 66 year olds (17.9%) (Astrom et al. 2005). Significant differences in having oral impacts were shown between sexes and income groups; women and the lower income were more likely to have impacts from oral health conditions.

The people in this sample had relatively good oral health behaviours, except for the dental attendance pattern. Frequency of taking sugary snacks and smoking were significantly related with all demographic factors; age, sex, education, and income. Other oral health behaviours showed statistically significant relationship with a few indicators rather than all of them.

In this study the mean number of needs for restorative treatment was higher in the group of younger people, highly educated, and higher earning income. Especially the RN 1, one surface restoration, followed this pattern. This is opposite to complicated needs, such as more than two surface restoration and prosthetics, which showed that the lower Socio-Economic Status (SES) had more treatment needs. It could be explained with the distribution of natural teeth number analysed by sociodemographic information in Table 6.3. The younger, highly educated, or higher income had more natural teeth in their mouths. Because of higher number of teeth remaining they required more treatments, especially simpler surface restorations. Compared with prosthetic needs, these surface-restorative treatments were supposed to be easy to handle and less expensive. It can be concluded that lower SES groups required less single surface-restorations but more needs for complicated treatment such as prosthetic appliances.

Complicated prosthetic and periodontal treatment needs were smaller proportion than the others in this study. In particular, replacement for all teeth was the rarest need. One of the reasons for that may be the age of the sample which ranged from 30 to 64 years and did not include the elderly who usually need more complicated prosthetics. The other reason was that of the participants were workers and they had work related national health insurance financially supporting their oral health care.

10.2 Comparison between Normative Needs and Socio-Dental Needs: For Specific Types of Treatments

It was hypothesised that 'the proportion of the people and the mean number of treatment with sociodental needs will be smaller than those with normative needs' and 'the workforce timing with sociodental needs will be smaller than those with normative needs'. The findings of this study supported the hypothesis.

10.2.1 Restorative Treatments

For restorative care, the basic model of dental treatment needs was not used because caries is considered a progressive condition. In this case, Normative Needs (NN) should be the main method of assessment. Propensity-Related Needs (PRN) was used for crowns and pulp care as it was considered that if a person had poor oral hygiene the decision by the dentist to root fill and/or crown a tooth would be influenced by that behaviour. The difference between NN and PRN without Impact-Related Needs (IRN) was not significant in restorative needs (Table 9.1). Non-significant difference between NN and PRN shown in the treatment timings was probably because of the small numbers of cases needing advanced restorative treatments. Only 11 people had NN for crowns for any reason (RN3) among the 1029 sample. The numbers were higher in periodontal treatment needs, for example 633 people had a need for Oral Hygiene Instruction (OHI).

10.2.2 Prosthetic Treatments

The difference between NN and IRN or PRN was significant in prosthetic treatment (Table 9.2). The decrease in needs for prosthetic treatments and the smaller number of dentists needed have implications for oral health service planning. In this study the most common prosthodontic need was bridge(s), almost twenty to thirty per cent of all types of treatment (Table 7.3). Generally the prosthetic treatment needs aim to

replace missing tooth or teeth for complete dentition (World Health Organisation 1997). It is also recommended to maintain as many occluding pairs of natural teeth as possible (Gilbert et al. 2004). However, there are some studies questioning whether only the complete dentition can satisfy oral functional needs (Kayser 1979; Witter et al. 1990). Leao and Sheiham (1995) showed that the number of teeth and chewing ability were closely related, but it was not linear. The occlusion of complete dentition can be preferable, if possible, but it is neither attainable not necessary in dental or financial terms (Witter et al. 1999). The conventional approach aims to restore complete dental arches by morphological criteria. As a result, it has placed more emphasis on quantity in dental care (Kalk et al. 1993).

Kayser (1979) suggested the concept of a Shortened Dental Arch which means that 20 teeth, from premolar to premolar, are enough to satisfy people's needs in relation to appearance and function in people aged over 45 years. The conclusion was that for persons aged approximately 45 years with moderate occlusal activity, there was sufficient adaptive capacity to maintain adequate oral function in shortened dental arches when there were at least a minimum number of 20 teeth (six aesthetic anterior units and four premolar occlusal units).

It was suggested that the Shortened Dental Arch can provide long-term sufficient oral comfort which is absence of pain and distress, proper chewing ability, and appreciation for the appearance of the dentition (Witter et al. 1990). Witter et al. (1990) measured numerous aspects of oral comfort with Shortened Dental Arch. They used a term 'satisfactory chewing ability' which was defined by patients that reported normal eating habits and required no change in food selection or food preparation due to masticatory impairment. They found that subjective chewing ability had not been impaired by the absence of the molar teeth when 20 'well-distributed' teeth are left in the oral cavity. The relationship between oral function and Shortened Dental Arch was also researched in terms of occlusal stability and cranio-mandibular dysfunction (CMD) (Witter et al. 1994a; 1994b). The occlusal stability was measured with number of occlusal contacts in the anterior region, overbite, interdental spacing and alveolar bone support (Witter et al. 1994a). Their results showed that: 1) Shortened Dental Arches do provide durable occlusal

stability; 2) free-end RPD do not contribute to occlusal stability in Shortened Dental Arch; and 3) Shortened Dental Arch with periodontally involved teeth show continuing periodontal breakdown. For the cranio-mandibular dysfunction, they reported that the absence of molar support is not a risk factor for CMD (Witter et al. 1994b). There have been several studies which researched the relationship between dental condition and nutritional status as well. Many papers explored the relationship between number of natural teeth and dietary and nutritional status. They used the '20 or 21 teeth threshold' as a minimum requirement (Sheiham et al. 1999; Sheiham and Steele 2001; Shimazaki et al. 2001; Sheiham et al. 2001a; Yoshihara et al. 2005). They concluded that the 20 or more natural teeth had good dietary capability and optimum nutritional intake.

Elias and Sheiham (1998) reviewed papers on mouth satisfaction related to teeth position and number. They categorised the factors having the greatest influence on chewing performance as number of teeth, the number of occluding pairs, or the amount of occluding surfaces. The conclusion from their reviews are as follows; a less than complete dentition can satisfy oral functional needs; missing posterior teeth are not very important from a subjective aspect; masticatory ability is generally sufficient as long as 20 or more 'well-distributed' teeth remain, such as in cases of Shortened Dental Arch; and the demand for replacement of missing teeth is related to the position of missing teeth. The relationship between oral health status and oral impacts also has been measured (Tsakos et al. 2004a). Their findings were similar as other following studies: 1) positive relationship between numbers of missing teeth and impacts (Cushing et al. 1986; Locker and Slade 1994; Slade and Spencer 1994; Leao and Sheiham 1995; Slade et al. 1996; Srisilapanan and Sheiham 2001; Ekanayake and Perera 2004); and 2) significant relationship between oral impacts and occluding pairs of natural teeth (Locker and Slade 1994; Leao and Sheiham 1995; Rosenoer and Sheiham 1995; Tsakos et al. 2004b). The older dentate with at least 9 occluding pairs in total or at least 3 occluding pairs in anterior teeth were less likely to have severe oral health-related impacts (Tsakos et al. 2006). Shugars et al (2000) assessed the consequences of not replacing a missing posterior tooth. In this retrospective longitudinal studies the patients did not show

the expected adverse consequences which are normally assumed to be related with non-replacement of a single posterior tooth.

10.2.3 Periodontal Treatments

Two different approaches were applied for periodontal treatment in Propensity-Related Needs (PRN). One was treating periodontal conditions as life-threatening or chronic progressive condition, without Impact-Related Needs (IRN). The other was basic model for dental treatment needs, incorporating with IRN. The gap between Normative Needs (NN) and Impact-Related Needs (IRN) in the model of non-progressive condition was 78.0 to 89.7 per cent, which is large. This difference reflects how many people had impacts from each dental condition. The bigger differences between NN and IRN occur when few people have oral impacts as in the case of periodontal conditions. Also three subjective measures, perceived oral health condition, perceived oral health needs, and oral impact on daily performance, did not show any significant difference between the participants assessed as needing periodontal treatment and those without such need (Tables 7.16, 7.17, and 7.18).

Our findings were similar to those from previous studies which showed the discrepancy between periodontal treatment needs assessed by dental professionals and patients (Gilbert and Nuttall 1999; Taani and Alhaija 2003; Vered and Sgan-Cohen 2003; Blicher et al. 2005). Gilbert and Nuttall (1999) assessed the sensitivity and specificity of questionnaire items and a clinical index of gingival health and concluded that they were weakly predictive. They said this was due to lack of awareness of people of their periodontal conditions. Similar results were reported by Vered and Sgan-Cohen (2003) and Blicher et al. (2005). Robinson et al (1998) also found these discordances between self-assessment of questionnaires and normative measures from clinical surveys. They suggested that the perception of needs may be related to other factors such as experience and expectations of dental cares. Also the difference between health professionals and individuals is referred to an unequal development of clinical, in comparison with subjective criteria

(Locker 1988). Therefore, clinical criteria of measurement of oral health alone are not sufficient to satisfy an individual's well-being concerning their mouth (Cohen and Jago 1976; Smith and Sheiham 1980; Tuominen 1987; Ettinger 1987; Oosterhaven et al. 1988; Locker 1988; Reisine et al. 1989; Elias and Sheiham 1999). As mentioned by Robinson et al (1998) the questionnaires are not useful for direct assessing of dental treatment needs of individuals but they can warrant further investigation as a method for assessing the needs of adult population.

10.2.4 All types of treatments

The effectiveness and quality of oral health care should be evaluated and all clinical concepts may be questioned (Antczak-Bouckoms 1995). Because there is wide variation in clinical practices, many health practices do not result in expected health benefits although based on reasonable pathophysiologic grounds. Mazurat and Mazurat (2003) considered that treatment decisions should be made after discussion between the patient and the practitioner, in which the patient's chief complaint, behaviour, social environment and personality are considered. Communication with patients is important (Sondell et al. 2002; Sondell et al. 2004). Stohler (2005) mentioned three desired aspects of future prosthodontic research: first, patient-oriented research which incorporates diverse health issues has becomes critical; second, it is now a translational science concerning specific aspects of knowledge into widespread availability such as well-being, health economics and health disparity; at last, prosthodontic research needs to incorporate with "hot" topics in the health sciences. They include measures of well-being, to reduce health disparities and to allow access to preventive services for all. Without human, physical and financial assets, there can be no quality research; without addressing relevant questions, there will be no audience; and without Research and Development, there will be no future.

Therefore a systematic method such as sociodental approach which does consider perceived needs and impacts and behaviours is more important in the planning of

oral health. Rich and Goldstein (2002) consider that 'treatment planning is no longer simply a result of diagnosis. It is a complex process that involves a combination of diagnostic information, patient desires, evidence-based outcome data, and a thorough review of the treatment alternatives.' Therefore, the new socio-dental approach to assessing dental needs is the adaptation of this paradigm shift and the workforce application of this concept is necessary in oral health policy.

10.3 Methodological issues

The age group of this sample was 30 to 64 who are normally in working places (Section 5.1.2). The sample of this study, therefore, is typical of a working population.

Several points of Socio-Dental Approach (SDA) to assessing dental needs were modified from the previous study. The propensity factors in this study categorised into poor and good. In a previous study the grading system for each propensity factor was grouped as poor, moderate, and good (Gherunpong 2004). However, the vast majority of this sample would be categorised into good propensity level. Few of them were in the poor or moderate. Consequently, it was decided to apply two grades system in the grouping of propensity factors.

Frequency of toothbrushing per day was used as a measure of the propensity factor which affects outcome of dental treatments, especially restorative, prosthetic, and periodontal treatments. Previously the combination of several propensity factors was used (Gherunpong 2004). This approach was quite complicated and it was necessary to get better evidence to decide on the selection of factors and the way of combining them. As a result, only one propensity factors was selected to incorporate in this Socio-Dental Approach. It comes from the reasons that this is the most well known factor related with the oral health and convenient to show the difference in application of sociodental needs in the model.

To evaluate periodontal treatment needs, the community periodontal index (CPI) was used. The limitations of their usage were recognised by many researches (Cutress et al. 1987; Grytten et al. 1989; Baelum et al. 1993; Page and Morrison 1994; Lennon 1994; Lewis et al. 1994; Holmgren 1994; Benigeri et al. 2000). The CPI only measures bleeding (CPI 1), calculus (CPI 2), and gingival pocket more than 4mm (CPI 3 and 4). Other important signs of periodontal disease do not included, such as dental mobility and attachment loss (Cutress et al. 1987; Holmgren 1994). Another problem is the hierarchical concept of progression in periodontal disease which is doubted by different countries studies (Grytten et al. 1989; Baelum et al. 1993; Lewis et al. 1994). The CPI assumed that the severe periodontal conditions with higher index are also positive for the other conditions which are less severe. For example, the person with CPI 3 for 4-5 mm gingival pocket is regarded to have bleeding (CPI 1) and calculus (CPI 2) signs as well. However, it can not be true to all the periodontal conditions. They concluded that the hierarchical concept have a danger to overestimate the treatment need. Even with these disadvantages, the CPI index was applied in this study with following reasons: first of all easy to use; and secondly world-wide application (Gjermo 1994; Croxson and Purdell-Lewis 1994; Dini and Castellanos 1995) for international comparisons (World Health Organisation 1997). Especially most of the workforce planning (Manji and Sheiham 1986; Louw et al. 1989; Dini and Castellanos 1995) are based on the CPI, as well as the WHO model (World Health Organisation 1989). With these reasons above, the CPI index was applied to measure periodontal conditions and then translated into CPN, which is periodontal treatment needs (Section 5.4.5.3).

The relationship between smoking and sociodemographic factors shown in Table 6.20 was quite different to other studies (Townsend et al. 1994; Khang et al. 2004; Cho et al. 2004; Khang and Cho 2006). Less educated or people earning less income were more likely to be a non-smoker. The finding is related with sociodemographic distribution of this study. In this study, age and sex were related with Socio-Economic Status (SES) (Chapter 6, Table 6.2); the younger and men were more likely to be highly educated and earning more. Findings from the Korean National Survey data for general demographic information (Korean National

Statistical Office (KNSO) 2006) were supported the features in this sub-study. The data were collected in the National Survey for registration at five year intervals and the period of 1975 to 2000 was selected for the comparison with study sample. The educational change of Korean population was quite steep, especially the highly educated who finished high school and more (Table 10.2). The percentage of people who finished only elementary school or middle school increased with age but the percent of those with high school and over respectively decreased. Average income was divided by the mean of male and female and then multiplied with 100 to be a percentage (Table 10.3). The proportions of men's income to average income were higher through all of this period even though the difference between men and women was decreasing. In 1975 the males earned 60,319 won per month on average compared to females with 25,465 won.

Table 10.2 Distribution of education by age and sex; graduates and attendants in each level of school, Korean National Survey 2000 (Korean National Statistical Office (KNSO) 2006)

Age	Total	Elementary		Middle		High +	
	N	N	(%)	N	(%)	N	(%)
Total	42,168,811	4023228	(9.54)	3693314	(8.76)	22587813	(53.57)
30-34	4093228	39385	(0.96)	178909	(4.37)	3726266	(91.03)
35-44	8183289	485003	(5.93)	1209085	(14.78)	6127175	(74.87)
45-54	5302273	1086203	(20.49)	1232545	(23.25)	2615652	(49.33)
55-64	3757321	1338339	(35.62)	648735	(17.27)	1055608	(28.09)
Male	21,062,752	1475423	(7.00)	1620648	(7.69)	12293861	(58.37)
30-34	2068202	16832	(0.81)	72976	(3.53)	1885219	(91.15)
35-44	4146905	173504	(4.18)	427578	(10.31)	3323132	(80.14)
45-54	2681343	357895	(13.35)	519653	(19.38)	1614483	(60.21)
55-64	1796145	470138	(26.17)	347278	(19.33)	749340	(41.72)
Female	21,106,059	2547805	(12.07)	2072666	(9.82)	10293952	(48.77)
30-34	2025026	22553	(1.11)	105933	(5.23)	1841047	(90.91)
35-44	4036384	311499	(7.72)	781507	(19.36)	2804043	(69.47)
45-54	2681343	728308	(27.16)	712892	(26.59)	1001169	(37.34)
55-64	1796145	868201	(48.34)	301457	(16.78)	306268	(17.05)

Table 10.3 Distribution of population and income by sex, Korean National Survey 1975-2000 (Korean National Statistical Office (KNSO) 2006)

Population	Year	Total	Male		Female	
		N	N	(%)	N	(%)
	1975	34678972	17445246	(50.30)	17233726	(49.70)
	1980	37406815	18749306	(50.12)	18657509	(49.88)
	1985	40419652	20227564	(50.04)	20192088	(49.96)
	1990	43390374	21770919	(50.17)	21619455	(49.83)
	1995	44553710	22357352	(50.18)	22196358	(49.82)
	2000	45985289	23068181	(50.16)	22917108	(49.84)
Income	**Year**	**Average**	**Male**		**Female**	
		won	**won**	**(%)**	**won**	**(%)**
	1975	46654	60319	(129.29)	25465	(54.58)
	1980	150747	192589	(127.76)	85674	(56.83)
	1985	268766	328177	(122.11)	158486	(58.97)
	1990	501992	588320	(117.20)	323692	(64.48)
	1995	927891	1049646	(113.12)	628275	(67.71)
	2000	1313910	1473789	(112.17)	954292	(72.63)

Big differences were found in the percentage of people who smoked between men and women (Table 6.20); around half of the men (46.8%) were non-smokers but the percentage was extremely high for women, 97.9%. As previously shown in Table 6.2, female has less chance to be highly educated and to earn more income. Therefore women, who are mostly non-smokers, had a higher probability to belong to the group with less education or less earning income. After adjusting for age and sex, the odds ratio (OR) of becoming a smoker showed expected trends; higher education and higher income had smaller odds ratio (Table 10.4). There was no interaction between education/income and age/sex.

Table 10.4 Logistic regression of smoking, after adjusting with age and sex

Smoking (yes/no)		OR	P value	95% CI
Education	Elementary	1.00		
	Middle school	0.58	= 0.121	0.30 to 1.15
	High school and over	0.50	= 0.037	0.26 to 0.96
Income (1,000 won)	Under 1,000	1.00		
	1,000 and over	0.74	= 0.262	0.44 to 1.25

10.4 Conclusions

1. There were marked differences between Normative Needs (NN), Impact-Related Needs (IRN), and Propensity-Related Needs (PRN). The overall decrease of Impact-Related Needs ranged from approximately 72.9% and 89.7% from normative needs; 5.9% to 33.3% in the PRN without IRN; and 73.6% to 91.8% in the PRN with IRN. There were considerable differences between conventional workforce planning using Normative Needs and a new approach with sociodental needs including Impact-Related Needs (IRN) or Propensity-Related Needs (PRN). Overall the percentage reductions of timings for need using IRN compared to Normative Needs (NN) was 73.8% to 82.2%; 25.2% to 29.5% for PRN without IRN; and 78.3% to 87.9% for the PRN with IRN.

2. The difference between normative and sociodental assessed needs was also found in the number of dentists needed per 100,000 people. 8.8 dentists would be needed to treat normatively defined restorative treatment if a dentist work 2,000 hours per year. This number of dentists decreased to 6.6 dentists for Propensity-Related Needs (PRN). In case of prosthetic treatments 87.1 dentists are required to satisfy Normative Needs (NN), 22.8 dentists for Impact-Related Needs (IRN), and 18.9 for PRN.

3. There were two options for periodontal treatment considering as: 1) chronic progressive or life-threatening condition, without Impact-Related Needs (IRN); and 2) basic model for dental treatment needs, incorporating with IRN. 22.5 dentists are needed to deal with Normative Needs (NN). This decreased to 15.9 dentists for Propensity-Related Needs (PRN) without Impact-Related Needs (IRN); if Normative Needs applied with condition-specific oral impact on daily performance (CS-OIDP) they are decreased to 4.0 dentists as IRN, 2.7 dentists for PRN with IRN. The reduction was also found when a dentist was assumed to work 1,500 hours or 1,200 hours per year.

4. Filling(s) and dental bridge(s) were the most common restorative and prosthetic needs.

5. More than half of the people needed oral hygiene instruction (OHI) at least, as a principal periodontal treatment.

6. Socio-Economic Status (SES) affected the number and types of treatment needs; lower SES people required more complicated types of treatment and higher SES less complicated treatments.

10.5 Implications of the findings and recommendations for future research

10.5.1 Implications of the findings in this study

1. Sociodental approaches to estimate dental needs should be used to estimate needs in national oral health surveys. In an era which is health-oriented and patient-centred such an approach should not be ignored. The movement of decision process from professional to people is irreversible and necessary.

2. A broader application of this approach should be used in planning frameworks and governmental plans for dental workforce planning. Sociodental studies of dental needs would allow allocating the resources more efficiently. As shown in this study workforce planning using sociodental needs could lead to a more efficient distribution of dental personnel, a limited resource.

3. The sociodental approach is more reliable to apply in specific areas of dental care, for example prosthodontics and periodontology. This study suggests the number of dentists needed for specialised areas and should assist the debate and discussions about this subject in Korea.

10.5.2 Recommendation for future research

1. Apply the new sociodental dental needs assessment approach to assess dental needs and workforce types and numbers for diverse treatments and broad age groups in national dental surveys. This study was limited within adults age groups aged 30 to 64 years-old. There have been studies for sociodental needs in other age groups, for example elderly and children. If children and adolescents are added in this workforce planning framework, needs for orthodontic treatment can be assessed.

2. National dental surveys should include the assessment of sociodentally assessed needs on a subsection of the total survey population, because doing a sociodental assessment on all may be too expensive. It will permit comparisons of needs and manpower estimates and hopefully a shift towards a more sociodental approach.

3. Compare workforce planning according to the diverse options of treatment. The people who do not have impacts or poor behaviours were categorised as non-treatment groups. It is valid for this cross-sectional study. However, treatment is a dynamic and circular process. Longitudinal studies are needed to test the validity of the estimates of need from cross-sectional sociodental studies.

4. Several studies have shown large differences in the time for treatment in different working environments. In this study only number of dentists and their working hours was applied because it is easy to interpret and illustrate. However, it is important to assess manpower when professionals are combined with dental auxiliaries such as dental hygienists and dental assistants in future studies. Several options can be tested to give more realistic recommendations for oral health policy-makers.

5. Find reliable ways of combining propensity factors with each type of treatment needs. Previous studies have tried to apply several propensity factors for a treatment but the correlation between treatment and oral health

behaviours was weak. Improved evidence is needed to find out the behavioural factors which affect treatment.

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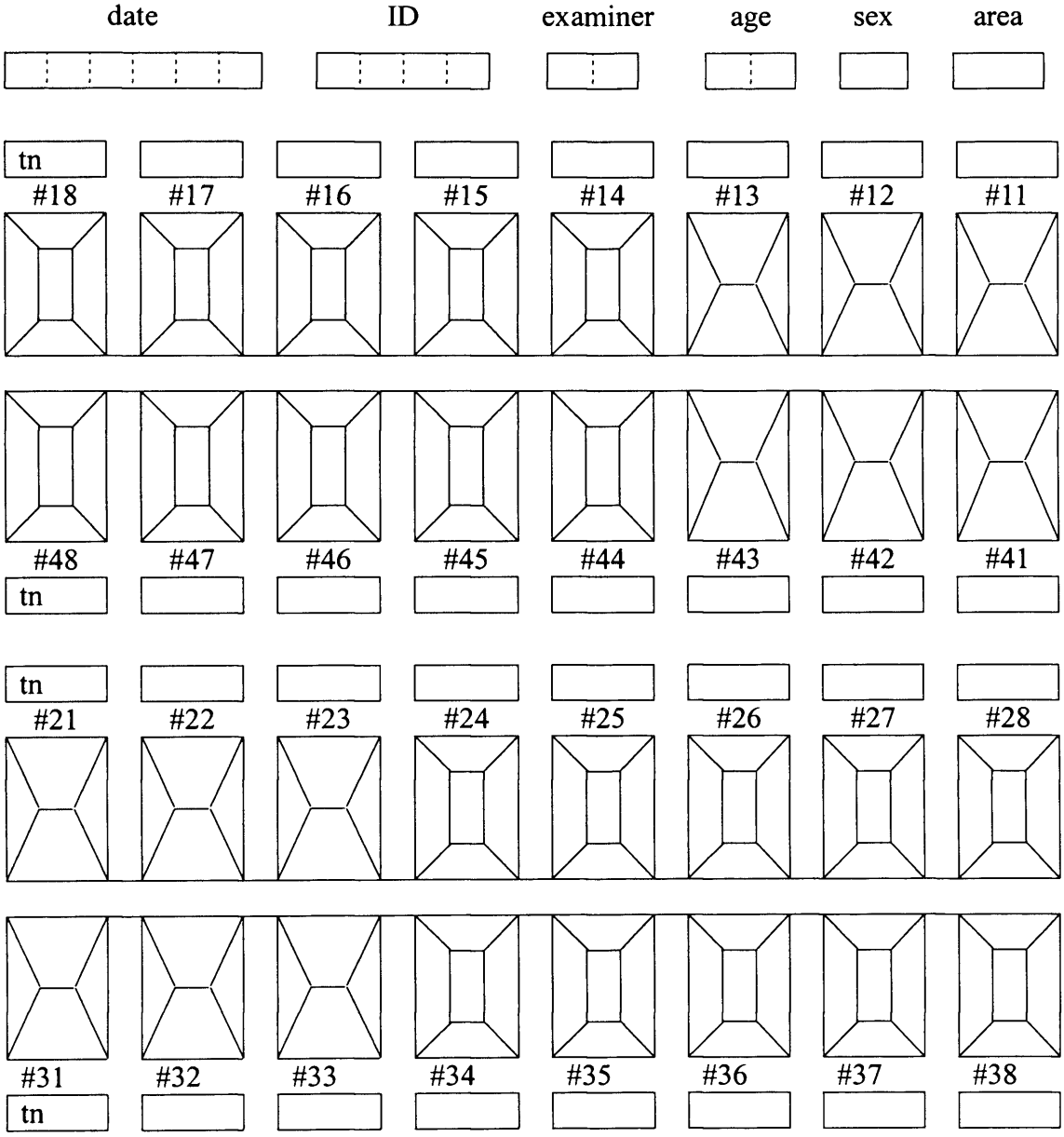
Appendices

APPENDIX 1. ORAL HEALTH ASSESSMENT (ENGLISH VERSION)

< FORM 1 >



TOOTH STATUS:

The criteria for diagnosis and coding (primary tooth codes within parentheses) for tooth status are:

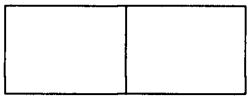
Code	Criteria
0	Sound surface
1	Decayed surface
3	Filled, with decay experienced
4	Missing, as a result of caries
5	Missing, any other reason
6	Fissure sealant
7	Filled, with no decay experienced
8	Unerupted tooth surface
9	Not recorded

TOOTH TREATMENT NEED:

The codes and criteria for treatment needs are:

Code	Criteria
0	None (no treatment)
1	One surface restoration
2	Two or more surface restorations
3	Crown for any reason
5	Pulp care and restoration
6	Extraction
7	Need for other care

PROSTHETIC STATUS



The presence of prostheses was recorded for both upper and lower jaw. The following codes were used:

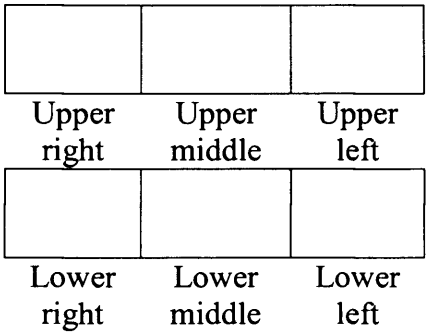
Code	Criteria
0	No prosthesis
1	Bridge
2	More than one bridge
3	Partial denture
4	Both bridge(s) and partial denture(s)
5	Full removable denture
9	Not recorded

PROSTHETIC NEED

The recording should be made on each jaw for the need of prostheses and the codes are as follows:

Code	Criteria
0	No prosthesis needed
1	Need for one-unit prosthesis (one tooth replacement)
2	Need for multi-unit prosthesis (more than one tooth replacement)
3	Need for a combination of one- and/or multi-unit prostheses
4	Need for full prosthesis (replacement of all teeth)
9	Not recorded

PERIODONTAL STATUS, COMMUNITY PERIODONTAL INDEX (CPI)



CPI was used for the record of periodontal status and the codes are as follows:

Code	Criteria
0	Healthy
1	Bleeding observed, directly or by using a mouth mirror, after probing
2	Calculus detected during probing, but all of the black band on the probe visible
3	Pocket 4-5mm (gingival margin within the black band on the probe)
4	Pocket 6mm or more (black band on the probe not visible)
X (5)	Excluded sextant (less than two teeth present)
9	Not recorded

< FORM 2 >

I. OROFACIAL TRAUMA (1-2)

1. Have you ever experienced fracture or loosing teeth from trauma?
   1) Yes **(go to question 2)**
   2) No **(go to question 3)**
2. What was the reason of dental trauma?
   1) Traffic accident
   2) Exercise
   3) Assault
   4) Falling down
   5) Others
   6) No answer
   7) Don't know

II. TEMPOROMANDIBULAR JOINT DISORDER (3-6)

3. Do you hear 'clicking' sound around your ear on one (or both) side(s) when you open your mouth now?
   1) Yes
   2) No
4. Do you feel pain around your ear on one (or both) side(s)?
   1) Yes
   2) No
5. Do you feel pain or discomfort when you open your mouth? (or do you have difficulty with opening?)
   1) Yes
   2) No
6. Have you ever received any treatment because of these symptoms?
   1) Yes
   2) No

III. NEED FOR IMMEDIATE CARE AND REFERRAL (7-8)

7. Does the interviewee need immediate care?
   1) Life-threatening condition (oral cancer or precancerous lesions) or other severe condition with clear oral manifestation **(go to question 8)**
   2) Pain or infection that needs oral manifestation **(go to question 8)**
   3) No **(go to question 9)**
8. Did you refer the interviewee to emergency care centre?
   1) Yes
   2) No
   3) No answer

IV. ILLEGAL DENTAL TREATMENT (9-11)

9. Have you ever received 'illegal' dental treatment?
   1) Yes **(go to question 10-11)**
   2) No **(go to question 12)**
10. Did you satisfied with that dental treatment?
   1) I didn't feel any discomfort
   2) I felt some of discomfort but it was okay
   3) It made me uncomfortable and irritable
   4) It was very uncomfortable (I use removable prosthetics only for eating food)
   5) No answer
11. How is the condition of illegal dental treatment now?
   1) It is okay
   2) There are some problems
   3) There are severe problems and need to be re-treated
   4) There are very severe problems and need immediate treatment
   5) No answer

V. ORAL CANCER (12-16)

12. Have you ever experienced oral cancer?
   1) Yes **(go to question 13-16)**

2) No **(no more questions)**

13. When did you know you have oral cancer? (When was the first time there were signs of cancer?)
    1) Under the age of 20
    2) Age of 20-29
    3) Age of 30-39
    4) Age of 40-49
    5) Age of 50-59
    6) Age of 60-69
    7) Over the age of 70
    8) No answer
    9) Don't know
14. How did you know you have oral cancer?
    1) Subjective symptom (pain or newborn tissue)
    2) During dental treatment
    3) During regular oral examination
    4) Others
    5) No answer
    6) Don't know
15. Who diagnosed as oral cancer finally?
    1) Dentist in dental clinic
    2) Dentist in health care centre
    3) Oral examiner
    4) Dentist in dental college hospital
    5) Medical doctor
    6) Other medical personnel
    7) It was not diagnosed
    8) No answer
    9) Don't' know
16. Where did or do you receive treatment for cancer?
    1) Dental clinic
    2) Dental clinic in general hospital
    3) Dental college hospital
    4) Other clinic

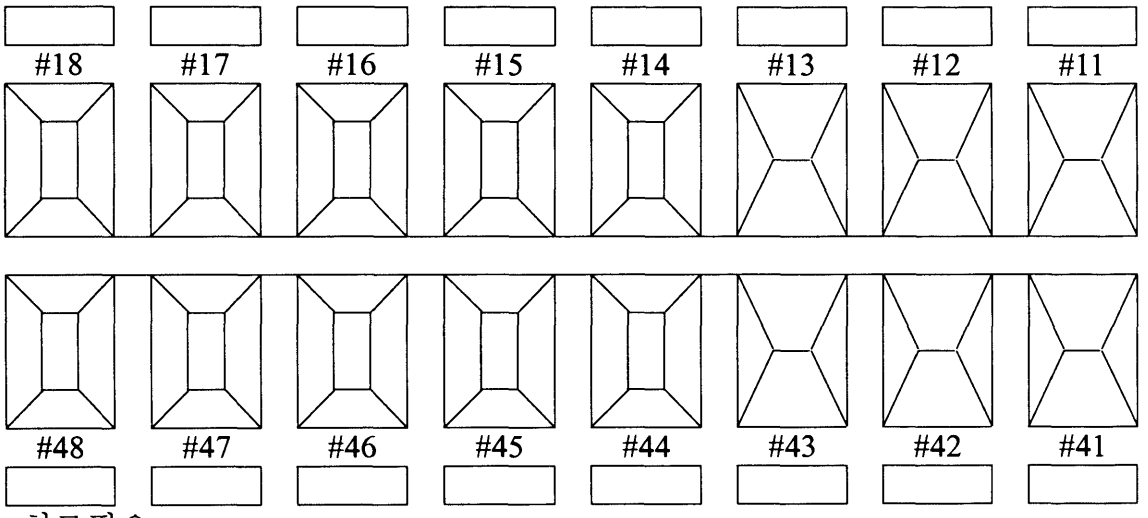
5) Don't receive treatment
6) No answer
7) Don't know

APPENDIX 2. ORAL HEALTH ASSESSMENT (KOREAN VERSION)

< 조사지 1 >

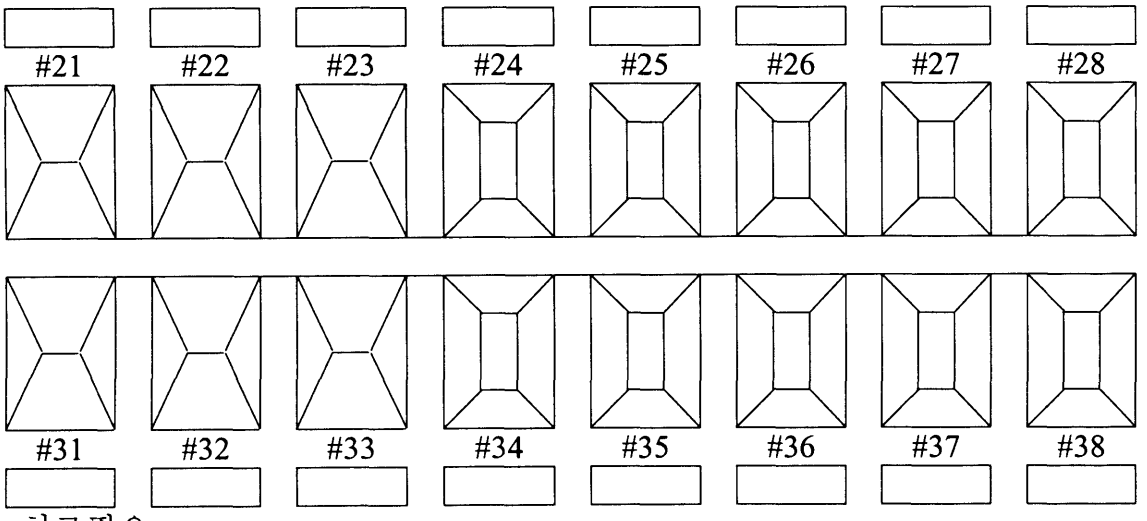
검사년월일 | 고유번호 | 조사자 | 나이 | 성별 | 지역

치료필요



치료필요

치료필요



치료필요

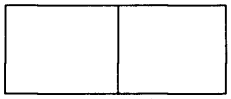
치아상태

코드	기준
0	건전치면
1	우식치면
3	우식경험처치치면
4	우식경험상실치면
5	우식비경험상실치면, 선천성 결손
6	전색치면
7	우식비경험처치치면
8	미맹출치면
9	기록불가치면

치료필요

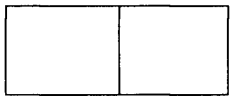
코드	기준
0	치료불필요
1	1치면 처치필요
2	2치면 이상 처치필요
3	인조치관수복필요
5	치수치료 및 수복필요
6	치아발거필요
7	기타 치료필요

보철물상태



코드	기준
0	보철물 없음
1	고정성가공의치 한 개
2	고정성가공의치 두 개 이상
3	국소의치만 있음
4	고정성가공의치와 국소의치가 공존함
5	총의치
9	기록불가

보철물필요



코드	기준
0	보철물 필요 없음
1	3단위 고정성가공의치 1개 필요
2	4단위이상 가공의치 혹은 국소의치 1개 필요
3	다수의 보철물 필요
4	총의치 필요
9	기록불가

치주조직검사

코드	기준
0	건전치주조직
1	출혈치주조직
2	치석형성치주조직
3	천치주낭형성치주조직 (4-5mm)
4	심치주낭형성치주조직 (6mm이상)
X (5)	제외(폐쇄삼분악)
9	기록불가

< 조사지 2 >

I. 악악면외상 (1-2)

1. 귀하께서는 외상으로 인해 치아가 깨지거나 빠졌던 적이 있었습니까?
   1) 예 **(2번 문항에 응답해 주십시오)**
   2) 아니오 **(3번 문항으로 가십시오)**
2. 치아를 다친 원인은 무엇입니까?
   1) 교통사고
   2) 운동 중에
   3) 구타
   4) 넘어짐
   5) 기타
   6) 해당없음
   7) 모름

II. 악관절장애 (3-6)

3. 현재 양쪽 (혹은 한 쪽) 귀 부근에서 입을 벌릴 때 '딸각'하는 소리가 납니까?
   1) 예
   2) 아니오
4. 현재 양쪽 (혹은 한 쪽) 귀 부근이 아픕니까?
   1) 예
   2) 아니오
5. 입을 벌릴 때 통증을 느끼셨거나 불편함을 느낍니까? (혹은 입이 잘 안 벌어집니까?)
   1) 예
   2) 아니오
6. 위와 같은 증상으로 인해 병원치료를 받은 적이 있습니까?
   1) 예

2) 아니오

III. 응급구강진료필요유무 (7-8)

7. 현재 피검자는 응급구강진료가 필요한 상황입니까?
   1) 생명을 위협하는 중대한 상태 **(8번 문항으로 가십시오)**
   2) 응급치료가 필요한 통증이나 감염상태 **(8번 문항으로 가십시오)**
   3) 아니오 **(9번 문항으로 가십시오)**
8. 현재 피검자를 응급구강진료기관에 의뢰하였습니까?
   1) 예
   2) 아니오
   3) 해당없음

IV. 부정치과시술 (9-11)

9. 귀하께서는 치과가 아닌 곳에서 무자격자에 의한 치과시술(야매)를 받아본 적이 있으십니까?
   1) 예 **(10-11번 문항에 응답해 주십시오)**
   2) 아니오 **(12번 문항으로 가십시오)**
10. 현재 그 치과시술 결과에 만족하십니까? (과거에 상태는 어떠하였습니까?)
    1) 불편함 없이 잘 사용하고 있다
    2) 약간 불편하긴 하지만 사용할만하다
    3) 불편하고 부작용이 있다
    4) 참기 힘들 정도로 불편하다 (가철성 보철물인 경우 식사시 이외에는 사용하지 않는다)
    5) 해당없음
11. 현재 부정치과시술 결과의 상태는 어떻습니까?
    1) 상태가 양호하다
    2) 약간 문제가 있다
    3) 문제가 심각하여 재진료의 필요가 있다
    4) 매우 심각한 문제가 있어 즉각적인 치료가 필요하다

5) 해당없음

V. 구강암 (12-16) (만 18세 이하는 조사하지 않음)

12. 귀하께서는 구강암에 걸린 적이 있습니까?

1) 예 **(13-16번 문항에 응답해 주십시오)**

2) 아니오 **(이후 해당사항 없음)**

13. 구강암에 걸렸다는 사실을 몇 세에 알았습니까?

1) 20세 미만

2) 20-29세

3) 30-39세

4) 40-49세

5) 50-59세

6) 60-69세

7) 70세 이상

8) 해당없음

9) 모름

14. 귀하는 구강암에 걸렸다는 사실을 어떻게 알았습니까?

1) 자각증상이 있었음 (통증 혹은 신생조직)

2) 일반치과진료 중에 우연히 발견

3) 정기구강검진 중에 발견

4) 기타

5) 해당없음

6) 모름

15. 구강암으로 최종 진단한 사람은 누구입니까?

1) 부근 치과의원 치과의사

2) 보건소 치과의사

3) 검진 치과의사

4) 병원 또는 종합병원 치과의사

5) 치과병원 또는 치과대학 부속병원 치과의사

6) 의사(치과의사 외)

7) 기타 의료인
8) 해당없음
9) 모름

16. 현재 혹은 과거에 구강암을 치료받았던 곳은 어디입니까?
1) 부근 치과의원
2) 병원 또는 종합병원
3) 치과병원 또는 치과대학 부속병원
4) 기타 진료기관
5) 치료받지 않음
6) 해당없음
7) 모름

APPENDIX 3. CRITERIA FOR ORAL EXAMINATION

Oral health status was assessed using dental mirrors, explorers, tweezers, and CPI probes under natural light. An oral health assessment form (Appendix 1) was developed to assess normative oral health status and treatment needs. Each category was scored according to the 'Clinical Criteria for the Oral Examination', which is mostly based on World Health Organisation criteria (1997) and modified by the Korean National Oral Health Survey. The measurements of clinical examination are used in Sociodental Needs Study (SNS) and the 2003 National Survey:

The purpose of guideline for clinical examination

This is the guideline of 2000 Korean National Oral Health Survey (KNOHS) and it aims to make a standard of clinical examination.

Oral examination team

A team consists of one examiner and one recording staff.

* The examiners can record by themselves when the team can not afford to do it. However, it is essential that examiner should not be tired because it can make mistakes.

Examination and order of record

The examination and record should be proceed in proper order, upper right, upper left, lower left, and lower right. Upper jaw should be examined and recorded from right to left and lower jaw from left to right. A tooth has the status of tooth and treatment need. The teeth should have both records before examining next teeth.

The teeth status should be recorded in either the primary or the permanent dentition and the treatment need is filled with a number.

* It is necessary to be careful for mixed dentition.

Sharp explorer is not recommended. However, it can be used in training and calibration but the pressure should be at least.

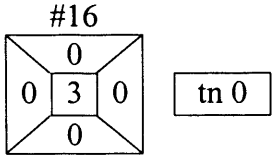
* This aims to prevent future caries processing from destroyed remineralised surface because of dental explorer. It can be used for removal of debris on tooth surface.

Calling out scores for the recorder

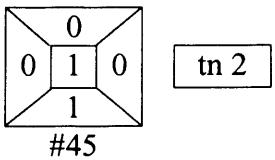
Each examiner calls out the scores so a recording clerk can print numbers clearly. The order of calling out the tooth status is: buccal, mesial, occlusal (posterior tooth), distal, and lingual surface. After then the treatment need is decided.

* The examples are following:

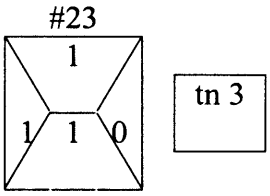
- "sixteen o, o, three, o, o T o" for upper right first molar filling (#16)



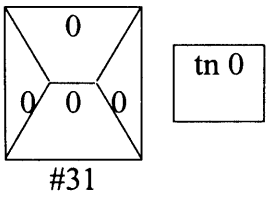
- "forty five o, o, one, o, one T two" for decayed lower right second premolar needed two or more surface treatment (#45)



- "twenty three one, one, one, o T three" for decayed upper left canine needed crown (#23)



- "thirty one all o T o" for sound lower left central incisor (#31)



"all o T o" or "all three T o" could be calling out when all surfaces are same score. T is inserted to differentiate between tooth status and treatment need.

Recording the scores

Numerals can be written large enough to fill the box when the scores are same for a tooth.

Sound surface could be left as empty even though the tooth also has decayed surfaces.

There can be continuous dentition only with sound surfaces. For example, call out "eighteen to fourteen all o" for sound teeth #18 to #14. Record "o" at #18 and #14 boxes with double line between them. It can be applied to the other conditions.

TOOTH STATUS

Selection of tooth for records

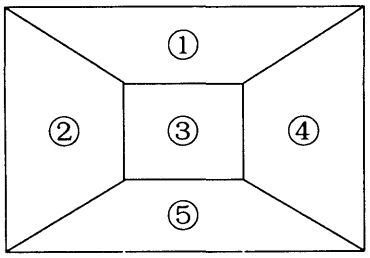
Four representative indices were used as the criteria of diagnosing and coding for tooth status: dental caries, prosthetic status, and periodontal status.

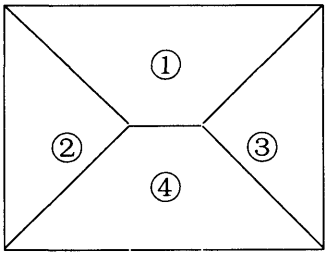
If a permanent and primary tooth are in same tooth space, only permanent tooth should be recorded.

* Even severe caries induce the eruption of permanent teeth, a primary tooth is not counted for DMFT index. It prevents overestimation of dental caries experience.

If both primary and permanent are absent and not extracted, the code is recorded as "unerupted permanent tooth".

The codes of tooth status





#18-14 (buccal, distal, occlusal, mesial, lingual surface)

#13-11 (buccal, distal, mesial, lingual surface)

#21-23 (buccal, mesial, distal, lingual surface)

#24-28 (buccal, mesial, occlusal, distal, lingual surface)

#48-44 (lingual, distal, occlusal, mesial, buccal surface)

#43-41 (lingual, distal, mesial, buccal surface)

#31-33 (lingual, mesial, distal, buccal surface)

#34-38 (lingual, mesial, occlusal, distal, buccal surface)

=> The number of total surface: 5*5+4*3+4*3+5*5+5*5+4*3+4*3+5*5=148 surfaces

The codes of tooth status are following:

0 Sound

1 Decayed

3 Filled, without decay

4 Missing, as a result of caries

5 Missing, any other reason

6 Fissure sealant

7 Filled, no decay

8 Unerupted tooth

9 Not recorded

* The same codes are used for both primary and permanent dentition. The code 2 of World Health Organisation (WHO) standards for "filled crown, with decay" is excluded because it is not useful. "Trauma (fracture)" is also excluded, with the reason of limited time and budget. The criteria of diagnosing and coding are limited within four representatives, dental caries, fluorosis, periodontal status, and prosthesis in National Survey of 2003.

Tooth surfaces

Posterior tooth is divided into 5 surfaces and they are buccal, mesial, occlusal, distal, and lingual surfaces. Anterior tooth is made up with 4 surfaces: buccal, mesial, distal, and lingual surfaces.

Each surface is separated by line angle and if there are special comments, it follows the instruction.

The imaginary midline separates the surfaces when the line angle is not clear.

The surface is defined as clinical crown including exposed root.

* Root status and treatment need are excluded in 2003 survey. The reasons of this decision: lack of budgets, limited time, poor condition of the examination, and low validity and reliability of the examiners caused from subjective judgement.

Primary tooth

Decayed and filling surfaces are only examined. Missing of primary tooth is not recorded.

* It is difficult to differentiate shedding teeth from decayed and the bias can be developed.

The primary tooth of the child aged over 10 or in 5^{th} grade of primary school is defined as "unerupted permanent tooth".

* The primary dentition index include only the children under 9 in 2003 survey and this is following WHO standards of primary dmft index.

Sound

Sound surface shows no evidence of treated, sealanted or untreated clinical caries processing.

A surface without softened floor or walls codes as sound. However, a primary anterior tooth defected by caries without softened floor or walls is coded as decayed.

* It allows Early Child Caries (ECC) to be recognised even they do not have softened floor or walls.

Decayed

Caries are recorded as present when a lesion in a pit or fissure, or on a smooth tooth surface, has an unmistakable cavity, undermined enamel, or a detectably softened floor or wall.

CPI probe could be used with at least pressure to confirm visual evidence of caries on the occlusal, buccal and lingual surfaces. In this case a surface is coded as decayed if softening is detected with CPI probe.

* CPI probe is limited to use not to destroy mineralised dental enamel. It should be used with at least pressure and without making noise.

A tooth is considered decayed when it has both caries and restorations.

A tooth with a temporary filling such as ZOE or ZPC should also be included in this category.

* Temporary crown is recognised as filling if it is not for abutment and all of the surfaces should be recorded as decayed.
A permanent filling destroyed partially or totally is recorded as decayed even though there is no detection of softened surface.
In cases where the crown has been destroyed by caries and only a part of the root is left, it is recorded as decayed, rather than missing.

Filled, without decay (with decay experienced)

A crown is considered filled without decay (with decay experienced), when one or more permanent restorations are present and there is no caries anywhere on the crown.
All of the surfaces in crown are filled, without decay (with decay experienced).
The filling including amalgam in primary or permanent tooth is also regarded as filled.

Missing tooth, as a result of caries

This code is used for permanent or primary teeth that have been extracted because of caries.
Examiner should ask the experience of caries. Missed permanent posterior tooth is coded "missing tooth" as a result of caries except third molars which have no clue for missing.
* The missed permanent anterior tooth is recorded as missing, for any other reason.
Imbedded implant fixture is regarded as missing tooth, as a result of caries or missing, for any other reason according to dental history.

Permanent tooth missing, for any other reason

This code is used for permanent teeth judged to be:

- Absent congenitally;
- Trauma;
- Extracted for orthodontic reasons;
- Because of periodontal disease;

- Preparation of prosthodontic treatment; or
- Missing anterior or posterior teeth without any reason.

Fissure sealant

This code is used for teeth in which a fissure sealant has been applied on the occlusal surface; or for teeth in which the occlusal fissure has been enlarged with a rounded or "flame-shaped" bur, and a composite material placed.
* A surface is recorded as fissure sealant if there is no caries even though sealant is fractured or worn. Recently resin fillings tend to cover with sealants and it is impossible to distinguish the differences with naked eyes. In this case, the code is "sealant" with admitted bias.

Filled crown, with no decay experience

This code is used for:

- Coronal status to indicate that a tooth forms part of a fixed bridge, i.e. a bridge abutment. * Exposed surface of prepped crown even without softened walls or floors is regarded as filling, with no decay experience rather than sound. If there are caries or filling, it is recorded as decayed or filling.
- Cosmetic crowns placed for reasons other than caries and veneers or laminates covering the labial surface of a tooth.
- The surface with orthodontic bracket and free from caries
- The crown for space remaining appliance

Unerupted crown

This classification is restricted to permanent teeth and used only for a tooth space with an unerupted permanent tooth but without a primary tooth.

Not recorded.

This code is used for any erupted permanent tooth that cannot be examined for any reason (e.g. because of orthodontic bands, severe hypoplasia, etc.).

The codes of treatment need

tn

#18-11, #21-28, #48-41, and #31-38

=> The number of total treatment need: 8+8+8+8=32

This code is scored when a teeth needs dental treatment with any reason such as caries, periodontal problems, or trauma.

The codes of treatment need are following:

0 None (no treatment)

1 One surface filling

2 Two or more surface fillings

3 Crown for any reason

5 Pulp care and restoration

6 Extraction

7 Need for other care

* P (preventive, caries-arresting care) and F (fissure sealant) in WHO standards were ruled out because all teeth should be under preventive care and the reason of inclusion is ambiguous. Veneer or laminate (4) was excluded from the code list because it is not cost-effective.

None (no treatment)

This code is recorded if a tooth is sound, or if it is decided that a tooth should not receive any treatment.

Unerupted tooth is also recorded as none (no treatment).

One surface filling

The code should be used to indicate the treatment required to:

- Treat one surface lesion due to initial, primary, secondary caries or trauma

* Discoloration of a tooth, developmental defect, abrasion, erosions, and attrition are excluded from the list of treatment needs in 2003 survey. Limited time, poor condition of the examination, and low validity and reliability of the examiners caused from subjective judgement are the reason of this decision.

- Replace one surface unsatisfactory fillings or sealants.

A filling is considered unsatisfactory if one or more of the following conditions exist:

- A deficient margin to an existing restoration that has leaked or is likely to leak to the dentine.
- An overhanging margin of an existing restoration that causes obvious local irritation to the gingiva and cannot be removed by recontouring of the restoration.
- A fracture of an existing restoration that either causes to be loose or permits leakage to the dentine. * The discolouration from amalgam or resin is excluded to minimise the treatment needs and focus on caries or periodontal problems.

Two or more surface fillings

The code should be used to indicate the treatment required to:

- Treat two or more surface lesions due to initial, primary, secondary caries or trauma
- Replace two or more surface unsatisfactory fillings or sealants

The proximal caries which need to fill two surfaces are included this category even though the origin is one surface.

Crown for any reason

This is when the treatment is needed but filling is not enough. The material could be metal, porcelain, or plastic resins. When primary posterior tooth are broken and do not occlude with opposite tooth, it is not counted as treatment need for crown.

Pulp care and restoration

This code is used to indicate that a tooth probably needs pulp care prior to restoration with a filling or crown from deep and extensive caries, or tooth mutilation or trauma.

Extraction

A tooth is recorded as "indicated for extraction", depending on the treatment possibilities available, when:

- A tooth has been destroyed by caries and it cannot be restored. * It is coded as extraction needed when the whole crown in primary anterior tooth is destroyed;
- Periodontal disease has progressed so the tooth is loosed and functionless causing pain. In this case it cannot be restored to a functional state in the clinical judgement of the examiner;
- A tooth needs to be extracted for a prosthesis;
- Extraction is required for orthodontic or cosmetic reasons; or
- A tooth is impacted.

Need for other care.

The examiner should specify the types of care for which code 7 is used. The use of these two codes should be kept to a minimum.

Third molar

The experience of decay in third molar should be asked. An examiner asks "have you ever pulled out any third molar?" before the examination. If they answer "yes" and check the reason. If they do not remember the reason or they answer ambiguously "maybe because of swelling", the code should be permanent tooth missing, with any other reason.

Proximal caries

It can be extended to buccal or lingual surface but should be limited within one forth of maximum mesio-distal length. It is defined as proximal caries even though there is no enamel broken down of occlusal surface in molar and decayed dentin is shown through sound enamel. It is defined as two surfaces caries and counts as two or more surface fillings needed.

Fusion tooth

It counts as one tooth. Mesial part is recorded as a tooth and distal part should be recorded as unerupted.

Common mistakes

Considerable care should be taken to diagnose tooth-coloured fillings, which may be extremely difficult to detect.

PROSTHODONTIC STATUS

The codes of prosthodontic status

The following codes are provided for this:

0 No prosthesis

1 Bridge

2 More than one bridge

3 Partial denture

4 Both bridge(s) and partial denture(s)

5 Full removable denture

9 Not recorded

Examine illegal dental treatment as normal prosthesis even though it needs to be repaired and record their status in Oral Health Assessment Form 2.

Examine illegal prosthesis as other prosthesis.

The record of prosthetic status

The presence of prostheses should be recorded for each jaw.

Upper	Lower

No prosthesis

This code is used for upper or lower jaw that does not have fixed or removable prosthesis because of tooth loss.

* Single crown is not defined as prosthesis. Whole surfaces of a crown are recorded as filled, with no decay.

Bridge

This code is used for one-unit prosthesis in upper or lower jaw regardless of the number of tooth connected or involved.
* Implant is recorded as a "bridge" when it replaces a tooth missing.

More than one bridge

This code is used for more than one-unit prosthesis in upper or lower jaw regardless of the number of tooth connected or involved.

Partial denture

This code is used when upper or lower jaw has partial denture without any other bridges.
* Single crown is allowed to be with partial denture as abutment(s).

Both bridge(s) and partial denture(s)

This code is used to record when upper or lower jaw has both bridge(s) and partial denture(s) regardless of the number of tooth connected or involved.
It does not matter how many they have.

Full removable denture

This code is used when upper or lower jaw has full removable denture.
* When upper or lower jaw has no teeth at all and an implant is used as prosthesis, it is recorded as "full removable denture".

PROSTHETIC NEED

The codes of prosthetic need

The recording should be made for each jaw on the need for prostheses, according to the following codes:

0 No prosthesis needed

1 Need for one-unit prosthesis (one tooth replacement)

2 Need for multi-unit prosthesis (more than one tooth replacement)

3 Need for a combination of one- and/or multi-unit prostheses

4 Need for full prosthesis (replacement of all teeth)

9 Not recorded

* The third molar with enough crown length as abutment and not tilted is recorded as other molars.

Prosthetic need could be recorded even the jaw already has prosthesis and needs to replace.

The standard of replacement

* Broken porcelain crown or facing of bridge needs to be replaced when it is impossible to repair.

A prosthetics should be replaced if an abutment crown in bridges is showing followings:

- Over ¼ part of a probe is inserted into the margin of a crown;
- Perforation;
- Prosthesis is moving because of melted out cementation; or
- Fracture of joint part.

A prosthetics should be replaced if a pontic of bridge is showing followings:

- Severe peripheral gingival swelling caused from high pressure of bridge.

A prosthetics should be replaced if a partial denture is showing followings:

- Fracture of clasp.

A prosthetics should be replaced if a partial denture or full removable denture is showing followings:

- Fracture of denture;
- Not used on daily life; or
- Gingival swelling in border line because of ill-fitting.

The record of prosthetic need

The presence of prosthetic need should be recorded for each jaw.

Upper	Lower

No prosthesis needed

This code is used for upper or lower jaw that does not need to have fixed or removable prosthesis because of tooth loss.

Need for one-unit prosthesis (one tooth replacement)

This code is used for one-unit prosthesis need in upper or lower jaw because of a tooth loss.

* When second molar is missing but the bite is normal, one-unit prosthesis is not necessary.

Need for multi-unit prosthesis (more than one tooth replacement)

This code is used for a prosthetic need in upper or lower jaw because of two or more teeth loss. They should be missing in one site and the prosthesis could be either bridge or partial denture.

Need for a combination of one- and/or multi-unit prostheses

This code is used for more than two one-unit and/or multi-unit prosthetic need(s) in upper or lower jaw regardless of the number of prostheses.

Need for full prosthesis (replacement of all teeth)

This code should be used when upper or lower jaw has none of teeth or the teeth unable to have clasp.

* Examples of the teeth which are unable to have clasp

- Only one or two teeth are left in anterior area and overdenture is recommended.
- It is impossible to be used as abutments because they are moving seriously.

COMMUNITY PERIODONTAL INDEX (CPI)

Instrument

A dental mirror and a specially designed lightweight CPI probe with a 0.5mm ball tip is used, with a black band between 3.5 and 5.5 mm and rings at 8.5 and 11.5 mm from the ball tip.

Indicators

Three indicators of periodontal status are used for this assessment: Gingival bleeding, calculus and periodontal pockets.

Sextants

The mouth is divided into sextants defined by tooth numbers: #01 sextant is 18-14; #02, 13-23; #03, 24-28; #04, 38-34; #05, 33-43; and #06, 44-48.

A sextant should be examined only if there are two or more teeth present which are not indicated for extraction.

Index teeth

For adults aged 20 years and over, the teeth to be examined are:

17	16	11	26	27
47	46	31	36	37

A sextant should be examined only if there are two or more teeth present which are not indicated for extraction.

The two molars in each posterior sextant are paired for recording. If one is missing, there is no replacement. When no index teeth or tooth is present in a molar sextant, all the remaining teeth in that sextant are examined and the highest score is recorded as the score for the sextant. In this case, distal surfaces of third molars should not be scored.

If no index teeth or tooth is present in an anterior sextant, for example #11 or #31, all the remaining teeth in that sextant are examined and the highest score is recorded as the score for the sextant. If index teeth or tooth is missing, there is no replacement.

For subjects under the age of 20 years, only six index teeth - 16, 11, 26, 36, 31, and 46 – are examined. This modification is made in order to avoid scoring the deepened sulci associated with eruption as periodontal pockets. If index teeth or tooth is missing, there is no replacement.

16	11	26
46	31	36

Detecting gingival bleeding, calculus, and periodontal pockets

An index tooth should be probed, using the probe as a "sensing" instrument to determine pocket depth and to detect subgingival calculus and bleeding response.

The probing force used should be no more than 20 grams. A practical test for establishing this force is placing the probe point under the thumb nail and pressing until blanching occurs.

The principle of using probe: Ainamo (1994)

- Probe all the index teeth
- The probing should start from severe area, 4 -> 3-> 2-> 1-> 0. This method enables to find out higher score, especially periodontal pocket. The highest score is more important than others.

The probe tip should be inserted gently into the gingival sulcus or pocket and the total extent of the sulcus or pocket explored. For example, the probe is placed in the pocket at the disto-buccal surface of the second molar, as close as possible to the contact point with the third molar. Keep the probe parallel to the long axis of the tooth (walking probing method). The probe is then moved gently, with short upward and downward movements, along the buccal sulcus or pocket to the mesial surface of the second molar, and from the disto-buccal surface of the first molar towards the contact area with the premolar. A similar procedure is carried out for the lingual surfaces, starting distolingually to the second molar.

Detecting calculus

- The air syringe can be used to convince the calculus.
- Even the calculus are detected, the other surfaces of a tooth should be examined. The decision is made after that.

Calculus only can be determined when it is clearly obvious.

The order of CPI probing

Upper jaw:

Probe and code #17-> #16-> #11-> #26-> #27. Detailed order is following:

#17 distobuccal, buccocentral, and mesiobuccal;

#16 distobuccal, buccocentral, and mesiobuccal;

#17 distolingual, linguocentral, and mesiolingual;

#16 distolingual, linguocentral, and mesiolingual;

#11 distobuccal, buccocentral, mesiobuccal, distolingual, linguocentral, and mesiolingual;

#27 distobuccal, buccocentral, and mesiobuccal;

#26 distobuccal, buccocentral, and mesiobuccal;

#27 distolingual, linguocentral, and mesiolingual; and

#26 distolingual, linguocentral, and mesiolingual surfaces.

Lower jaw:

Probe and code #37-> #36-> #31-> #46 -> #47.

Record the highest score for a sextant. If the score is 3 or 4, there is no need to carry out the probing.

Surface of probing

Probe distobuccal, buccocentral, mesiobuccal, mesiolingual, linguocentral, and distolingual surface of a tooth. In case of the distobuccal, mesiobuccal, mesiolingual, and distolingual surfaces, probe line angle area. Line angle is defined as borderline or shift line of proximal papillar or marginal gingiva.

Insertion of probe for CPI

The probe tip should be inserted gently into the gingival sulcus or pocket keeping parallel to the long axis of the tooth. However, in proximal area the probe tip should be inserted tipping to central axis.

The probing

Use walking probing method. When the probe is inserted into periodontal pocket, the ball tip should move within subgingiva following the anatomical configuration of the surface of the tooth root.

The codes of CPI

The codes are:

0 Healthy

1 Bleeding observed, directly or by using a mouth mirror, after probing

* This is a code for observed bleeding obviously.

- When the gingiva has pin-point bleeding and it is not clear whether the code is 0 or 1, write down the code as 0.

- The order of the examination is:

(Upper jaw) probe #17-> #16-> #11-> #26-> #27 and speak out the code;

(Lower jaw) probe #37-> #36-> #31-> #46-> #47 and speak out the code.

- Wait 10-30 seconds after probing to check bleeding.

2 Calculus detected during probing, but the entire black band on the probe visible

* Record 2 when the calculus is obviously observed.

- Air syringe can be used to finalise the calculus examination.

3 Pocket 4-5 mm (gingival margin within the black band on the probe)

* Lower score should be corded in case the gingival margin is around lower borderline of black band on the probe which can be coded as 3 or lower than 3.

4 Pocket 6mm or more (black band on the probe not visible)

X Excluded sextant (less than two teeth present)

9 Not recorded

Examination and recording

The index teeth in a sextant should be probed. All the remaining teeth can be probed when there is no index tooth. Then the highest score is recorded in the appropriate box.

Upper right	Upper middle	Upper left

Lower right	Lower middle	Lower left

Summary for CPI with age group

Over 20: 10 index tooth, using CPI probe

15 to 19: 6 index tooth, using CPI probe

12 to 14: 6 index tooth, using CPI probe (pockets should not be recorded and only bleeding and calculus should be considered). * Use CPI probe to record only bleeding and calculus.

APPENDIX 4. ORAL HEALTH QUESTIONNAIRE (ENGLISH VERSION)

< FORM 1 >

I. GENERAL INDEX (please tick √ where in number or fill in with your answer)

1. Sex: 1- male 2- female
2. Age in 2003: _____
3. Name: _____
4. Area:
   1) Metropolitan
   2) City
   3) Rural
5. Education level:
   1) Below graduation from elementary school
   2) Graduate of middle school
   3) Graduate of high school
   4) Graduate of university
   5) Graduate of graduate school
6. Occupation: _____(refer to the code box)
7. National Health Insurance
   1) Labour National Health Insurance
   2) Regional National Health Insurance
   3) National medical aid
   4) No insurance
8. Income:
   1) Below 500,000 won
   2) 510,000 – 990,000 won
   3) 1,000,000 – 1,490,000 won
   4) 1,500,000 – 1,990,000 won
   5) 2,000,000 – 2,490,000 won

6) 2,500,000 – 2,990,000 won
7) 3,000,000 – 3,990,000 won
8) 4,000,000 – 4,990,000 won
9) 5,000,000 – 5,990,000 won
10) Over 6,000,000 won

II. GENERAL HEALTH RELATED WITH ORAL HEALTH (please tick √ where relevant)

1. Do you have Diabetes?
   1) Yes
   2) I had Diabetes but have recovered now
   3) No
2. Have you ever been treated to relieve the symptoms of Diabetes?
   1) Yes
   2) No
   3) No answer
   4) Don't know
3. Do you have heart disease?
   1) Yes
   2) I had heart disease but have recovered now
   3) No
4. Overall, would you say that your general health is:
   1) Very good
   2) Good
   3) Fair
   4) Poor
   5) Very poor

III. ORAL HEALTH

1. In general, would you say that the health of your teeth and mouth is:
   1) Very good
   2) Good
   3) Fair
   4) Poor
   5) Very poor
2. How satisfied are you with your oral health?
   1) Not at all satisfied
   2) Not satisfied
   3) Fair
   4) Satisfied
   5) Very satisfied
3. How often are you concerned about your oral health?
   1) Concern always
   2) Concern occasionally
   3) Never concerned
4. Do you think you need dental treatment now?
   1) Yes
   2) No
   3) Don't know
5. How much dental treatment do you think you need?
   1) Never needed
   2) Don't need
   3) Fair
   4) Need
   5) Very much need

IV. ORAL HEALTH BEHAVIOUR PATTERN

1. Did you clean your teeth yesterday?
   1) Yes

2) No

2. (If you answered 'yes') How many times did you clean your teeth yesterday? (Check all that apply)
   1) Before breakfast
   2) After breakfast
   3) Before lunch
   4) After lunch
   5) Before dinner
   6) After dinner
   7) After snack
   8) Before going to sleep
3. Do you use fluoride toothpaste?
   1) Yes
   2) No
   3) Don't know whether the toothpaste included fluoride

   (Please write down the name of toothpaste. _____)
4. Which of the following items did you use to clean your teeth? (check all that apply)
   1) Floss
   2) Mouthrinse
   3) Interdental brush
   4) Automatic toothbrush
   5) Others
   6) Not using

V. ORAL HELATH RELATED BEHAVIOUR PATTERN

1. How many times do you have snack or drink on a typical day?
   1) Once
   2) 2-3 times
   3) More than 4 times

4) No snack
5) Don't know

2. Which of the following snacks and soft drinks do you have on a typical day?
   1) Cookies, cake, or candy
   2) Vegetables or fruit
   3) Processed fruit (i.e. canned fruit)
   4) Beverage (including soft drinks and juice)
   5) Don't have
   6) Don't know
3. Do you smoke cigarettes now?
   1) Yes
   2) I used to be smoked but I quit
   3) No **(go to the Question 6)**
4. (Until now or in the past) how long have you been smoking? _____ years
5. (Until now or in the past) how many cigarettes do you smoke per day?
   1) Less than half a pack (1-10 cigarettes)
   2) Around 1 pack (11-20 cigarettes)
   3) Half and a pack
   4) Over 2 packs
6. Do you drink alcoholic drinks now?
   1) Yes
   2) I used to drink, but I don't drink any more
   3) No **(go to the Question VI)**
7. In the past 12 months how often did you have alcoholic drinks (glasses of spirits or wine or bottles of beer) have you had?
   1) Special occasions only
   2) Once or twice a month
   3) Once or twice a week
   4) Almost every day
   5) Twice a day or more

VI. PATTERN OF USING DENTAL CARE

1. In general, do you go to the dentist for:
   1) A regular check up
   2) An occasional check up
   3) Only when you're having trouble/pain with your teeth
   4) Don't go
2. Have you ever visited dentist within last 5 years?
   1) Yes
   2) No **(go to the Question 11)**
3. How long ago was your last dental visit?
   1) Under 6 months
   2) 6 months – 1 year
   3) 1-2 years
   4) 2-3 years
   5) 3-5 years
4. What kind of dental clinic do you use usually?
   1) Dental clinic
   2) Dental hospital
   3) Dental clinic in general hospital
   4) Dental college hospital
   5) Health care centre
   6) Others
5. What is the reason of your selection of above dental clinic?
   1) Short distance
   2) Introduced by relatives
   3) Recommended by other clinic
   4) Advertisements
   5) Recommended by working place
6. Where is the dental clinic you usually visit?
   1) Region of residence, Eup, Myun, Dong
   2) Regions of residence, City, Gun, Gu (other Eup, Myun, Dong)
   3) Out of residence, Eup, Myun, Dong

4) Other city
5) Don't know

7. How do you go to the dental clinic?
   1) On foot
   2) By car
   3) By public transport
   4) Extra
8. How long does it take to go to the dental clinic?
   1) Under 10 min.
   2) 10-30 min.
   3) 30-60 min.
   4) 1-2 hours
   5) Over 2 hours
9. What kind of dental treatment did you receive?
   1) Routine check
   2) Prevention (i.e. fluoride application, sealants)
   3) Scaling
   4) Dental caries treatment (i.e. filling)
   5) Toothache (endo tx.)
   6) Bleeding (perio tx.)
   7) Pericoronitis
   8) Extraction or intraoral surgery
   9) Loose teeth
   10) Making dentures (prosthetics)
   11) Repair of denture
   12) Others: _____
10. How much did you pay totally for recent dental visit?
    1) Under 5,000 won
    2) 5,000 – 20,000 won
    3) 20,000 – 100,000 won
    4) 100,000 – 300,000 won
    5) 300,000 – 500,000 won

6) 500,000 – 1,000,000 won
7) 1,000,000 – 3,000,000 won
8) Over 3,000,000 won
9) Don't know

11. Do you find it difficult to access the dental clinics when you want dental care?
    1) Yes
    2) No
    3) Don't know
12. (If you answered 'yes') what makes it difficult for you to obtain it? (check all that applies)
    1) Availability of service
    2) Inability to pay/ no insurance
    3) Transport difficulties
    4) Long queues/ waiting times
    5) Time off work
    6) Difficult to get appointment
    7) Can't find a good dentists/ clinics
    8) Discrimination on basis of social class, sexual orientation, HIV status, etc.
    9) Fear of dentists/ dental care procedures
    10) Lack of child care
    11) Lack of confidence in cleanliness at dental clinic
    12) Lack of confidence that dental treatment will work
    13) Dissatisfaction with previous dental service
    14) Others: _____

< FORM 2 >

VII. OIDP ASSESSMENT

1. In the past six months, have you had any problem mentioned in the OIDP Assessment Chart below [Dimension: eating, speaking, tooth cleaning, physical activities, etc.]? If you answered yes, how often have you had this problem?

Dimension	**Never**	**Less than once a month**	**Once or twice a month**	**Once or twice a week**	**3-4 times a week**	**Every, or nearly every day**
1. Eating food						
2. Speaking clearly						
3. Cleaning your teeth (or dentures)						
4. Doing light physical activities such as household cleaning and maintenance, walking, playing games						
5. Usual daily activities such as going out to school, shop, work, visit friends, etc.						
6. Sleeping						
7. Relaxing – reading, watching TV, or listening to music						
8. Smiling, laughing and showing teeth without embarrassment						
9. With your emotional state, for example becoming more easily upset than usual						
10. Enjoying the contact of other people, such as relatives, friends or neighbours						

2. If you have had any problem mentioned in OIDP Assessment Chart, using a scale from 0 to 5, where 0 is no effect and 5 is a very severe effect, which number would you say reflects the effect this problem had on your daily life?

	No effect					**Very severe effect**
1. Eating food						
2. Speaking clearly						
3. Cleaning your teeth (or dentures)						
4. Doing light physical activities such as household cleaning and maintenance, walking, playing games						
5. Usual daily activities such as going out to school, shop, work, visit friends etc.						
6. Sleeping						
7. Relaxing – reading, watching TV, listening to music						
8. Smiling, laughing and showing teeth without embarrassment						
9. With your emotional state, for example becoming more easily upset than usual						
10. Enjoying the contact of other people, such as relatives, friends or neighbours						

3. If you have had any of the problems mentioned in OIDP Assessment Chart, to which condition(s) do you attribute this impact?

	The code number of the conditions that attribute to this impact (check all that apply)
1. Eating food	
2. Speaking clearly	
3. Cleaning your teeth (or dentures)	
4. Doing light physical activities such as household cleaning and maintenance, walking, playing games	
5. Usual daily activities such as going out to school, shop, work, visit friends etc.	
6. Sleeping	
7. Relaxing – reading, watching TV, listening to music	
8. Smiling, laughing and showing teeth without embarrassment	
9. With your emotional state, for example becoming more easily upset than usual	
10. Enjoying the contact of other people, such as relatives, friends or neighbours	

< CONDITIONS THAT ATTRIBUTE TO YOUR PAIN IN MOUTH>

Code	Different conditions
1	Toothache
2	Sensitive tooth
3	Tooth decay, hole in a tooth
4	Fractured tooth
5	Tooth loss
6	Loose tooth
7	Colour of teeth
8	Position of teeth e.g. crooked, projecting, gap
9	Shape or size of teeth
10	Bleeding gums
11	Swollen gums, gum abscess
12	Receding gums, periodontal disease
13	Calculus, tartar
14	Oral ulcer or sore spots
15	Bad breath
16	Deformity of mouth or face e.g. cleft lip, cleft palate
17	Clicking or grating noise in jaw joint
18	Defective filling or crown e.g. broken, colour
19	Loose ill fitting denture
20	Orthodontic appliance, wires or bands for straightening teeth, braces

APPENDIX 5. ORAL HEALTH QUESTIONNAIRE (KOREAN VERSION)

< 조사지 1 >

I. 일반조사항목 (해당번호에 √표시 혹은 적절한 내용을 채워주세요)

1. 성별: 1- 남자 2- 여자
2. 나이: 만_____세
3. 이름: _____
4. 지역:
   1) 대도시
   2) 중소도시
   3) 농어촌
5. 교육정도: 귀하의 학력은?
   1) 초등학교 졸
   2) 중학교 졸
   3) 고등학교 졸
   4) 대학교 졸
   5) 대학원 졸 이상
6. 경제활동: 현재 어떤 일(직업)에 종사하고 계십니까? _____
7. (조사원은 지침서의 직업분류표를 보고 기입하십시오.)
8. 의료보장상태: 귀하가 소지하고 있는 건강보험카드는?
   1) 직장건강보험
   2) 지역건강보험
   3) 의료보호
   4) 미가입
9. 가구소득: 귀댁의 월간 평균소득은 대략 얼마입니까?
   1) 50만원 이하
   2) 51 – 99만원
   3) 100 – 149만원
   4) 150 – 199만원
   5) 200 – 249만원
   6) 250 – 299만원

7) 300 – 399만원
8) 400 – 499만원
9) 500 – 599만원
10) 600만원이상

II. 구강건강과 관련된 전신건강 (해당번호에 √표시를 해주세요)

1. 귀하께선 당뇨병을 앓고 있으십니까?
   1) 예
   2) 예전에는 있었으나 지금은 완치되었음
   3) 아니오
2. 당뇨병의 증상을 완화하기 위해 치료를 받았습니까?
   1) 예
   2) 아니오
   3) 해당없음
   4) 모름
3. 심장질환을 앓고 있으십니까?
   1) 예
   2) 예전에는 있었으나 지금은 완치되었음
   3) 아니오
4. 스스로 생각할 때, 같은 연세의 다른 사람과 비교하여 전신건강이 어떤 편이라고 생각하십니까?
   1) 매우 건강하다
   2) 건강한 편이다
   3) 보통임
   4) 건강하지 못한 편이다
   5) 매우 건강하지 못한 편이다

III. 구강건강문제 조사항목

1. 스스로 생각할때, 같은 연세의 다른 사람과 비교하여 구강건강이 어떤 편이라고 생각하십니까?
   1) 매우 건강하다
   2) 건강하다
   3) 보통임
   4) 건강하지 못한 편이다
   5) 매우 건강하지 못한 편이다
2. 자신의 구강건강상태에 대해 얼마나 만족하십니까?
   1) 전혀 만족하지 못함
   2) 만족하지 못함
   3) 보통임
   4) 만족하는 편임
   5) 매우 만족함
3. 자신의 구강건강에 대해 얼마나 자주 걱정을 하십니까?
   1) 항상 걱정한다
   2) 가끔 걱정한다
   3) 전혀 걱정하지 않는다
4. 현재 자신의 구강(혹은 치아)문제로 인해 치료를 받아야 한다고 생각하십니까?
   1) 예
   2) 아니오
   3) 모름
5. 자신의 구강(혹은 치아)문제로 어느 정도의 치료가 필요하다고 생각하십니까?
   1) 전혀 필요치 않음
   2) 필요치 않음
   3) 보통임
   4) 필요한 편임
   5) 매우 필요함

IV. 구강 건강생활실천 조사항목

1. 귀하께선 어제 잇솔질을 하셨습니까?
   1) 잇솔질 하였음
   2) 잇솔질 하지 않았음
2. (어제 잇솔질을 하셨다면) 잇솔질한 시기(해당 번호)에 모두 √표시를 해주십시오.
   1) 아침식사 전에
   2) 아침식사 후에
   3) 점심식사 전에
   4) 점심식사 후에
   5) 저녁식사 전에
   6) 저녁식사 후에
   7) 간식 후에
   8) 잠자기 전에
3. 귀하께선 현재 불소함유치약을 사용하고 있으십니까?
   1) 예
   2) 아니오
   3) 모름 (치약의 상품명을 적어주세요. _____)
4. 치약과 치솔 이외에 귀하께서 사용하시는 구강(환경관리)용품이 있습니까? 해당하는 것(번호)에 모두 √표시를 해주십시오.
   1) 치실
   2) 구강세정액(양치액)
   3) 치간칫솔
   4) 전동칫솔
   5) 기타 용품
   6) 사용하지 않음

V. 기타 구강건강과 관련된 보건의식행태

1. 귀하께선 하루 평균 몇번이나 간식을 드십니까?

1) 1번
2) 2-3번
3) 4회 이상
4) 먹지 않음
5) 모름

2. 귀하께선 간식으로 주로 어떤 음식을 드십니까?
   1) 과자, 케익, 사탕류
   2) 야채, 과일
   3) 가공과일 (통조림 등)
   4) 음료 (청량음료 및 과일쥬스 포함)
   5) 먹지않음
   6) 모름
3. 귀하께선 현재 담배를 피우고 계십니까?
   1) 예
   2) 과거에 피웠으나 지금은 피우지 않음
   3) 아니오 (아래 6번 문항으로 가시오)
4. (현재까지 혹은 과거에) 몇 년간이나 담배를 피우셨습니까?
   _____년
5. (현재까지 혹은 과거에) 담배를 피울 때 하루 평균 얼마나 피우셨습니까?
   1) 반갑 이하 (1-10개피)
   2) 약 한갑 (11-20개피)
   3) 한 갑 반
   4) 두 갑 이상
6. 귀하께선 현재 술을 드시고 계십니까?
   1) 예
   2) 과거에는 마셨으나 지금은 마시지 않음
   3) 아니오 (아래의 VI문항으로 가시오)
7. (1번이나 2번으로 답한 경우) 최근 1년간 얼마나 자주 술을 드셨습니까?

1) 특별한 일이 있을 경우에만
2) 한 달에 1-2회
3) 1주일에 1-2회
4) 거의 매일
5) 하루에도 두 번 혹은 그 이상

VI. 치과병의원 이용실태 조사항목

1. 일반적으로 얼마나 자주 치과를 찾으십니까?
   1) 정기적으로 방문함
   2) 기회가 생길 때 방문함
   3) 치아에 문제가 있거나 치통이 있을 때만 방문함
   4) 이용하지 않음
2. 귀하는 지난 5년간 구강진료기관을 이용한 적이 있습니까?
   1) 있다
   2) 없다 (11번 문항으로 바로 가세요)
3. 귀하계서 가장 최근에 치과병의원에 갔던 적은 언제입니까?
   1) 6개월 미만
   2) 6개월 – 1년 미만
   3) 1년 – 2년 미만
   4) 2년 – 3년 미만
   5) 3 – 5년
4. 귀하께서 주로 이용하시는 치과병의원은 무엇입니까?
   1) (동네) 치과의원
   2) 치과병원
   3) 종합병원 내의 치과
   4) 치과대학 병원
   5) 보건(지)소
   6) 기타 의료기관
5. 주로 이용하는 치과병의원은 어떻게 찾아가셨습니까?

1) 거리가 인접해서
2) 친지 등의 권유로
3) 타 치과병의원의 권유로
4) 광고를 통해서
5) 회사의 지정의료기관이어서

6. 주로 이용하는 치과병의원은 어디에 있습니까?
   1) 거주지역 읍면동 내
   2) 거주지역 시군구 내 (타 읍면동)
   3) 거주지역 타 시군구
   4) 타 시도
   5) 모름
7. 주로 이용하는 치과병의원에 어떻게 가십니까?
   1) 걸어서
   2) 자가용
   3) 대중교통
   4) 기타
8. 주로 이용하는 치과병의원에 갈때 얼마나 걸립니까?
   1) 10분 미만
   2) 10-30분 미만
   3) 30-60분 미만
   4) 1-2시간 미만
   5) 2시간 이상
9. 지난번 치과병의원 방문시 진료내용은 무엇이었습니까?
   1) 정기적인 검진
   2) 실런트, 불소도포 등 예방치료
   3) 정기적인 스케일링
   4) 충치치료 (치아충전)
   5) 치통치료 (신경치료)
   6) 잇몸에서 피가 나고 아파서 치료함 (잇몸치료)
   7) 사랑니가 아파서 치료함

8) 치아를 뽑거나 혹은 구강 내 수술
9) 빠진 치아를 고정함
10) 틀니 혹은 보철물 제작
11) 틀니 혹은 보철물 수리
12) 기타: _____

10. 지난번 치과진료시 지불한 진료비는 총 얼마입니까?
1) 5천원 미만
2) 5천원 - 2만원 미만
3) 2만원 - 10만원 미만
4) 10만원 - 30만원 미만
5) 30만원 - 50만원 미만
6) 50만원 - 100만원 미만
7) 100만원 - 300만원 미만
8) 300만원 이상
9) 모름

11. 구강진료가 필요할 때, 치과병의원을 찾기가 어렵다고 느끼십니까?
1) 예
2) 아니오
3) 모름

12. (찾기가 어렵다고 느끼신다면) 찾기 힘들게 만드는 이유는 무엇입니까? 해당하는 것(번호)에 모두 √표시를 해주십시오.
1) 필요한 진료인지에 대한 의문으로
2) 진료비를 지불할 비용(돈) 부족으로
3) 교통편이 불편해서
4) 기다리는 환자가 많고, 오래 기다려야 하므로
5) 근무 시간중에 가야하므로
6) 예약하기가 힘들어서
7) 마음에 드는 치과의사와 치과를 찾을 수 없어서
8) 사회적 지위, 질병(예, 에이즈, 간염등) 등의 이유로 차별 받을까봐
9) 치과의사와 진료 자체에 대한 두려움으로

10) 어린이를 맡겨둘 시설이 부족해서

11) 치과의 청결도를 믿을 수 없어서

12) 치과에서 행하는 진료를 믿을 수 없어서

13) 예전에 받았던 진료에 만족하지 못해서

14) 기타: (_____)

< 조사지 2 >

VII. OIDP 평가

1. 최근 6개월 동안, 입안의 문제로 아래에 나열된 문제를 경험한 적이 있으십니까? 있다면 얼마나 자주 그러셨습니까? (해당 번호/칸에 √표시를 해주세요.)

	전혀 없음	한달에 1회미만	한달에 1-2회	1주일에 1-2회	1주일에 3-4회	거의 매일
1) 입안의 문제로 음식 섭취의 어려움	⓪	①	②	③	④	⑤
2) 입안의 문제로 명확히 발음하기 어려움	⓪	①	②	③	④	⑤
3) 입안의 문제로 칫솔질 등 치아(혹은 틀니)를 깨끗이하기 어려움	⓪	①	②	③	④	⑤
4) 입안의 문제로 집안청소, 산책 등 가벼운 신체 활동하기 어려움	⓪	①	②	③	④	⑤
5) 입안의 문제로 직장출근, 장보기, 친구 만나기 등 일상적인 생활을 유지하기 어려움	⓪	①	②	③	④	⑤
6) 입안의 문제로 잠자기 어려움	⓪	①	②	③	④	⑤
7) 입안의 문제로 독서, TV보기, 음악듣기 등 휴식이 어려움	⓪	①	②	③	④	⑤
8) 입안의 문제로 미소짓기, 웃기, 치아 드러내기 등이 어려움	⓪	①	②	③	④	⑤
9) 입안의 문제로 평상시 보다 쉽게 화를 냄	⓪	①	②	③	④	⑤
10) 입안의 문제로 친지, 친구, 이웃 등과 어울리는 것이 예전만큼 즐겁지 않게 됨	⓪	①	②	③	④	⑤

2. 최근 6개월 동안, 입안의 문제로 아래에 나열된 문제를 경험하였다면, 각각의 문제가 자신의 일상생활에 얼마만큼의 영향을 미쳤다고 생각하는 지를 '아무 영향이 없었음: 0'에서부터 '매우 심각한 영향을 미쳤음 : 5'까지의 숫자를 이용하여 표현해 주세요. (해당 번호/칸에 √표시를 해주세요.)

⓪ ① ② ③ ④ ⑤
아무 영향이 없었음 매우 심각한 영향을 미쳤음

	아무런 영향 없음					매우 심각한 영향
1) 입안의 문제로 음식 섭취의 어려움	⓪	①	②	③	④	⑤
2) 입안의 문제로 명확히 발음하기 어려움	⓪	①	②	③	④	⑤
3) 입안의 문제로 칫솔질 등 치아(혹은 틀니)를 깨끗이하기 어려움	⓪	①	②	③	④	⑤
4) 입안의 문제로 집안청소, 산책 등 가벼운 신체 활동하기 어려움	⓪	①	②	③	④	⑤
5) 입안의 문제로 직장출근, 장보기, 친구 만나기 등 일상적인 생활을 유지하기 어려움	⓪	①	②	③	④	⑤
6) 입안의 문제로 잠자기 어려움	⓪	①	②	③	④	⑤
7) 입안의 문제로 독서, TV보기, 음악듣기 등 휴식이 어려움	⓪	①	②	③	④	⑤
8) 입안의 문제로 미소짓기, 웃기, 치아 드러내기 등이 어려움	⓪	①	②	③	④	⑤
9) 입안의 문제로 평상시 보다 쉽게 화를 냄	⓪	①	②	③	④	⑤
10) 입안의 문제로 친지, 친구, 이웃 등과 어울리는 것이 예전만큼 즐겁지 않게 됨	⓪	①	②	③	④	⑤

3. 최근 6개월 동안, 입안의 문제로 아래에 나열된 문제를 경험하였다면, 어떠한 요인들로 인한 결과였다고 생각하십니까? 우측에 나열된 예상되는 입안문제에 관한 표를 참고하여, 영향을 미쳤다고 추정되는 요인의 번호를 모두 기입하십시오.

	영향 미친 요인의 번호
1) 입안의 문제로 음식 섭취의 어려움	
2) 입안의 문제로 명확히 발음하기 어려움	
3) 입안의 문제로 칫솔질 등 치아(혹은 틀니)를 깨끗이하기 어려움	
4) 입안의 문제로 집안청소, 산책 등 가벼운 신체 활동하기 어려움	
5) 입안의 문제로 직장출근, 장보기, 친구 만나기 등 일상적인 생활을 유지하기 어려움	
6) 입안의 문제로 잠자기 어려움	
7) 입안의 문제로 독서, TV보기, 음악듣기 등 휴식이 어려움	
8) 입안의 문제로 미소짓기, 웃기, 치아 드러내기 등이 어려움	
9) 입안의 문제로 평상시 보다 쉽게 화를 냄	
10) 입안의 문제로 친지, 친구, 이웃 등과 어울리는 것이 예전만큼 즐겁지 않게 됨	

<예상되는 입안문제에 관한 표>

번호	예상되는 입안문제들
1	치통
2	시린이
3	충치
4	부러진(깨진) 치아
5	치아 상실(치아 뽑힘)
6	치아 동요(흔들림)
7	치아 색깔의 이상
8	삐뚤삐뚤하거나 튀어나온 치아배열, 넓은 치아사이의 간격 등 부정교합
9	치아의 형태 혹은 크기의 이상
10	잇몸에서 피가 남
11	잇몸이 붓거나 종기가 생김
12	잇몸이 움푹 패이거나 고름이 흐름
13	치석이나 치아착색
14	구강내 궤양(입안이 헐거나 짓물림) 혹은 닿기만 해도 아픈 부위
15	구취(입냄새)
16	구강 혹은 얼굴 기형(언청이 등)
17	턱관절에서 나는 딸깍소리 혹은 잡음
18	불량한(깨짐, 변색등) 충전물 혹은 보철물
19	잘 맞지 않는 틀니
20	각종 치열 교정장치

APPENDIX 6. MANUAL FOR THE INTERVIEWERS OF ORAL HEALTH QUESTIONNAIRE

< CONTENTS >

< HOW TO INTERVIEW >

1. Oral Health Questionnaire consists of Form 1, oral health pattern and behaviour, and Form 2, OIDP Assessment.

2. The interviewers distribute Oral Health Questionnaire Form 1 at first and encourage them to fill in by themselves.

3. When the interviewees finish Form 1, introduce the survey and explain them how to answer the Form 2. The interviewers should be next to the interviewees to help when they have some queries.

< MANUAL FOR THE QUESTIONNAIRE >

- Form 1 -

Sex (1st item in I. GENERAL INDEX)

This is recorded at the examination. The appropriate code is filled in the box.

Age (2nd item in I. GENERAL INDEX)

It is recorded as age at last birthday (i.e. a person in the 35th year of life is 34). In Korea, age is normally expressed in another way from western countries. Interviewers asked the people when they were born or when is the birthday and it can be converted into the age.

Name (3rd item in I. GENERAL INDEX)

Name identifies the Forms of Oral Health Assessment and Questionnaires when they mixed with others' sets. It is not recorded in the data file with confidentiality.

Area (4th item in I. GENERAL INDEX)

The code of area informs the location type for each survey site.

Educational level (5th item in I. GENERAL INDEX)

It is compulsory to finish elementary and middle school in Korea (Article 8 in Education Act). Free education of middle school introduced recently in 1985. The category, thus, started immediately after elementary school. The item is divided into five according to the grade of educational level.

Occupation (6th item in I. GENERAL INDEX)

Write down the number referring to Classification of Occupations (Appendix 7). If there is any query with the classification, interviewers should ask to the interviewees for detail. Final occupational code is three digital numbers. First place is following brief category and the others, two numbers in last place are for the detailed classification. For example, the porter and the street cleaner are included in simple labour starting from 9 but they have different detailed record, 07, and 08. Thus the final code of the porter is 907 and the street cleaner, 908.

National Health Insurance (7th item in I. GENERAL INDEX)

Most Koreans are supported by at least one type of health system. Labour National Health Insurance (NHI) includes employees in the private sector and government employees such as military personnel and private school employees. It covers their dependants as well. The others are insured by Self-employed, Regional NHI. Koreans residing in abroad and foreigners residing in Korea can join in the NHI programme on a voluntary basis. The remainders who are indigent or belong to low-income brackets are covered by the Medical Aid Program, a Korean social assistance program. A small number of people who lost their job suddenly or not in the Korean ID system are not insured by the health care system.

Income (8th item in I. GENERAL INDEX)

After adopting the International Monetary Fund (IMF) system, many Korean people lost their job and even their income was decreased. Thus the interval between each income section is smaller than previous 2000 Korean National Oral Health Survey, especially in low income groups.

Diabetes and heart disease (II. GENERAL HEALTH RELATED WITH ORAL HEALTH)

The people are asked whether they have diabetes or disease, and if they had, whether they are receiving treatment. It avoids including the people who are already treated and do not need special attention for their general health.

Perceived oral health status (1st item in III. ORAL HEALTH)

The perception of the oral health status is asked and there were five grades such as: 1) very good; 2) good; 3) fair; 4) poor; and 5) very poor.

Satisfaction with oral status (2nd item in III. ORAL HEALTH)

It questions how much they satisfied with their oral health status and there are five grades as follows: 1) not at all satisfied; 2) not satisfied; 3) fair; 4) satisfied; and 5) very satisfied.

Perceived dental treatment need (4th item in III. ORAL HEALTH)

The perception of dental treatment need is asked and there are three answers such as: 1) need treatment; 2) did not need treatment; and 3) don't know.

Tooth cleaning habits (1st and 2nd items in IV. ORAL HEALTH BEHVAIOUR PATTERN)

The questionnaire asks the frequency of tooth brushing habit. The parameter for recent date of toothbrushing is yesterday because it is easy to remember.

Use of fluoride toothpaste (3rd item in IV. ORAL HEALTH BEHAVIOUR PATTERN)

At first, the interviewer checked the use of fluoride toothpaste. Most people did not know and they were not sure whether their toothpaste contained the fluoride or not. The toothpaste with fluoride in Korean market were researched and the list of toothpastes with or without fluoride was compiled (Annex 8). Most toothpaste,

except some imported and specified products, contained fluoride. The interviewer shows the lists to the people and asks them to check which category of the toothpaste they use.
When they tick 2) No or 3) Don't know including fluoride, check whether the toothpaste contains Fluoride or not. Show the information about the Toothpaste with or without Fluoride and if they use toothpaste which is not in the classification, write down the brand name of it.

Sugary food consumption habits (1st and 2nd items in V. ORAL HEALTH RELATED BEHAVIOUR PATTERN)

Participants are asked what kind of snacks they have and how frequently they take snacks.

Smoking habits (3rd, 4th, and 5th items in V. ORAL HEALTH RELATED BEHAVIOUR PATTERN)

After checking whether they smoke or not, the duration and amount of smoking are asked for total amount.

Drinking habits (6th and 7th items in V. ORAL HEALTH RELATED BEHAVIOUR PATTERN)

It is same way of questioning with smoking habit.

Interval of dental attendance (3rd item in VI. PATTERN OF USING DENTAL CARE)

The period is from last visit of dental clinic until now. Dental attendance is recorded as for:

- Regular check up;
- An occasional check up; and
- Only when they are having trouble or pain with their teeth.

Dental clinic which they used (4th item in VI. PATTERN OF USING DENTAL CARE)

Dental hospital has several specialised department similar to dental college hospital but it is much smaller. It is also different with dental clinic and dental clinic in dental hospital (i.e., dental hospital has the department of Prosthodontics, Orthodontics, Periodontics, and Conservation)

Dental treatment which they received (9th item in VI. PATTERN OF USING DENTL CARE)

1) Routine check: they have only oral examination without any other treatment.
2) Prevention: the tooth is coated with plastic material or gel with Fluoride without any treatment of prepping, anaesthesia, and bleeding in gums caused by practice.
3) Scaling: the treatment which removes the dental calculus or discolouring agent.
5) Toothache (endo tx.): You should visit dental clinics several times and each time they use something as wire to pick the tooth. It cause severe pain and after finishing the treatment it disappear with any other sense.

The fee schedule for dental treatment (10th item in VI. PATTERN OF USING DENTAL CARE)

Usually dental fee is under 20,000 won with the support from NHI. Prosthodontic treatment which is not covered with NHI costs approximately 200,000 – 300,000 won per crown. When you have denture you pay 500,000 – 1,000,000 won per unit normally.

- Form 2 -

Oral Impacts on Daily Performance (OIDP) (Appendix 2 form 2)

People are asked whether they had any oral health problem in relation to 10 performances, for example eating and speaking. If they answer 'yes', how often do they experienced the problems is checked. There are six grades of frequency as followings: 1) never; 2) less than once a month; 3) once or twice a month; 4) once or twice a week; 5) 3-4 times a week; and 6) every, or nearly every day. After then, the interviewer survey how much they are affected from the problems on their daily lives. The scales of the effect ranged from 0, no effect, to 5, very severe effect. At last, the interviewer shows the list of 20 conditions, for example toothache and sensitive tooth, and then asks to choose specific conditions which make them difficult in each performance.

1. The contents of the items 1), 2), and 3) look similar. However, they are different because 1st item asks how often do they have this problem (=frequency), 2nd item how much they are affected from this problem (=severity), and 3rd item to which condition(s) do they attribute this impact (=reason).

2. Emphasise 'in the past six months' and 'the problem in your oral health' when you explain to the interviewees.

3. Start by asking 1st item and then fill in the items of 2nd and 3rd.

4. The answer for 1st item is scaled from 0 to 5 and they should tick which they think is right.

0 No;
1 Less than once a month;
2 Once or twice a month;
3 Once or twice a week;
4 3-4 times a week; or
5 Every, or nearly everyday

5. The answer for 2nd item is scaled from 0 to 5 and they should tick which they think right.

⓪ ① ② ③ ④ ⑤

No effect Very severe effect

6. The answer of 3rd item is the condition to which do they attribute the impact.

- Toothache: the pain caused from tooth
- Sensitive tooth: the symptom when they eat or drink cold food
- Dental caries: decayed tooth
- Dental calculus: it is hard material changed from the remnants of food stuck around the tooth and usually black colour.
- Colour of teeth: the tooth colour is changed because of discolouring agent, for example cigarettes
- Fillings: the tooth is filled with amalgam, gold or etc after removing decay.
- Prosthodontics: the crowns or bridges which cover the teeth fully with metallic material after endodontic treatment.

7. When they tick the answer in 1st item as

1) Scale 0, No: no need to answer for 2nd item and 3rd item.
2) Scale over 1: find and make a circle in the number of dimension for 2nd item which they answer in 1st item. Tick the scale of severity from 0 to 5. It is similar in 3rd item but they should write down every number which they think it affects to their pain in mouth.

8. In case they answer for 2nd or 3rd item even though they tick the scale 0, no, in 1st item, ask again for 1st item.

1) If they answer as 'no' or '0', it is okay.
2) If they answer they have experienced the problems, rewrite 1st item and then following the instruction as normal.

APPENDIX 7. CLASSIFICATION OF OCCUPATIONS

	1. High-ranking public and management officials
100	High-ranking public officials (above directors of the bureau)
101	Social organisation (political parties, economic organisations), high-ranking officers and staffs (above the head of the department)
102	The chief of the organisation affiliated with government
103	High-ranking officers of the organisation affiliated with government
104	Manager of the enterprise had 5 and over employees
105	High-ranking officers and staffs (above the head of the department) of the enterprise had 5 and over employees
106	Manager of the enterprise had less than 5 employees
107	The manager of the organisation affiliated with government
108	The manager of the enterprise (above the chief of the department)
109	The militaries (generals), the police (above superintendent)
110	Middle-ranking public officials (a secretary, an administrative official)
111	The militaries (field grade), the police (lieutenant)
112	The militaries (company grade)
113	The managers of production line
114	The managers of the construction work
199	Other high-ranking officers and staffs, the managers of corporation or integrated
	2. Specialists
200	The lawyers
201	The judge, the public prosecutor
202	The judicial scrivener, the notary public
203	Other legal specialists
204	The doctor
205	The veterinarian
206	The physician of Chinese
207	The pharmacist
208	The nurse
209	The midwife
210	Other clinical health specialists
211	The professor (above the assistant professor)
212	The teacher in high school or middle school
213	The teacher in elementary school
214	The teacher for preschool children
215	The teacher in special school
216	The certified public accountant or the chartered accountant
217	The tax accountant
218	The patent attorney (lawyer) or specialist
219	The advertisement agent, the patent agent
220	The recorder, the librarian
221	The writer, contributor
222	The author or the creative writer (the novelist, the poet and others)
223	The reporter, the critic, and the editor
224	The sculptor, the painter
225	The composer, the popular song singer, the dance director
226	The vocalist, the conductor of the chorus or the orchestra
227	The talent, the comedian

228	The actor in cinema or play
229	The specialist in computer
230	The engineer
231	The scholar, the researcher (Doctor in natural, cultural, social science)
232	The scholar, the researcher (Master in natural, cultural, social science)
233	The scholar, the researcher (under Bachelor in natural, cultural, social science)
234	The professor (full-time lecturer)
235	The minister, the missionary
236	Other specialist
	3. The associated specialist
300	The assistant in computer, the key-punch operator
301	The manager of ship or aircraft
302	The technician of ship or aircraft (engineer, controller, navigator...)
303	The taxidermist, the technician of agriculture or forestry
304	The associated specialist in health (clinical assistant, hygienist, optician, dental technician, physical therapist, massagist, practitioner of the finger-pressure treatment...)
305	The associated specialist in nursing or delivery (assistant nurse or midwife), the curer with faith
306	The associated teacher in elementary school
307	The associated teacher for preschool children
308	The associated teacher in special school
309	Part-time lecturer, the lecturer for study paper (guidance teacher), the extracurricular lecturer, the advisor
310	The manager of the entertainer, the promoter for sports
311	The intermediary for real estate
312	The associated specialists in finance or selling (agent or intermediary for stock or finance)
313	The consultant or agent of travel agency,
314	The agent for selling (cars, electronic devices...)
315	The connoisseur for jewels, the auction dealer
316	The stenographer, the secretary of management, the bailiff, the insurance agent
317	The public officials of taxation
318	The police investigator (below sergeant), the private detective
319	The interior decorator, the designer of business, product or clothes
320	The announcer, MC of entertainment, DJ
321	The conductor of the orchestra for light music, the magician, the acrobat, the trainer of animal, the performer
322	The singer or the dancer working in the bar
323	The professional sport player, the coach, the referee, the Baduk player
324	The militaries (sergeant)
325	The public officials lower class (below junior officials), except fireman, policeman, and the warder
399	Other associated specialists (the assistant of the ministry or the preacher
	4. Office worker
400	The secretary or typist
401	The office worker for bookkeeping, allowance, or statistical data of work
402	The office worker for supply or transport of the material
403	The office worker for management of book or data
404	The postman, the office worker for post classification
405	The proof-reader
406	The accountant, the money-lender, the bank cashier

407	The pawnbroker, the dealer of horse-race ticket
408	The office worker in travel agency
409	The receptionist in hotel or hospital
410	The telephone operator
499	Other office workers
	5. Services or seller
500	The travel attendant, the tour guide
501	The crew in ship or airplane, the conductor of passenger
502	The guide in bus
503	The visiting housekeeper
504	The steward in hotel, the cook, the waiter, the bartender
505	The nursery governess
506	The medical attendant, the nurse working for family or individual
507	The emergency staff, the assistant of the pharmacist or the veterinarian
508	The hairdresser, the make-up artist for stage, the undertaker
509	The private attendant, the helper with talking
510	The astrologer, the prophet, the palm reader
511	The fireman, the policeman (except the investigator), the traffic policeman, the maritime policeman, the warder (below the sergeant or the junior)
512	The policeman specially detailed to protect body, the bodyguard, the rescue staff
513	The model working in fashion, art, or advertisement
514	The shopkeeper, the advertisement man
515	The salesman in the shop or street stall
516	The insurance salesman
517	The investigator
518	The salesman (business department)
599	Other services or worker in market with sales
	6. The agriculture, the fishery, and the stock breeding
600	The owner of ships
601	The producer of agricultural, stock, forestry, or fishery-related product for selling (big-sized business)
602	The producer of agricultural, stock, forestry, or fishery-related product for selling (middle-sized business)
603	The producer of agricultural, stock, forestry, or fishery-related product for selling (small-sized business)
604	The producer of agricultural, stock, forestry, or fishery-related product for selling (poor class or a tenant)
605	Agriculture or fishery for self-supply
699	Other skilled worker in agriculture or fishery
	7. Technical services
700	The skilled worker or the technician
701	The apprentice or non-skilled worker (the assistant of the skilled worker or the technician)
799	Other technician
	8. The operator of machine or apparatus
800	The self-hired cab (taxi) driver
801	The cab (taxi) driver in transport company
802	The private car driver
803	The bus driver in transport company
804	The private ban driver working for institutes or church

805	The truck driver in transport company
806	The self-hired truck driver
807	The driver for heavy equipment
808	The engineer for train
809	The ship deck officer
899	Other operator or assembler of machine or apparatus
	9. Simple labour
900	The visiting or telemarketing salesman
901	The peddler or stallman
902	The shoe shiner, the deliveryman
903	The assistant for housework or cleaning
904	The room clerk, the laundryman
905	The superintendent in building or apartment, the car washing worker
906	The newspaper deliveryman, the paper deliveryman
907	The porter, the guard, ticket examiner
908	The street cleaner
909	The store clerk, the oiling worker
910	Simple labour in agriculture, forestry, or fishery
911	Simple labour in mine, constructing, manufacturing, or transport
912	Other simple labour
	10. Others
950	The landlord of real estate or building
951	The military (solder)
952	The person living with annuity (pension) after retirement with the age limit
953	The person who earn income with interest
954	The person who is a member of a family but have no occupation
998	No response
999	No answer (age 6-18)
980	The housewife
981	The student
000	No occupation

APPENDIX 9. CHECKLIST FOR ORAL EXAMINATION

< CHECKLIST BEFORE ORAL EXAMINATION >

Checklist	Support	Telephone No.	Check
Contacts with administrators in the place for oral examination			
2 assistants	Health centre		
Check the condition of place for oral examination			

APPENDIX 8. TOOTHPASTE WITH OR WITHOUT FLUORIDE

TOOTHPASTE WITH FLUORIDE				
AMOREPACIFIC				
White E	Median	Xylet	Songyeom	
LG				
Cliden	Clinx	Lucky	Perio	Bamboo salt
E plus				
BUKWANG				
Antiplaque	Sirimed for hypersensitivity tooth			
AEKYUNG				
Clean & White	2080	Vitadent	Herb & Bio salt	
CJ				
Doctor Sedoc (tube)		Doctor Sedoc (gel)		
MUKUNGHWA				
Xyldent				
DONG-A				
Garglin				
ARM AND HAMMER				
Dental care				
TOOTHPASTE WITHOUT FLUORIDE				
ZACT (Japan)				
SHINHWA(PIGEON)				
Denticoen				

< INSTRUMENTS AND SUPPLIES >

			Contents	No.	Check
Set	Examination equipments	Set 1	Container 1 (50 mouth mirrors) + cloth	3	
			Container 2 (50 mouth mirrors + 50 periodontal probes) + cloth	2	
		Set 2	Container 2 (50 mouth mirrors + 50 periodontal probes) + cloth	3	
		Necessary for both	Disposable bag	1	
			Gauze (sterilised, 100 pieces)	1 pack	
			Battery-operated lights	2	
			Disposable gloves	1 pack	
			Disposable masks	1 pack	
			Gown	1	
	Examination forms	Set 1	Paper set 1 (oral health assessment form)	150	
			Paper set 2 (oral health assessment form + interview form)	100	
		Set 2	Paper set 2 (oral health assessment form + interview form)	150	
	Introduction papers		Coated paper for oral examination introduction for examinee	1	
			Copies of oral examination introduction for examinee	200	
	Instruction for examiners		Manual for interviewers, guideline for review of oral examination, coding lists, and measurement criteria		
	Instruction for interviewers				
	Stationeries		Pens (for interviewees, 1 set is a dozen)	2 set	
			Sharpened pencils and erasers	2	
Others	Gift		Keyholders and toothbrush/toothpaste set	200	
	Name card			1 set	

< CHECKLIST AFTER ORAL EXAMINATION >

	Respondents	**Etc.**	**Check**
Photocopying the assessed forms	Jae-in Ryu		
Daily review of assessment forms for completeness and accuracy of recordings	Jae-in Ryu		
Assembling the forms in numerical order	Jae-in Ryu		
Check the no. of examinees needed	Jae-in Ryu		

APPENDIX 10. ORGANISING SURVEY

< CONTENTS >

< CHECKLIST BEFORE ORAL EXAMINATION >

- A schedule of data collection
- Approval from the authorities after provide with introduction of the survey
- Contacts with people in authority (i.e., the principal in school should be contacted for information as when the school is in session, when the children will be available for examination, and where is a suitable area or room that could be used for the examination.)
- Geographic condition (i.e., Weather conditions such as raining...)
- Several scenarios according to how many people and organisation will be involved.
- Appointment after oral examination (i.e., refreshment with supporting team in examined area)

< ORGANISING THE SURVEY >

- A team
- One interviewer and one examiner
: Firstly interview and then examine the oral condition
- One interviewer and two examiners
: plan 1 – one interviewer organises the whole process and one of the examiner helps interviewer and the other examines oral status
: plan 2 – one interviewer interviews and two examiner check oral status.
- Mostly dental examination is in last of medical checkups. It needs help from organizing clerk to distribute interview form and to encourage the interviewees to fill it in. The organising clerk should explain briefly what they will do.
- The oral examiner asks for help to the general health examiner if he or she can do it together. If it is possible, the examinees are recommended to fill in the interview forms after explanation. The oral examination should be the first in order.

< INSTRUMENTS AND SUPPLIES >

- Mirror: sterilised
- Periodontal probe: sterilised
- Gift: key ring, make clear who and when it would be distributed
- Pen: need as much as can

< THE ROLE OF INTERVIEWER >

- The introduction of this survey
- Managing the procedure of interview and oral examination
- The interviewees can fill in by themselves for general index (because of privacy policy).
- The interviewer can ask and fill in the questionnaire from GENERAL HEALTH RELATED WITH ORAL HEALTH. Young people usually prefer to write down by themselves.
- The organising clerk can directly introduce and distribute the questionnaire when the interviewees wait for the oral examination.

- The organising clerk should check the accuracy and completeness of the questionnaire when it is filled in by the interviewees.

< THE ROLE OF THE EXAMINER >

- The examiner records the oral health assessment form first and then oral health interview form.
- They can consult if the examinees want to know more about their oral health. Most of the examinees are interested in their oral health status.
- They should examine carefully and with detail.
- They can check the other conditions after NEED FOR IMMEDIATE CARE AND REFERRAL briefly and explain when the interviewees want to know.

APPENDIX 11. NOTICE FOR ORAL HEALTH SURVEY 1

2003 NATIONAL ORAL HEALTH SURVEY

- **The respondents: Korean Institute of Oral Health Services**
- **The examiners: The professors from Dental College and the experts related with oral health**

Ministry of Health and Welfare

APPENDIX 12. NOTICE FOR ORAL HEALTH SURVEY 2

NATIONAL ORAL HEALTH SURVEY

❖ The social interests and needs for health are increasing with improved quality of life and oral health is necessary to achieve them. The government makes efforts to support and improve oral health with systematic management and it needs concrete data related with oral health life style of people. National Oral Health Survey aims to obtain those data and other countries already have done this survey, for example USA, UK, and JAPAN. They are used as basic research materials to establish and evaluate oral health policy. This is the reason we are surveying National Oral Health.

❖ 2003 National Oral Health Survey team which consists of the professors from dental colleges in University and the experts in oral health will visit your area or hospital. The cooperation for the survey will be need.

Title : 2003 National Oral Health Survey

Method : Visit survey area or hospital (oral examination and oral health questionnaire forms of 2003 National Oral Health Survey)

Date : 1st September 2003 - 31st December 2003

Target : the residents and students in the area

Responsibility: Korean Institutes of Oral Health Services

Researchers: The professors from dental colleges in University and the experts in oral health

SEPTEMBER 2003

MINISTRY OF HEALTH AND WELFARE

APPENDIX 13. HANDOUTS FOR ORAL HEALTH SURVEY

NATIONAL ORAL HEALTH SURVEY

❖ Hello.

We are the member of National Oral Health Survey Team organised from the Ministry of Health and Welfare. The following questionnaire is a part of the survey and it contains some questions about your oral health life and opinion. There is no right answer for the questions. Feel free when you tick or write down the answer. If you have any query, please don't hesitate to ask.

The collected information will be used only as nameless data and it is presented as 'there are some percentages of people who think oral health is important to their entire life.' There is no private information related with the people who participate in this survey. Thanks for your help and it could be great help for this survey.

National Oral Health Survey Team which is organized from
Ministry of Health and Welfare and University of KANGNUNG DENTAL COLLEGE

Preventive dentistry professors;
Dr. DOOKSANG MA, Dr. SEHWAN JUNG
The Institute of oral health researcher;
Miss JAE-IN RYU

APPENDIX 14. GUIDELINE FOR REVIEW OF ORAL EXAMINATION FORMS

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<REVIEW OF ORAL HEALTH ASSESSMENT FORM>

• If the tooth status is 4 (missing as a result of caries) or the treatment need is 6 (extraction) and the prosthetic need 0, it should be corrected according to the tooth status.

• If the teeth statuses are 7447, 747, 7557, 757, they should be written on prosthetic status with proper types.

• Periodontal status, CPI could be X when the prosthetic status is 3, 4, and 5, which are partial or full dentures. However, the periodontal status should be filled in with a certain number. (It is common that there is no code even they are 'healthy')

• If the boxes are not checked in ORAL HEALTH INTERVIEW FORM, it should be tick with 'no'.

• Considerable care should be taken to code the treatment need for missing teeth. (The tooth status is coded as 4 or 5 which means a tooth is missing)

1) The treatment need of tooth is 0 when the tooth is missing.

2) It is not applicable with the code of the treatment need 7, for other care.

3) The prosthetic need should be filled not treatment need.

• When the examiner decide that it needs implants,

1) Fill in as 0 in the treatment need

2) Fill in as 1 in the prosthetic need because it needs one-unit prosthesis (one tooth replacement).

• The treatment needs for last posterior molar when it is missing

1) Examine the occlusal relationship of that posterior area.

2) Only if it makes abnormal movement because of no occluding tooth, you can code it for treatment needs.

3) Otherwise you should code as 0 which means that it needs no prosthesis.

i.e. when the second permanent molar is missing and the occlusion is normal between upper and lower, you code as 0 for the prosthetic need, no prosthesis needed.

• Followings are not included in category 7, 'need for other care':

1) Orthodontic treatment;

2) Sealant: in the surface of healthy (0) or early caries;

3) Periodontal treatment;

4) Fracture treatment; or

5) Attrition, abrasion, erosion, dental or enamel hypo or hyperplasia, discolouration.

<REVIEW OF ORAL HEALTH QUESTIONNAIRE>

• ask 8 people at maximum and then wait until they finish.

• The address should be written from city or GUN, UP, MYUN, DONG. i.e. CHILKOK GUN WAEGWAN UP

• If the address of the examinee is missed, write down the address of examination place (hospital, UP, MYN, DONG).

• The telephone number could be missing and if they just have mobile number it is O.K. The telephone number should be contained STD code. i.e. KANGWON DO 033-

• After finishing the whole process of examination the number of the examinees should be written in order.

• Empty the space for the code of the examiner.

• Please tick in the box of the numbering rather than write down the number.

• If it is obviously wrong the answer should be corrected. i.e. the examinee is the soldier and he or she ticks in the index for national health insurance as NATIONAL MEDICAL AID. The recording clerk should correct it as LABOUR NATIONAL HEALTH INSURANCE.

• If the answer is uncertain, don't write down anything.

• The occupation should be filled in with proper code number. The sub-division is not important because the evaluation of the data depends on the division not sub-division.

• The public serviceman is regarded as 'the public officials lower class (below junior officials) (325)' and the National Health Insurance should be LABOUR NATIONA HEALTH INSURANCE.

• The NATIONAL MEDICAL AID can be acquired regardless of the income status.

• If the examinee answer that 'I don't have Diabetes' and tick for the question, 'have you ever been treated to relieve the symptom of Diabetes?' as 'yes', it regarded as that he or she had Diabetes but have recovered now and correct the first answer.

• If the examinee answer that 'I don't have Diabetes', the answer for the next question 'Have you ever been treated to relieve the symptom of Diabetes' should be 'no answer'.

• If the examinee tick for the question, 'did you clean your teeth yesterday?' as 'no', but he or she answers for the second question, 'how many times did you clean your teeth yesterday?', correct the first answer as 'yes'.

• The examinees could check every item 'which they use for cleaning teeth'.

• If the examination is done, tick for the question, 'will you be examined for oral health' as 'yes'.

• The address of hospital is following;

- Pohang, Gyeongsangbook-Do, (46-5): Sinsegaeyonhap Clinic, 50-2, Oksung 1 Li, Hunghae-Eup, Book-Gu, Pohang city, Gyeongsangbook-Do
- Gumi, Gyeongsanbook-Do (47-5): Soonchynhyang Gumi Hospital, 250, Gongdan 2 Dong, Gumi city, Gyeongsangbook-Do
- Chilkok, Gyeongsanbook-Do (58-5): Waegwan Hospital, 174-54, Waegwan Dong, Waegwan Eup, Chilgok Gun, Gyeongsanbook-Do
- Wonju, Gangwon-Do (39-5): Sunggi Hospital, 264-21, In Dong, Wonju city, Gangwon-Do
- Kangnung, Gangwon-Do (40-5): Gangnung Korea Hospital, 286-6, Okchun Dong, Gangnung city, Gangwon-Do
- Hongcheon, Gangwon-Do (53-5): Asan Hospital in Hongcheon, 466-1, Galmagok Ni, Hongcheon Eup, Hongcheon Gun, Gangwon-Do

APPENDIX 15. MANUAL FOR RECORDERS

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< MANUAL FOR RECORDING QUESTIONNAIRE TO SPSS >

1. Numbering

1) Give the identification number to the oral examination and the questionnaire forms. First order of the numbering is the date of examination and then the age.
2) Write down the ID number of the questionnaire in each page.
3) Start from the one of the oral examination and the questionnaire forms and then match the number with the other.

2. Checking questionnaire

1) Check again whether it is filled in a right way before recording (referring the Guideline for Review of Oral Examination Forms).
2) Be careful with the items of the occupation, toothpaste with or without Fluoride, frequency of toothbrushing, and OIDP index.

3. Open and save

1) Remember where the file is saved.
2) Save SPSS files in one folder.
i.e. Create folder, 'Questionnaire', in C drive and save every file there.
3) There are two ways to open the file. One is to click toolbar 'Open' and the other is to use 'Recently used data or files' in File column.
4) For safety, save and check files frequently.
5) Save files with the name of date. If the file is missing, damaged, or not saved, you can use the previous file as a backup data.
i.e. You record data on 10th November 2003 and the name of data file is q10_11_03. When you work on 11th November 2003, open the file, q10_11_03, and then 'Save it as' q11_11_03 in the same folder before entering data. Record the questionnaire

in q11_11_03 and you will have 2 files, q10_11_03 and q11_11_03 in the folder, Questionnaire.

6) Keep 5 files at maximum in the folder.

i.e. If there are files named as q10_11_03, q11_11_03, q12_11_03, q13_11_03, q14_11_03, and q15_11_03, you can delete q10_11_03 which is the oldest.

4. Data entry

1) Start from the front page of the questionnaires.

2) Empty the cell when there is no answer.

3) Record ID number at first and skip sex, age, name, and address which are repeated in oral examination forms.

4) The title of the variables in SPSS files are same with the number in questionnaire, starting with q.

i.e. the variable for Education level (1_5) in questionnaire is q1_5.

5) Input the number in the right cell.

i.e. The person who has ID number 1 graduated high school. Record 3 in the cell, the variable q1_5 (column) and the case 1 (row).

	Q1_5	-> variables
1	Cell	Cell
-> case	Cell	Cell

6) If the questionnaires allow more than two answers, they should be recorded in different way, multiple response tables. The answering numbers are changed into variables and they are recorded as 0=no or 1=yes.

i.e. ID number 1 answered he or she clean tooth (4_1) 2) after breakfast, 4) after lunch, 6) after dinner, and 8) before going to sleep. Do not record as 2, 4, 6, and 8. Input 1(=yes) for the variables q 4_1_2 (after breakfast), q4_1_4, q4_1_6, q4_1_8.

7) Leave the cell as empty if they could not answer. i.e. the variables **q4_1, q5_3, q5_4, and q6_2.**

i.e. They answered that they did not clean their teeth yesterday in q4_1 and then they could not answer for the variables q4_1_*.

8) The name of variables in OIDP index starts with d (dimension) and the number is in order.

i.e. Question number 1 in OIDP index is d1_1 not q7_1.

9) Record as usual SPSS variables for d1 and d2.

10) Should be careful in recording d3. Find the number of condition which affects each dimension and input 0=no or 1=yes in the cell.

i.e. In case of ID number 1, OIDP d3_1 'Eating food' is affected by the conditions 1(=toothache), 2(=sensitive tooth), and 5(=tooth loss). Record 1(=yes) for the variables d3_1_1, d3_1_2, and d3_1_5.

< MANUAL FOR RECORDING ORAL EXAMINATION FORM TO FOXPRO >

1. Open and save

1) You select **'Open'** in the toolbar of **'File'** with F10 key and it shows 'Drive' and 'Directory'.
2) Choose Directory **'questionnaire'** in C drive.
3) The Command window appears as "USE C:\ QUESTIONNAIRE\ OREXAM. DBF" and the cursor is blinking.
4) Type '**appe**'(abbreviated word for 'append') and the file is opened.
5) After finishing record, push **the key W with Ctrl.** You can exit from the file with automatic saving. You can also enter **Esc key** but it does not save current case which you were working and only save up to the previous case.
i.e. You decided to finish recording in the end of the front page for ID 1000 and pushed **Esc key**. The data of ID 1000 will be missed out and only have the data from the case, ID 999.
6) Type **'quit'** in command window at right side or select **'quit'** from file toolbar.
7) Window shows **'normal shutdown'** and it means the programme is finished safely. You can close the window with clicking toolbar **'X'** in the right top.

2. Record

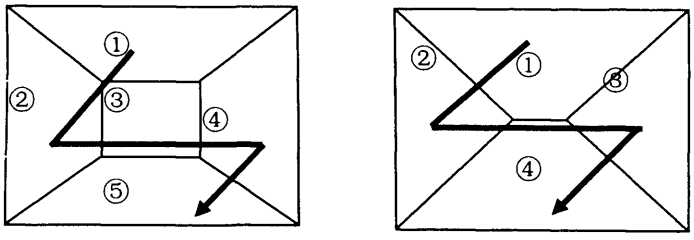
1) There are 46 fields in the opened file and the followings are:

Field name	Contents	Ciphers
ID	ID number	4
AGE	Age	2
GENDER	Sex	1
AREA	Area	1
TTN 10	Treatment need for teeth #11-18	8
TTN 20	Treatment need for teeth #21-28	8
TTS 18-48	Tooth status for 32 teeth (32 fields)	4-5
TTN 40	Treatment need for teeth #41-48	8
TTN 30	Treatment need for teeth #31-38	8
PPS	Prosthetic status	2
PPN	Prosthetic need	2
CCPI	Periodontal status, CPI(Community Periodontal Index)	6
QQ1	Questions from oral health interview forms (1-6)	6
QQ2	Questions from oral health interview forms (7-11)	5
QQ3	Questions from oral health interview forms (12-16)	5

2) Record from left to right side.

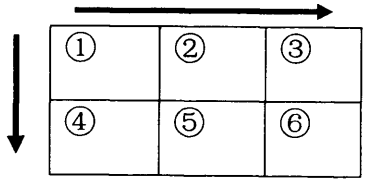
3) Record just the number, not alphabet T for TTN (Tooth treatment need).

4) The order of TTS (Tooth status) is following:



5) Skip the Dental Fluorosis section which is not applicable for adult.

6) The order of CCPI (Periodontal Status, Community Periodontal Index) is following:



7) Record as **5 when Periodontal Status, CPI is X=Excluded sextant** (less than two teeth present).

8) Record as **8 when there is 'no answer'** for the questions.

i.e. The examinee has no experience (2=no) with Orofacial trauma (question 1). They can skip the answer for 2nd question and directly go for 3rd question. In this case, record 8 (=no answer) for 2nd question, 'the reason of the Orofacial trauma'. It aims to differentiate the people who answered as 'yes' in the first question but 'no' for the reason question.

APPENDIX 16. SCORING METHODS

OIDP SCORE

[(frequency score* of oral impact on "Eating" X severity score* of impact on "Eating") +
(frequency of "Speaking" X severity of "Speaking") +
(frequency of "Cleaning teeth" X severity of "Cleaning teeth") +
(frequency of "Doing light physical activities" X severity of "Doing light physical activities") +
(frequency of "Usual daily activities" X severity of "Usual daily activities") +
(frequency of "Sleeping" X severity of "Sleeping") +
(frequency of "Relaxing" X severity of "Relaxing") +
(frequency of "Smiling, laughing and showing teeth without embarrassment" X severity of "Smiling, laughing and showing teeth without embarrassment") +
(frequency of "With your emotional state" X severity of "With your emotional state") +
(frequency of "Enjoying the contact of other people" X severity of "Enjoying the contact of other people")] X 100/250**

* score ranged from 0 to 5

** maximum possible score [sum of 10 performances score (5 frequency score X 5 severity score) = 250]

CS-OIDP

Identify the possible causal impairments (specific conditions) for each type of treatment.

Calculate the score for each of ten performances only with possible causal impairments.

Sum up these scores for ten performances only with possible causal impairments.

Divide with total score, 250, and multiply with 100 for percentage