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**A PROTOCOL FOR EPIDEMIOLOGICAL
PATHFINDER ORAL HEALTH SURVEY IN
PAPUA NEW GUINEA DEFENCE FORCE**

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SUMMARY

Almost all countries, regions, and communities in the world have some oral health services for meeting the needs of their population. However, these services are often insufficient to fulfil the needs in terms of prevention, curative, and restorative services. Thus, planning and subsequent implementation of oral health services and programmes to overcome most of the oral health problems, and to improve oral health and the oral health care system, is critically important. The planning of oral health services and programmes is usually based on a specific situation analysis to obtain an idea of the current oral health and oral health care system, and to document the development of, and possible changes, in these features. An analysis of the situation involves collection of epidemiological and other relevant data from which inferences can be made for the whole or most of the population.

The collection of epidemiological and other relevant data for situation analysis can be achieved through a combination of clinical and questionnaire survey. The basic oral health survey methodology as recommended by World Health Organization is the method of choice to collect epidemiological data for estimation of the current oral health status of the population and future needs for oral health care. It provides baseline data for planning and evaluation of oral health services, and monitoring of changes in levels and patterns of oral diseases and other conditions. Self administered questionnaires have been designed to collect information on the impact of oral health care system, socioenvironmental, and personal characteristics in oral health outcomes including: oral health status and treatment needs, oral health behaviour and oral quality of life.

Central to the knowledge of oral health status and treatment needs of the population is the need for epidemiological data on oral diseases and conditions. The epidemiological data includes: dentition/dental caries status; periodontal diseases/attachment status; oral mucosa lesions; enamel opacities/hypoplasia; dental fluorosis; dental facial anomalies; and prosthetic status; and the treatment needs for all of these oral diseases and conditions.

Oral health behaviour of the target population can be assessed by investigating oral hygiene practices including: toothbrushing; flossing; and toothpick use, and utilisation of oral health services. These oral health behaviours of individuals and community groups are influenced by personal, oral health care system, and socioenvironmental characteristics. These characteristics can influence an individual's likelihood of engaging in various oral health behaviours, and either facilitate or impede individual's oral health behaviour.

Oral quality of life is an ultimate outcome of oral health behaviour and oral health status. The oral quality of life of the population can be determined by: self assessment of perceived oral well-being; self reported oral disease symptoms; and social and physical functioning, as a result of oral health problems.

With the availability of data pertinent to oral health status, oral health behaviour, and oral quality of life of the target population, it is possible to evaluate and plan for oral health services and programmes for the improvement of oral health, and to monitor changes in levels and patterns of oral health outcomes in the community.

Due to lack of comprehensive baseline oral health data, it has been evidently unpracticable to plan, evaluate, and monitor oral health and the oral health care system in Papua New Guinea Defence Force (PNGDF). There has been an imperative need to design a protocol for a descriptive pathfinder oral health survey in PNGDF to collect epidemiological and other relevant data for planning, evaluation, and monitoring of oral health and oral health care. The availability of such data should subsequently provide the basis for the improvement of the oral health of PNGDF personnel and their dependants.

This thesis has reviewed the literature on oral health outcomes including: oral health status and treatment needs; oral health behaviour; and oral quality of life, and has presented a protocol for epidemiological pathfinder oral health survey (descriptive - cross-sectional) in Papua New Guinea Defence Force. The protocol will be strongly recommended for implementation by the Papua New Guinea Defence Force.

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DEDICATION

This thesis is dedicated to:

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Chapter 1

INTRODUCTION

1.1 BACKGROUND

It has been said that there is a growing awareness that the ability of people to utilise health resources is almost limitless and yet there is a limit to the resources that can be devoted to health. Although everyone needs access to dental health services, the amount of services that can be provided is grossly inadequate for this need in almost every country. The need for planning to achieve wise utilisation of scarce resources is particularly important in dentistry. Therefore, the need to plan and develop programs that are directed to overcoming the most significant oral health problems in the most efficient and effective manner is critically important to develop as well as to a developing nation (WHO 1976), region and community including Papua New Guinea Defence Force.

The global picture at present in oral health is that, there is a rapidly increasing dental caries problem, a stable but high periodontal disease problem, and a scarcity of manpower in most of the developing countries. This is in contrast to a stable or decreasing dental caries problem, a stable or decreasing periodontal disease problem, and a growth in manpower availability in most of the highly industrialised countries. In most of the developing countries, the effect of increasing dental caries prevalence, superimposed on an already high prevalence of periodontal disease, indicate a growing proportion of the population suffering from repeated episodes of acute pain from childhood to the third or fourth decade of life and from premature loss of teeth. Usually the pain produces an immediate demand for dental services. These dental services should be aimed primarily at relieving the acute episodes and contributing greatly to the prevention of premature loss of teeth (Renson 1984, WHO 1980a, 1984, 1992).

These trends call for an urgent priority for integrated, coordinated planning for more balanced and comprehensive oral health services to provide regular preventive, curative and restorative services, as well as for appropriate manpower production in order to avoid unnecessary and major wastage of resources. In most of the developing countries including Papua New Guinea (PNG), there is a clear evidence that the lack of resources, manpower, and money; combined with their other needs and demands, emphasises the necessity for careful planning of the oral health services (WHO 1980a).

Features of oral health care which are common to all countries, regions, and communities of the world include **(WHO 1980a)**:

- (1) *There are some oral health services for meeting the needs of their population.*
- (2) *These services are insufficient to fulfil these needs in the traditional preventive curative, restorative, and/or rehabilitative way.*
- (3) *There is virtually universal recognition by the population itself, health administrators, and other authorities, including politicians, of the need for improvement of oral health services and more adequate fulfilment of oral health needs, particularly by prevention.*

The planning of oral health services must be based on a specific situation analysis. A practical approach to the planning of oral health services requires the following steps **(WHO 1980a)**:

- (1) *Collection of epidemiological and other relevant data for a situation analysis.*
- (2) *Establishment of measurable goals for the oral health services, based on the data collected and taking into consideration all the resources available - manpower, facilities, and funding.*
- (3) *Establishment of quantitative and qualitative manpower production goals linked with the oral health services goals.*
- (4) *Inclusion of an evaluation program enabling the plan and the goals to be modified when appropriate.*
- (5) *Careful costing of the plan.*

For the purpose of this thesis, the major emphases will be on the first step of the planning process - situation analysis. The *situation analysis* involves the collection of *epidemiological data* from which inferences can be made for the whole or most of the population. The basic oral health survey as recommended by the World Health Organization provides a sound basis for estimating the present oral health status of a given population and its future needs for oral health care, and for monitoring changes in the levels and patterns of oral diseases and conditions. Furthermore, it produces reliable baseline data for the development of national or regional oral health programs and for planning for appropriate numbers and types of personnel for oral care required **(WHO 1997)**.

FDI (1975) defines epidemiology as “*the study of the incidence, prevalence, distribution and control of a disease, defect or disability in a population or group, and its associated variables*”. The aim of an epidemiological survey is generally to observe the state of nature, not to change it. Information on the occurrence and distribution of oral diseases and conditions are recorded and tabulated so that inferences may be drawn from the tabulated findings. In addition, the epidemiological surveys are commonly aimed:

- (1) *To determine the prevalence of the oral diseases and conditions within different age, sex, ethnic, national, geographic or social groups of people (descriptive).*
- (2) *To search for possible causes of any differences manifested among and within these groups, such as diet, geographical locality, or presence of trace elements (analytic or explanatory).*
- (3) *To determine the type, extent and severity of oral diseases and conditions relative to each other and general health problems.*
- (4) *To assess the extent to which public health programs have been effective in improving dental health.*
- (5) *To stimulate and maintain public awareness of the importance of dental health.*

1.1.1 Epidemiological Study Designs

There are two major types of epidemiological study designs: experimental and observational. In *experimental studies*, the investigator actually introduces a factor or intervenes in the environment of the study subjects to see what impact the intervention has on the study subjects compared with a group of subjects that did not have the intervention. In *observational studies*, the investigators do not directly intervene but instead develop methods for describing events that occur naturally without their direct intervention and the effect that this has on the study subjects. The observational studies can be either descriptive or analytic in emphasis, depending on the types of research or survey questions they address. *Descriptive surveys* provide a profile of the characteristics of a population or group of interest, while the *analytic studies* ask why the group has the characteristics (**WHO Regional Office-Western Pacific 1992, Aday 1996**).

There are three major types of observational study designs: cross-sectional, group-comparison, and longitudinal. The designs differ principally into two ways: (1) the number of groups explicitly included in the study and the criteria for choosing them, and (2) the number of points in time and reference periods for gathering the data (**WHO Regional Office-Western Pacific 1992, Aday 1996, Daly et al 1997**). For the purpose of this thesis, only cross-sectional and group-comparison will be defined.

Cross-section designs generally focus on a single group representative of some population of interest in which data are gathered at a single point in time, and the reference period for the characteristics that the study subjects are asked to report may be either for that point in time or for some reasonable period of time that they can recall in the past.

Group-comparison designs explicitly focus on two or more groups chosen because one has a characteristic of interest and the other does not, in which the data are collected as is the case with cross-sectional design.

1.1.2 Methods of Collecting Oral Health Data

In dentistry, the principal methods of collecting oral health data include: clinical oral examination; personal interview; and self-enumeration. Choosing a collection method for a survey depends on a number of factors. In general, the choice of the method of collecting oral health data is determined by the nature of the problem, objectives of the survey, sampling frame, and resources including: time, manpower, and/or money (**Darby & Bowen 1980, Jackson 1993, Aday 1996**).

1.1.2.1 Clinical oral examination

Clinical oral examination method involves a basic oral health survey as recommended by World Health Organization (**WHO 1997**), which is commonly used to collect information about the oral health status and treatment needs of a population, and subsequently, to monitor changes in levels and patterns of oral diseases and conditions. This method makes it possible to assess the appropriateness and effectiveness of the oral health services being provided and to plan or modify in order to improve oral health and oral health services.

The special factors associated with two major oral diseases and an extensive experience gained in epidemiology over the past 25 years have enabled a practical, economic survey sampling methodology to be developed, called the *pathfinder* method. This method uses stratified cluster sampling technique, which aims to include the most important population subgroups likely to have differing disease levels. It also requires an appropriate number of subjects in specific index age groups in any one location. Thus, reliable and clinically relevant information for planning is obtained at minimum expense. The pathfinder survey is meant to incorporate sufficient examination sites to cover all important subgroups of the population that may have differing disease levels or treatment needs, and at least three or more of the age groups or index ages. This type of survey design is suitable for the collection of data on the prevalence of oral diseases and conditions affecting the population; disease level, severity and need for treatment in subgroups of the population; and age profiles of oral diseases in the population to enable care needs for different age groups to be determined, to provide information about severity and progression of disease, and to give an indication as to whether the levels are increasing or decreasing. Thus, it is suitable for the collection of data for the planning and monitoring of oral health services in all countries regardless of the level of disease, availability of resources, or complexity of services (WHO 1997).

1.1.2.2 Personal interview

Personal interview method involves: face to face interview; telephone interview; and computer assisted telephone interview (CATI). *Face to face interview* is highly effective in terms of establishing rapport, boosting response rates and data quality, and collecting sensitive or complex data. However, it is expensive in terms of resources required and possible for interviewer(s) to be biased. *Telephone interviewing* is usually cheaper in terms of resources required, however, it is possible to end up with partial responses as a result of withdrawals; to introduce bias because of unavailability of telephones, as some subscribers are unlisted, or changes of addresses. *CATI* involves entering the respondent's answers directly into a computer system, with significant reductions in survey and data processing time. It also allows automatic dialling of respondents, computerised sequencing of questions, edits and checks data as it is entered, and has an immediate tabulation of results at the end of the survey. However, it is very expensive in terms of costs of equipment and training of interviewers (Jackson 1993, Aday 1996).

1.1.2.3 Self-enumeration

Self-enumeration method refers to respondents completing the survey *questionnaires* either by postal or hand delivered. Postal or mail-out surveys are an effective and efficient method of collecting data where information is to be collected regularly or over a long period. It is inexpensive and possible to distribute large numbers of questionnaires in a short time covering wide geographic area, thus allowing respondents to complete the questionnaires in their own time. Hand-delivered questionnaires involves delivering to, and/or collecting from respondents personally by an investigator. It usually results in an improved response rates compared with a postal survey, and is particularly suitable where information needs to be collected from several members of a household. However, the hand delivered questionnaires method is expensive and difficult to achieve sufficient level or quality of response (Jackson 1993, Aday 1996).

An application of a social survey approach by self administered questionnaire through hand-delivery at the time of clinical examination, allows measurement of oral health attitudes, knowledge, behaviour, and quality of life. Such information obtained is invaluable in providing oral health planners and administrators, politicians or other authorities with reliable and accurate data that are a prerequisite for effective policy formulation and planning in order to improve oral health and oral health services in the country, region or community (Bowling 1997, Brennan et al 1997, Daly et al 1997).

1.1.3 Oral Health Outcomes

Oral health outcomes are the effects of oral health services on patients' oral health as well as patients' evaluations of their oral health care. Reliable and valid information on oral health outcomes is essential for evaluation, monitoring and development of plans and policies for the improvement of oral health and oral health services (Bowling 1997, Daly et al 1997).

The oral health outcomes including: oral health status and treatment needs; oral health behaviour; and oral quality of life will be discussed separately in chapters 2-4. The Second International Collaborative Study (ICS II) postulates that an individual's oral health behaviour including oral hygiene practices and oral health service utilisation, is influenced by his or her predisposing and enabling characteristics.

Characteristics such as sex, education, occupation, and health beliefs predispose an individual to engage or not to engage in certain oral health behaviour, while enabling characteristics such as income, having or not having a usual source of oral health care, residence and family size might facilitate or impede the individual's practice of such behaviours. The individual's personal characteristics and oral health behaviour also affect his or her oral health status. Subsequently, the individual's personal characteristics, oral health behaviours, and oral health status affect his or her oral quality of life. These personal characteristics are also being influenced by socioenvironmental characteristics and the oral health care system (**Chen et al 1997**).

A combination of clinical examinations and self-administered questionnaires is the method of choice to collect essential data for the assessment of oral health outcomes and to provide the baseline oral health data for planning, monitoring and evaluation of oral health and oral health care.

1.1.4 Papua New Guinea Defence Force Dental Health Services

The Directorate of Health Services (DHS) under Personnel Branch is responsible to Chief of Personnel for the organisation, administration and implementation of free medical and dental services in Papua New Guinea Defence Force (PNGDF). The Dental Health Services coordinator is responsible to the Director of Health Services for the provision of dental health services to the Defence Force personnel (Army, Navy and Air Force), dependants (wives & children), civilian employees of Department of Defence and other authorised civilians.

The primary aim of PNGDF Dental Health Services is to contribute to the combat effectiveness of the armed forces, through the cost effective maintenance of a high standard of dental fitness. Subjected to service convenience, PNGDF dental facilities may be made available to dependants, civilian employees of Defence Department and other authorised civilians (**PNGDF 1974**).

Lack of information about the rapidly changing oral health outcomes including: oral health status and treatment needs; oral health behaviours; and oral quality of life of the Papua New Guinea (PNG) Defence Force population, has been a serious limitation to the assessment of current oral health and oral health services, planning of dental care programs, and the estimation of dental workforce requirements. Indeed, the lack of comprehensive baseline oral health data makes it very difficult to plan, monitor and evaluate dental health services; and to ascertain the prevalence and distribution of oral diseases and other oral conditions in PNG Defence Force.

1.2 AIM OF THE THESIS

The urgency of the need for a pathfinder oral health survey in Papua New Guinea Defence Force (PNGDF) is highlighted by the lack of comprehensive baseline oral health data and has been recognised for many years by PNGDF Dental Health Services. In recognising the significance and the need, this thesis is aimed:

- 1 To review *oral health outcomes: oral health status and treatment needs, oral health behaviours, and oral quality of life*, as a result of the impact of the oral health care system, the socioenvironmental characteristics, and personal characteristics. These dimensions of oral health outcomes will be discussed respectively in chapters 2-4 and provide the basis for the second aim.
- 2 To develop *a protocol for an epidemiological pathfinder oral health survey in Papua New Guinea Defence Force (descriptive - cross-sectional)*. The development of the protocol will be discussed in chapter 5, focusing on the oral health outcome dimensions.

Chapter 2 ORAL HEALTH STATUS AND TREATMENT NEEDS

2.1 INTRODUCTION

From oral health data accumulated at the WHO Global Data Bank in Geneva, there are two major trends in oral health status identified: (1) deterioration for most of the developing countries; and (2) improvement for most of the industrialised countries. It has been reported that the oral disease prevalence in industrialised countries is decreasing due to an availability of fluoride and oral hygiene improvement. In contrast, the oral diseases levels seen in many developing countries are increasing as a result of social changes, coupled with poor oral hygiene practices (Renson 1984).

Traditionally, dentistry has been perceived as being concerned with the health of the teeth and their supporting tissues, the periodontium. However, while the health of teeth and the periodontium predominate within dental services, dentistry has developed a wider perspective on oral health that now encompasses the oral cavity and its supporting structures (Spencer et al 1993).

In recent times, routine dental work in many countries has been concerned mainly with the management of dental caries and periodontal diseases and their sequelae, that is, with relieving pain, restoring or extracting teeth, and making prosthetic appliances. However, emphasis now involves a much wider range of oral diseases and conditions including: lesions of the oral mucosa, problems of the temporomandibular joint, disorders of occlusion, and enamel opacities/hypoplasia (WHO 1990, 1997).

For planning purposes, it is important that as accurate information as possible is obtained concerning the prevalence and severity of oral diseases and conditions. The objectives of basic oral health surveys are to collect information about the oral health status and treatment needs of a population and, subsequently, to monitor changes in levels and patterns of disease. Thus, it is possible to assess the appropriateness and effectiveness of the services being provided and to plan or modify oral health services for the improvement of oral health (WHO 1990, 1997).

An analysis of the situation in which program planning and subsequent implementation will take place is essential to obtain an idea of the current oral health situation, the performance of the oral health services, and to document the development of and possible future changes in these features. Subsequently, the oral health status and treatment needs data obtained from situation analysis can be used to set measurable goals in the preventive, curative, and restorative services (**WHO 1976**). Central to the knowledge of oral health status is the need for epidemiological data on oral diseases and other oral conditions throughout the population (**WHO/FDI 1989**).

Furthermore, the oral health status and treatment needs of individuals and community groups is an indication of oral health outcome as affected by personal characteristics, oral health care system, and socioenvironmental characteristics. As postulated by the Second International Collaborative Study (ICS II) (**Chen et al 1997**), an individual's personal characteristics and oral health behaviour affect his or her oral health status.

As recommended by the World Health Organization, basic methods of oral health survey should be used to provide a sound basis for estimating the present oral health status of a population and its treatment needs, and for monitoring changes in the levels and patterns of oral diseases and conditions. The principles contained in the latest edition should be adopted because it presents an updated version of the WHO Oral Health Assessment Form, takes account of the experience gained in these surveys, and contains recent developments in oral health care and epidemiological techniques. In particular, new sections on the evaluation of extra-oral conditions, the oral mucosa, enamel opacities/hypoplasia, loss of periodontal attachment and dentofacial anomalies are included, in order to provide a more complete assessment of oral health status and treatment needs (**WHO 1997**).

The oral health status parameters to be discussed in this chapter include: dental caries in terms of dentition status; periodontal status including loss of periodontal attachment; and other oral conditions including, temporomandibular joint problems, dentofacial anomalies, oral mucosa lesions, prosthetic status, dental fluorosis, and enamel opacities/hypoplasia; and their treatment needs.

2.2 DENTAL CARIES

2.2.1 Definition of Dental Caries

The **World Health Organization (1962)** defined dental caries as *a localised, post-eruptive, pathological process of external origin involving the softening of the hard tissue and proceeding to the formation of a cavity*. More recently, **Newbrun (1983)** defines *dental caries* as a *multifactorial disease in which there is an interplay of four principle factors: the host (primarily the teeth and saliva); the microflora; the substrate or diet; and time*. For dental caries to occur, conditions within each of these factors must be favourable such as susceptible host, a cariogenic oral microflora, a suitable substrate or diet, and all simultaneously occurring within a sufficient length of time.

The dental caries is characterised by demineralisation of the mineralised tissues of the teeth, namely the enamel, dentine, and cementum followed by disintegration of their organic composition by acids produced by oral bacteria. The development of dental caries is a dynamic process of demineralisation of the dental tissues by the products of bacterial metabolism, thus the lesion may range from changes at the molecular level to gross tissue destruction and overt cavitation (**Newbrun 1983**).

Globally, dental caries ranks among the most prevalent diseases of humans. It can start soon after primary teeth erupt in early childhood. It is a public health problem in most countries. Current perception is that the prevalence of dental caries is declining in industrialised or developed countries and escalating in less developed or developing countries (**Horowitz 1996**).

Some of the terminologies used in the description of dental caries in epidemiological studies worth knowing including (**WHO 1962; FDI 1975**):

- (1) *Past dental caries* refers to carious lesions that have been eliminated usually by tooth extraction or fillings (restoration).

(2) The *dental caries status* is a term used to describe the occurrence of dental caries in the teeth present at the time of the examination, including primary (untreated) caries or decayed (D) and restored caries (filled or F), but excluding teeth missing (M) as a result of extraction because of caries. Therefore, a person is classified as either having a positive (with caries) or negative (no caries) status.

(3) *Caries prevalence* or *experience* are similar terms used to denote the accumulated total number of teeth, surfaces or sites affected by dental caries. These terms include the caries status of teeth present at the time of examination and the teeth lost because of caries. Usually, caries experience refers to that in a group or population. When the prevalence is expressed as an average, the denominator is the number of persons examined.

(4) The *dental caries free* usually refers to a sound tooth, surface or site. When applied to an individual, the term indicates that there is no active dental caries present nor is there evidence of past dental caries as manifested by arrested lesions, the presence of fillings or extraction.

(5) *Caries predilection sites* designate those anatomical locations of the teeth that are likely to become carious. The three main types are pit and fissure sites, free (non-proximal) smooth sites and non-free (approximal) smooth sites. On some tooth surfaces, e.g the lingual surfaces of maxillary first molars, both a smooth surface and a pit predilection site may be distinguished. In most locations, however, only one type of predilection site exists on one surface.

(6) *Life time caries experience* constitutes the past caries and existing clinical caries. It is the sum of the number of decayed, missing and filled teeth.

(7) *Incidence (increment) of clinical caries* refers to the number of new carious lesions, teeth or surfaces occurring in an individual or group within a stated period of time. It is customary to express caries incidence as an average annual score or increment per person.

2.2.2 Epidemiological Classification of Dental Caries

Epidemiologically, dental caries may be classified into: initial or incipient; and clinical lesions (FDI 1975). *Initial or incipient lesions* are those carious lesions that have not reached the stage of having a visible break in the enamel surface. Usually, an incipient lesion appears as a chalky-white or discoloured area, and is generally not detectable by physical examination, although it may be apparent on a radiograph. *Clinical lesions* are those that have reached the stage of actual cavitation and usually can be diagnosed with reasonable certainty by clinical (visual-tactile) or radiographic examination.

The clinical dental caries may be further classified as:

- (1) *Primary caries* - a positively diagnosed cavity that is not associated with a restoration.
- (2) *Secondary caries* - a positively diagnosed carious lesion that occurs at the margin of an existing restoration. It may be a new lesion or a remaining part of an inadequately excavated and filled lesion.

The present classification used by the profession for the identification of carious lesions is based on the location of the lesion as introduced by Black 100 years ago (Elderton 1988; Mount & Hume 1998). However, a new classification proposed by Mount and Hume (1998) is based on the site of the carious lesion and the extent (size) to which it has progressed. There are three sites on the crown or root of a tooth for the plaque to accumulate and produce carious lesion. These sites are: (1) *pits and fissure* on otherwise smooth surfaces; (2) *contact areas* between any two teeth; and (3) *gingival or cervical margin* around the full circumference of a tooth. The cavities extend into four sizes: (1) *minimal* - just beyond healing through remineralisation; (2) *moderate* - a little larger but still sufficient sound tooth structure to support a plastic restorative material; (3) *enlarged* - the cavity has extended to the stage where it is necessary to use the restorative material to support the remaining tooth structure through a protective cavity design; and (4) *extensive* - a loss of bulk tooth structure such as a cusp or an incisal edge. Mount and Hume (1998) state that the proposed classification allows more relevant details to be recorded for each lesion and will be of value both for personal records and epidemiological studies. However, this proposal is yet to be adopted by WHO and FDI for world wide use.

As recommended by the World Health Organization, the basic epidemiological oral health surveys focus on two general sites: crown and root of the teeth, in order to determine the dentition status and treatment needs of a population (WHO 1997).

2.2.3 Dental Caries Indices

An *index* is a method of quantifying a particular characteristic or a way of expressing a certain condition in terms of a ratio or other number derived from a series of observations and used as an indicator or measure of the severity of that condition. The index to be used is determined by the purpose of the survey. The indices of dental caries, most appropriately used for oral health surveys, serve two purposes: measurement of prevalence, and intensity (WHO 1962).

Measurement of prevalence refers to the proportion of persons affected with clinical caries, teeth missing due to caries, or filled teeth. The prevalence of decayed (D or d), missing (M) due to caries or filled (F or f) is calculated by the sum of persons affected with DMF or df and divided by the number of persons examined and multiplied by 100. The prevalence rates can be expressed specifically for age, sex, geographical locality, ethnic groups or other relevant variables; and for primary and permanent teeth. These prevalence rates should provide the proportion of the population who:

- (i) require treatment for clinical caries;
- (ii) have teeth missing because of caries;
- (iii) have teeth filled; and
- (iv) are caries-free.

Measurement of intensity or extent of dental caries is the number of teeth affected per person. The indices recommended by the WHO and FDI are DMF index and df index which are used to measure the extent of caries experience in a population. It is also possible to use the components of each index to provide additional information of practical importance in planning and evaluating public dental health programs (WHO 1962).

DMF index is a quantitative expression of a person's lifetime caries experience in the permanent teeth. An average DMF score expresses the mean caries prevalence in a group of individuals. The DMF index is the sum of decayed (D), missing (extracted) because of caries (M), and filled (F) permanent teeth (T) or tooth surface (S). Each tooth or tooth surface is counted only once, either under D, M, or F. Third molars are often excluded, in which case only 28 permanent teeth are at risk.

dmf index is a quantitative expression of the caries experience or caries prevalence in the primary teeth. It is the sum of decayed (d), missing (m) due to caries, and filled (f) primary teeth (t), or tooth surfaces (s). It is used in the same way as DMF index. Only those teeth which should be present according to the subject's age at the time of examination are assessed in the missing component. For example, it may be decided to classify missing deciduous canines and molars as missing (m) only in children less than nine years of age, because beyond that age it may be impossible to determine whether a given missing tooth has been extracted or has exfoliated. If all missing primary teeth not replaced by a permanent successor are considered as missing teeth regardless of age, it is an over estimation of the dmf index results.

The number of primary or permanent teeth with untreated dental caries related to either the total number of persons examined or per 100 examined teeth is called *caries morbidity*. Whereas the number of permanent teeth lost or indicated for extraction from all causes per 100 teeth or per individual is called *tooth mortality*. The tooth mortality values may be separated according to cause of loss (FDI 1975).

At the *individual level*, decayed teeth (D or d) reflect an unawareness or neglect of existing disease. Missing teeth (M or m) denote tooth mortality, reflecting neglect or treatment resulting in extraction. Filled teeth (F or f) are the result of treatment of caries. DMFT or dmft therefore represents the cumulative impact of caries. At the *societal level*, the mean DMFT or dmft score indicates the overall impact of the oral health care system, caries prevention and treatment measures, and other social, cultural and economic factors. The proportions of each of the components reflect the degree to which the oral health care system has successfully treated dental caries. The proportion of M or m is an important indicator of the success in preventing the extraction of teeth due to caries or treatment of caries (Chen et al 1997).

2.2.4 Diagnosis of Dental Caries

There are four key methods in use in many countries today: clinical, radiographic, fibre optic transillumination, and elective temporary tooth separation. The only method most commonly used in epidemiology is *clinical diagnosis* in which the examiner deals with a population rather than individuals (Pitts 1993).

Traditionally, the diagnosis of dental caries involves the use of a mirror, an explorer, and perhaps bite-wing radiographs. A tactile feeling of resistance when the explorer is removed from the tooth surface, leads to an almost unquestioned diagnosis of caries. However, there is a growing awareness of the unreliability of *probe catches* using a sharp explorer. The validity of such a method is poor. It has been demonstrated that an excessive force and improper use of the explorer can damage enamel, leading to cavitation in an incipient caries. A simple but important advance in the routine clinical examination is the reduced dependence on the explorer. Studies have shown that, at least for some populations, visual examination may be as effective as an explorer in diagnosing a clinical caries lesion and confirming the need for treatment lesions. Future diagnosis of caries may be improved by the use of radiography or lasers which are now largely confined to further research (Pitts 1993, WHO 1992).

Although dentists are expert at diagnosing caries, it should not be taken for granted that they are infallible. Because the dental caries is difficult to diagnose, the dentists cannot all have been correct in their diagnoses. Studies have proven that high proportion of dentists do not agree with each other on the presence or absence of dental caries. Dental epidemiologists have battled with the issue for many years and they have found it necessary to institute comprehensive training programs for their examiners (Elderton 1988, Bader & Shugars 1993).

For diagnostic purposes, the dental caries is categorised according to the morphology, or tooth site, including (Dodds 1993, Pitts 1993): occlusal caries; approximal caries; smooth surface caries; recurrent caries; and root caries. Each of these sites has different problems, and in some cases different methods of diagnosis associated with it.

Occlusal Caries - Every practitioner is aware of the problems inherent in determining the presence or absence of an early or incipient lesion in these sites, because the base of fissures cannot be directly visualised. Few would argue that one of the prime aids to diagnosis is the visual technique, observing a clean and dry tooth with a good clinical light source. The use of the probe or explorer is more contentious, not only is there the possibility of precipitating cavitation in an incipient lesion, but evidence from studies indicate no differences in diagnostic accuracy between the use of the explorer and the use of the visual technique alone. Because of this, the call for “*sharp eyes and blunt probe*” has been made more often, and it would seem an appropriate recommendation to suggest discontinuing the use of the sharp explorer to diagnose clinical caries in pit and fissure sites.

Approximal Caries - Approximal lesions, like occlusal lesions, have the problem of a lack of direct evidence and poor agreement between dentists on diagnostic and treatment planning considerations. Diagnosis may be made with the aid of bitewing radiographs, however, traditionally radiographs have been seen as inappropriate for epidemiological studies.

Smooth Surface Caries - Diagnosis of enamel caries on free smooth surfaces (i.e. buccal and lingual surfaces) should present few problems to the practitioner. These sites are easily visualised, and as long as the teeth are clean (plaque and calculus deposits removed) and dry, then observation with a good light source and mirror should be sufficient for diagnosis of both incipient and frank carious lesions.

Root Caries - Root caries may be present with or without cavitation but will exhibit both a darkened, discoloured appearance and a tacky or leathery feel upon probing with moderate pressure. In general, visual and tactile methods can be used to detect these lesions in an epidemiology setting.

Recurrent Caries - While recurrent or secondary caries may be the most common reason for re-restoration of teeth, there has been relatively little research effort directed towards this area, and practitioners' decisions to replace restorations have been shown to be remarkably inconsistent. Although the restored teeth might appear caries free, studies have shown that the use of caries detector dyes can indicate the presence of either new and/or recurrent caries. This red dye in particular enhances the visual recognition of dentinal caries by staining the infected demineralised dentine (**Fusayama & Terachima 1972, Anderson & Charbeneau 1985, Kidd et al 1989, Kidd 1996**). From an epidemiological perspective, visual, without caries detector dyes, and tactile methods are used in the detection of the recurrent caries lesions.

The criteria for diagnosis and coding procedures of dental caries is based on the Basic Methods of Oral Health Surveys (**WHO 1997**) and will be discussed in detail in Chapter 5.

2.2.5 Treatment Needs

An ultimate outcome of the caries diagnostic process in clinical practice is the decision concerning the need for treatment (**Bader & Shugars 1993**). Therefore, the examiners must be encouraged to use their own clinical judgement when making decisions on what type of treatment would be appropriate, based on what would be the probable treatment for the average person in that community or country.

Data on treatment needs are of great value at local and national levels because they provide a basis for estimating personnel requirements and costs of an oral health program under prevailing or anticipated conditions, provided that demand levels for those needs are taken into account. It is recommended that the treatment requirements should be assessed for the whole tooth including both coronal and root caries. The type of treatment required, if any, should be recorded in the space provided on the assessment form (see Appendix 1), immediately after the status of a tooth is recorded and before proceeding to the next tooth or tooth space (**WHO 1997**). Details of the codes and criteria for treatment needs will be also discussed in Chapter 5.

The treatment needs for dental caries are determined by dentition status and the treatment of individual teeth based on the following (WHO 1997):

- (1) Number and percentage of persons with and without natural teeth.
- (2) Mean number of primary teeth present per person.
- (3) Number and percentage of subjects with caries and untreated caries of the primary dentition; and with four or more dmft primary teeth.
- (4) Mean number of decayed; filled with decay; filled; missing; dmft of primary teeth per person.
- (5) Mean number of permanent teeth per person.
- (6) Number and percentage of subjects who have or have had caries; with untreated caries; and with four or more DMF of permanent teeth.
- (7) Mean number of decayed; filled with decay; filled; missing; and DMF of permanent teeth per person.
- (8) Number and percentage of subjects with root caries.
- (9) Mean number of teeth per person with root caries.
- (10) Number and percentage of subjects with coronal and/or root caries.
- (11) Mean number of teeth per person with coronal and/or root caries.
- (12) Number and percentage of subjects requiring preventive or caries-arresting care; sealant; surface fillings; crown/bridge; pulp care and restoration; extraction; or other treatment.
- (13) Mean number of teeth per subject requiring preventive or caries-care; sealant; surface fillings; crown/bridge; pulp care and restoration; extraction; or other treatment.

2.2.6 Dental Caries Status in Papua New Guinea (PNG)

Available national oral health data show that the dental caries is not a significant public health problem in PNG. The mean dmft/DMFT for 6-11 years age group are 1.1 and 0.3; mean DMFT of 0.8 for 12-14 years, 1.3 for 15-19 years, 2.7 for 35-44 years, and 2.8 for 45 years and above age groups (Humphreys 1976, Davies 1990). These indicate that the prevalence of dental caries is substantially low.

2.3 PERIODONTAL DISEASES

New developments and discoveries in the aetiology, distribution, and progression of periodontal diseases have affected the way in which the dental profession perceives the importance of the diseases and their prevention and control. These new information emerged as a result of a variety of laboratory, clinical and epidemiological studies (**Hunt 1988**).

Since the 1980s, the interpretation of epidemiological data on periodontal diseases has brought dramatic considerations and subsequent modifications. It was previously held that virtually all persons are susceptible to severe periodontal disease and the disease progresses throughout life in a linear fashion from gingivitis to periodontitis with bone loss to tooth loss. It has been reported that periodontal disease is the principal cause of tooth loss after the age of 35 years. The majority of tooth mortality studies have shown that the number of teeth lost due to periodontal reasons increased with increasing age, although caries remained the main reason for tooth loss for all ages. The relationship between age and periodontal disease is age-associated rather than being a consequence of aging. However, this view is no longer valid due to numerous reversible and irreversible signs that make up all periodontal diseases and their progression with age (**Burt 1993, Spencer et al 1993, Ong 1998**).

In principle, the periodontal diseases are the same in industrialised and developing countries. That is, periodontal diseases caused by the same micro-organisms and need the same approach towards prevention and treatment. From the public health perspective, the similarities in periodontal conditions around the world in patterns of prevalence and severity are far more striking than the differences. However, the only true difference is that the periodontal diseases are much more prevalent and severe in developing countries because of poorer oral hygiene practices and considerably high calculus retention (**Pilot 1993**).

2.3.1 Definitions

All the elements supporting the tooth such as cementum, periodontal membrane, alveolar bone and gingiva constitute the *periodontium*. *Periodontal diseases* are a group of lesions affecting these tissues surrounding and supporting the teeth in their sockets. Periodontal disease is a generic name given to those chronic inflammatory conditions of bacterial origin which begin with inflammation of the gingiva and leads, in time, to loss of attachment and bony support for the tooth (WHO 1962, FDI 1984, Loe 1993).

The periodontal diseases are inflammatory lesions caused by host-microorganisms, resulting in loss of connective tissue fibre attachment to the root surface (Kornman & Loe 1993). Since establishment of the relationship between an accumulation of bacterial plaque on the teeth and development of gingivitis, the plaque has been accepted as the essential factor for the initiation of periodontal inflammation and disease (Loe et al 1965, Theilade et al 1966).

Numerous studies have reported that the accumulation of plaque for prolonged periods of time will mature and subsequently may or may not lead from a localised inflammatory response to chronic-adult periodontitis. Local factors such as oral hygiene standards, tooth anatomy and position, presence of restorations with or without overhanging margins, and orthodontic bands may influence the maturation process of plaque. Similarly, systemic factors such as hormonal changes during pregnancy, puberty and in diabetes mellitus, and impairment in the immune status may also affect the rate of progression of periodontal diseases. In addition, smoking habits and stress may also contribute to the progression of the periodontal diseases (Kornman & Loe 1993, Lang & Corbet 1994).

The term *gingivitis* refers to the reversible inflammatory condition of the papilla and gingival margin characterised by redness, swelling, bleeding and ulceration. *Destructive periodontal disease or periodontitis* is the chronic progression of the inflammatory condition into pocket formation, loss of attachment, and eventually loss of bony support. Gingivitis and periodontitis are associated with different bacterial flora. There is now general agreement that gingivitis is the initial lesion in the development of periodontitis and that it represents the initial stage in the process leading to destructive periodontal disease. Gingivitis precedes periodontitis, however, not all sites with gingivitis later develop periodontitis (FDI 1984, Loe 1993, Brown & Loe 1993).

2.3.2 Classification of Periodontal Diseases

In 1993, the European Workshop on Periodontology reached an agreement to simplify the classification of periodontal diseases into categories which could be diagnosed instantaneously using a simple set of clinical diagnostic tests such as visual inspection, periodontal probing to reveal probing depths and bleeding on probing. Together with the age of the patient, four categories are suggested: gingivitis; adult periodontitis; early-onset periodontitis; and necrotising periodontitis (WHO 1978, Ranney 1993, Lang & Corbet 1994).

Gingivitis represents the pathophysiologic host response to bacterial plaque alone or aggravated systematically by sex hormones, drugs or systemic diseases. It is the most common form of periodontal disease and may affect over 90% of a population. The lesion is generally confined to the gingival margin and is observed locally or generally. It may persist for years without further progressing into the supporting periodontal structures. Gingivitis may occasionally be accompanied by ulcerations and necrotising areas or it may in rare cases be related to allergic reactions or associated with skin diseases (WHO 1978, Ranney 1993, Lang & Corbet 1994).

Adult periodontitis is the most prevalent form of periodontitis and usually a chronic disease emerging from its precursor, namely gingivitis, as a result of long-standing plaque accumulation (**Lindhe et al 1975**). Since not all gingivitis appears to progress to periodontitis (**Listgarten et al 1985, Brown & Loe 1993**), specific bacteria have been postulated to account for the great variation in disease progression in various individuals (**Socransky & Haffajee 1992**). The periodontal lesion is characterised by loss of connective tissue fibre attachment to the root surface. The major clinical sign of periodontitis is bleeding on probing and loss of connective tissue attachment from the cemento-enamel junction as measured by clinical probing (**WHO 1978, Ranney 1993, Lang & Corbet 1994**).

Early onset periodontitis is usually found among the young aged persons during childhood or adolescence. The two particular groups of the early onset periodontitis have been characterised by the World Workshop of the American Academy of Periodontology in 1989 are: prepubertal periodontitis and juvenile periodontitis. The *prepubertal periodontitis* is rare and can exhibit both localised and generalised pattern of attack. The localised form affects only deciduous dentition and is less aggressive, while the generalised form affects both deciduous and permanent teeth and is thought to start soon after the eruption of the deciduous teeth. The *juvenile periodontitis* is a relatively infrequent disease and occurs in adolescents around puberty. It is characterised by gingival inflammation and severe angular bony defects, resulting in pronounced loss of periodontal attachment during adolescence. It can be localised involving incisors, first molars; or generalised involving teeth other than incisors and first molar. The major clinical features of the early-onset periodontitis are the presence of severely advanced lesions with bleeding on probing, suppuration, greatly increased probing depths, but relatively thin deposits of plaque at an early age (**Ranney 1993, Brown & Loe 1993, Lang & Corbet 1994**).

Necrotizing periodontitis is usually an ulcerative lesion and appears to progress rather dramatically. It involves not only necrosis of papillae, but may be alveolar bone also. Today it is mostly diagnosed in HIV-seropositive patients (**Winkler & Murray 1987, Ranney 1993**). The major clinical features of these lesions are profuse bleeding - occasionally on light touch or when using the air syringe, pocket formation, recession, necrotic papillae and eventually sequestering bone particles, halitosis and pain (**Lang & Corbet 1994**).

In addition, these periodontal disease categories may be localised or generalised, slowly or rapidly progressing, well-responding or refractory to therapy, caused by specific microorganism or result from a particular host response impairment. Also, *periodontal abscesses* may be encountered with all forms of the periodontal diseases presented (**Ranney 1993, Lang & Corbet 1994**).

2.3.3 Periodontal Disease Indices

Over the past several decades, dental epidemiologists have developed and used a wide variety of indices to estimate the prevalence of periodontal disease, resulting in a confusing picture of the distribution of the disease. Perhaps the most widely used index has been Russel's periodontal index (PI), which assumes that periodontal disease is a single disease with a range of mild to advanced manifestation. An individual's PI score is the average score across all the teeth on a five point scale ranging from healthy to gingivitis to severe periodontitis (**Russel 1956, Hunt 1988, Menassa & Van Dyke 1998**).

For epidemiological purposes, an index system which is simple to use and permits the study of a large number of persons at a minimum cost would be preferable. Such simplifications of full mouth periodontal examinations have been suggested by reducing the number of teeth to be examined, giving a single score to groups of teeth rather than recording each tooth separately, and the use of dichotomous criteria instead of using different gradings for increasing severity of a given sign (**Ainamo & Ainamo 1985**).

At the initiative of the World Health Organization, the Community Periodontal Index of Treatment Needs (CPITN) was developed (**Ainamo et al 1982**), and subsequently adopted by the Federation Dentaire Internationale, after years of collaborative research, testing and refining, for use both in epidemiological studies and for screening of patients in general dental practice (**FDI 1985**). Since then, the CPITN has been widely used in all parts of the world. It aims at recording the maximum treatment need of each subject, based on measures of gingival bleeding, calculus deposits, and pocket depth. The index does not reflect the extent and severity of periodontal attachment (**Ainamo et al 1982, Hunt 1988, Menassa & Van Dyke 1998**).

The CPITN has been accepted as the global standard for rapid assessment of both the periodontal diseases prevalence and treatment needs. It also reflects how successful a society has been able to maintain and promote the healthy condition of gums and periodontium. It is an established index of levels of periodontal condition in populations for which specific interventions might be considered. It is a procedure which uses clinical parameters and criteria relevant to planning for the prevention and control of periodontal diseases (**Oliver et al 1993, Chen et al 1997, Menassa & Van Dyke 1998**). Furthermore, it plays a very important role in reaffirming the existence of superficial and destructive periodontal condition and their episodic nature (**Cutress et al 1987**). Numerous results are now kept in the WHO Global Data Bank and have substantially increased the knowledge and understanding of the prevalence and distribution of periodontal diseases and have made it possible to start the planning of preventive periodontal services on a population level as well as for individuals (**Pilot et al 1986**).

2.3.4 Diagnosis of Periodontal Diseases

Most epidemiological surveys of periodontal disease have used pocket depth measurements as indicators of disease level; but these measures fail to take into account the additional periodontal breakdown manifested through gingival recession. Studies have shown that there is no direct correlation between pocket depth and attachment loss. Therefore, the periodontal estimates that have been based on pocket depths may not have been good measures of the cumulative periodontal destruction that has occurred in a population (**Aucott & Ashley 1986, Carlos et al 1987, Hunt 1988**). However, **WHO (1997)** postulates that the probing pocket depths gives some indication of the extent of loss of attachment, although this measurement is unreliable when there is gingival recession, that is, when cementoenamel junction (CEJ) is visible.

The common indicators used in the assessment of periodontal disease status are: gingival bleeding, calculus, periodontal pockets, and periodontal attachment. During the clinical examination, it is essential to have adequate light, mouth mirror, and Community Periodontal Index (CPI) probe. A specially designed lightweight Community Periodontal Index (CPI) probe with a 0.5 mm ball tip, a black band between 3.5 and 5.5 mm and rings at 8.5 and 11.5 mm from the ball tip is used to assess gingival bleeding, calculus, periodontal pockets and periodontal attachment (**Hunter 1994, WHO 1997**).

The mouth is divided into six sextants defined by tooth numbers: (i) 18-14, (ii) 13-23, (iii) 24-28, (iv) 38-34, (v) 33-43, and (vi) 44-48. A sextant can be only examined if there are two or more teeth present which are not indicated for extraction. For adults aged 20 years and over, the index teeth to be examined are: (i) 17 & 16, (ii) 11, (iii) 26 & 27, (iv) 37 & 36, (v) 31, and (vi) 46 & 47. Only a highest score for each sextant is recorded. In order to avoid scoring the deepened sulci associated with eruption as periodontal pocket for subjects under 20 years of age, only six index teeth are to be examined: (i) 16, (ii) 11, (iii) 26, (iv) 36, (v) 31, and (vi) 46. For the same reason, children under the age of 15 years, only bleeding and calculus should be considered during the clinical examination (**WHO 1997**).

Information on the loss of periodontal attachment can be collected from index teeth in each sextant of subjects 20 years and over. The most reliable way of determining loss of periodontal attachment in each sextant is to record this immediately after recording the CPI score for that particular sextant. The highest score for CPI and loss of attachment may not necessarily be found on the same tooth. When the CEJ is not visible, and the highest CPI score for a sextant is less than 4 (pocket depth less than 6mm), any attachment loss for that sextant is estimated to be less than 4mm (**WHO 1997**).

The criteria for diagnosis and coding procedures of periodontal diseases will be discussed further in Chapter 5.

2.3.5 Treatment Needs

It has been recommended that the treatment needs are to be recorded from the anterior sextants after examination of only the right central incisor in the maxilla and the left central incisor in the mandible. In posterior sextants, the first and second molars are examined but only one score for the highest treatment need around the two teeth is recorded (**Ainamo & Ainamo 1985**).

The codes and criteria for the assessment of community periodontal index (CPI) as indicated in the oral assessment form (see **Appendix 1**), are used to determine the periodontal treatment needs. The codes and criteria for various types of preventive or therapeutic treatment are as follow (**WHO 1977, Jenkins 1996, Menassa & Van Dyke 1998**):

- (1) A code of 4 is given to the sextant if the coloured coded area of the WHO probe disappears into the inflamed pocket indicating pocket depth of 6mm or more. Such sextant requires complex treatment involving either deep scaling, curettage or surgical intervention including extraction.
- (2) A code of 3 is given to the sextant if the coloured coded area of the probe remains partially visible indicating a pocket depth of 4-5mm. The treatment required is thorough scaling and root planing and proper personal oral hygiene.
- (3) A code 2 is assigned to the sextant if there are no pockets exceeding 3mm, but dental calculus and dental plaque are present. The treatment required is same as code 3.
- (4) A code 1 is assigned when there is no calculus, but bleeding occurs on gentle probing. This indicate that the treatment required is oral hygiene instruction only to improve oral hygiene.
- (5) A code 0 is assigned to the sextant if there is no obvious signs of plaque, calculus, gingivitis or periodontitis. This indicates no treatment is required.

The loss of attachment information provides an estimation of the lifetime accumulation of the periodontal attachment destruction and permits comparisons between population groups only, but not to describe the full extent of loss of attachment in an individual. The score for an individual subject is the arithmetic average of the scores for the teeth in his or her mouth. The population score is the arithmetic average of the individual scores for the subjects examined. Scores may be computed for a population of teeth as well as for persons (Russel 1956).

The community periodontal index of treatment needs of the population are based on the CPI and loss of attachment scores, and are assessed in terms of (WHO 1997):

- (i) The percentage of subjects with: healthy periodontal tissues; bleeding only; bleeding and calculus only; bleeding, calculus and shallow pockets; and bleeding, calculus and deep pockets. It is a measure of prevalence.
- (ii) The mean number of sextants with healthy periodontal tissues; bleeding or higher score; calculus or higher score; shallow pockets or higher score; and deep pockets, and the mean number of sextants excluded from examination. This is a measure of intensity or extent.
- (iii) The number and percentage of subjects with loss of attachment, by highest score. It is also a measure of prevalence.
- (iv) The mean number of sextants with loss of attachment by score; excluded from examination; and not recorded. This is also a measure of intensity or extent.

2.3.6 Periodontal Diseases Status in Papua New Guinea (PNG)

Available data show that periodontal diseases begin in the early teens and reach an advance stage in the age group 35-44 years. It has been reported that a high prevalence of calculus and intense gingivitis in community and high school children in the age groups 6-11, 12-19 years. The percentage of children in PNG presenting with periodontal diseases, ranges from 15-65% (3.0% = healthy, 15.0% = bleeding, 65.0% = calculus, 18.0% = pocket 4-5mm). For adults, in age groups 35-44 and 45 plus years, the percentage of adults presenting with periodontal diseases ranges from 40-68%. In addition, it has been reported that there is relatively high percentage (27-64%) of tooth loss (one or more teeth) as a result of extraction due to periodontal disease, which is the only form of treatment available. Thus, periodontal disease is the major cause of pain, discomfort, loss of teeth and inefficient mastication, especially in persons 45+ years. These findings clearly indicate that the periodontal disease is the major oral disease problem in PNG (**Humphreys 1976, Amaratunge & Pouru 1987, Davies 1990**). Therefore, oral health promotion and preventive oral health services are essential to prevent and control rapidly increasing periodontal diseases in PNG.

2.4 OTHER ORAL CONDITIONS

According to Basic Methods of Oral Health Surveys, information on other oral conditions including: enamel opacities/hypoplasia, dental fluorosis, oral mucosa, prosthetic status, and dentofacial anomalies, must be included in epidemiological studies in order to provide a more complete assessment of oral health status and treatment needs of the population (WHO 1997).

2.4.1 Enamel Opacity/Hypoplasia

Opacities/hypoplasia of enamel refers to developmental defects and are classified into three categories (WHO 1997):

- (1) *Demarcated opacity* is an alteration in the translucency of the enamel in variable degree and demarcated from the adjacent normal enamel with clear and distinct boundary. It can be white, cream, yellow, or brown in colour.
- (2) *Diffuse opacity* is an alteration in the translucency of enamel in variable degree and white in colour. There is no clear boundary between the adjacent normal enamel and the opacity can be linear or patchy or have a confluent distribution.
- (3) *Hypoplasia* refers to a defect involving the surface of the enamel and is associated with a localised reduction in the thickness of the enamel. It can occur in the form of: (a) pits; (b) grooves; (c) partial or complete absence of enamel over dentine. The affected enamel appears translucent or opaque.

Criteria for examination and coding will be discussed further in Chapter 5. The prevalence and severity of the enamel opacities/hypoplasia can be assessed by *the number and percentage of subjects with enamel opacities or hypoplasia, by condition and number of teeth affected* (WHO 1997).

2.4.2 Fluorosis

Dental fluorosis is a hypoplasia of the dental enamel caused by the intake of excessive amounts of fluoride during the years of tooth calcification. The study of dental fluorosis began in the early part of the century with McKay's pioneering work on the causes and distribution of mottling, first referred to as Colorado Brown Stain. Later, Dean developed and subsequently modified the first fluorosis index and community fluorosis index (CFI) (Szpunar & Burt 1987).

The premolars and second molars are most frequently affected, whilst the upper incisors, and lower incisors are least affected. It has been recommended that Dean's index criteria be used and the recordings are made on the two most affected teeth. Usually, the fluorosis lesions are bilaterally symmetrical and tend to appear across the tooth horizontally in striated pattern (WHO 1997).

The procedures, codes and criteria of assessing dental fluorosis will be further discussed in Chapter 5. The prevalence and severity of fluorosis can be estimated by *the number and percentage of subjects with dental fluorosis, by level of severity* (WHO 1997).

2.4.3 Oral Mucosal Conditions or Diseases

Oral mucosal conditions or diseases are now having greater significance within the practice of dentistry. They are either locally originated in the oral cavity or systemically originated such as HIV and other immuno-suppressive diseases which are manifested in the oral cavity.

The oral cancers are important because of their life threatening implications rather than high prevalence. It has been postulated that 3% to 4% of all the cancers are oral cancers. Most of the oral cancers are located on the lips while other common sites are the floor of the mouth, tongue, mucosa, and soft and hard palate.

Although the prevalence of the oral mucosal lesions originating from systemic diseases are low, their effect on the practice of dentistry is substantial. Among them are HIV and other immuno-suppressive diseases, coupled with other viral infections transmitted via blood or other body fluid for example, hepatitis B & C. These infections have given emphasis to infection control procedures that are having a strong influence on dental education and delivery of services (Spencer et al 1993).

Measure of prevalence of oral mucosa conditions is based on (WHO 1997):

- (1) *Number and percentage of subjects with healthy oral mucosa; with oral cancer; leukoplakia; lichen planus, ulceration (aphthous, herpetic, trauma), necrotizing gingivitis, candidiasis, abscess, or other condition.*
- (2) *Tabulation of oral mucosal conditions, by location.*

Therefore, clinical examination of every subject should include the examination of oral mucosa and soft tissues in and around the mouth as detailed in the manual of basic oral health surveys methodology (WHO 1997). The details on the examination procedures and codings will be discussed in Chapter 5.

In *Papua New Guinea (PNG)*, it has been reported that oral cancer accounts for approximately 10-23% of all the cancer cases (Atkinson et al 1964). Davies (1990) reports that pre-leukoplakia (0.5-0.7% persons) and leukoplakia (1.1-12% persons) are common among persons 35 years or over. Social behaviours such as betel-nut chewing which involves a combination of three ingredients: betel-nut, lime, and mustard; and smoking tobacco wrapped in leaves or newspaper have a strong association with oral cancer and leukoplakia lesions. Such practices are very common with approximately 32-100% persons chewing betel-nut and 10-50% persons smoke tobacco in PNG.

2.4.4 Prosthetic Status

Prosthetic status refers to the presence of prostheses and perceived need for prostheses at the time of the clinical examination. The prosthetic status and treatment need reflects the level of edentulism and the potential for tooth replacement (**Spencer et al 1993**).

The dental prostheses include: partial dentures, full dentures and bridges. Presence or absence of these prostheses also reflects the capabilities of the dental services system. The measure of prevalence and severity of dental prostheses is determined by the: number and percentage of subjects with prostheses, by type of prosthesis and by jaw; and number and percentage of subjects requiring prostheses by type of prosthesis and by jaw (**WHO 1997**). The actual codes and criteria for recording prostheses status and prosthetic needs will be discussed also in Chapter 5.

2.4.5 Dentofacial Anomalies

Assessment of dentofacial anomalies is based on Dental Aesthetic Index (DAI) methodology which is specifically designed to measure dental aesthetics. Using objective measures of occlusal conditions, it ranks a person's dental aesthetics on a scale of societal norms for socially acceptable dental appearance. It can also serve as an index of the need for orthodontic treatment by indicating for any set of occlusal measurements and the amount of deviation from social norms for aesthetic dental appearance. It has been recommended that this index be used for age groups in which there are no longer primary teeth, usually from 12 years (**WHO 1997**).

This method of collecting dentofacial anomalies data is based on three categories: dental anomalies, space anomalies, and occlusion anomalies (**Arnljot et al 1985**):

(1) *Dentition anomalies* include defects of development such as congenitally absent teeth or impacted teeth, and also teeth missing because of extraction or trauma and retained primary teeth.

(2) *Space anomalies* include intra-arch measurements such as crowding and spacing.

(3) *Occlusion anomalies* including inter-arch measurements such as overbite, overjet and anteroposterior molar relationships.

The collection of data according to Dental Aesthetic Index (DAI) criteria permits analysis to be made of each component of the index or group under anomalies of dentition, space and occlusion. The codes and criteria will be discussed in Chapter 5.

The *treatment needs* for dentofacial anomalies are determined by the *severity of malocclusion* based on the standard DAI scores. WHO (1997) recommends that the measure of prevalence and severity of the dentofacial anomalies can be estimated from the:

- (1) *percentage of subjects with missing incisors, canines and premolars;*
- (2) *percentage of subjects with crowding, spacing, diastema, or anterior maxillary or mandibular irregularities;*
- (3) *percentage of subjects with anterior maxillary overjet, anterior mandibular overjet, vertical anterior openbite, or anteroposterior molar relation; and*
- (4) *percentage of subjects with dentofacial anomalies, by level of severity.*

In conclusion, information on the oral health status and treatment needs of a population is an indication of oral health outcome as affected by personal, oral health care system, and socioenvironmental characteristics. It is therefore imperative that an accurate information pertinent to the prevalence and severity of oral diseases and conditions is obtained to provide reliable baseline data for situation analysis. Subsequently inferences can be made for the whole or most of the population as basis for planning and evaluation of oral health services for the improvement of oral health, and for monitoring of the changes in levels and patterns of oral diseases and conditions.

Central to the knowledge of oral health status and treatment needs of the population is the need for epidemiological data on oral diseases and conditions. The collection of epidemiological data involve clinical oral examination based on the World Health Organization's methodology of oral health surveys. The oral clinical examinations involve an assessment of the following oral diseases and conditions: dental caries in terms of dentition status; periodontal status in terms of periodontal diseases/attachment; oral mucosa lesions; enamel opacities/hypoplasia; dental fluorosis; dentofacial anomalies; and prosthetic status, and their treatment needs. Criterias of diagnosis and recording for each oral disease and condition will be discussed in Chapter 5.

Chapter 3

ORAL HEALTH BEHAVIOUR

3.1 INTRODUCTION

In order to understand, explain, and predict oral health behaviours prevailing in the community, Cohen (1981) suggests that a social and behavioural science research approach be employed. Application of social surveys, such as, public opinion polls or questionnaires, help to define the parameters of the population being studied. These involve obtaining valid and dependable information from providers of dental care, consumers of dental care, health students and administrators of oral health care. Usually, the information collected includes general backgrounds, attitudes, values, beliefs, and practices of oral health. In delivering comprehensive dental services either for the community or individual, it is necessary to define all the elements involved in the community quantitatively and qualitatively.

Oral health behaviour as one of the oral health outcomes of an individual can be categorised into two levels: the individual and the system. Firstly, at the *individual level*, the individual's oral health behaviour is related to: *oral hygiene practices* and *utilisation of oral health services*. The oral health behaviour is determined by *personal characteristics* which are categorised into predisposing and enabling variables or factors. The *predisposing variables* including sex, gender, level of education and occupation, perceived general health status and health beliefs. These factors allow an individual to engage, or not to engage, in certain oral health behaviour. *Oral health beliefs* include: (1) the perceived seriousness of oral diseases; (2) importance of oral health; (3) benefits of brushing, flossing, oral health service visits; and (4) the number of perceived barriers including fear, being too busy, lack of services, to obtaining oral health care. These oral health beliefs tend to influence the individual's likelihood of engaging in various health behaviour. The *enabling variables* include: the level of income; residence or geographical location; family size; and having or not having a usual source of oral health care, tend to either facilitate or impede oral health behaviour. Therefore, the individual's oral health care behaviour is influenced by his or her predisposing and enabling characteristics.

Secondly, at the *system level*, the oral health behaviour is influenced by the socio-environment and the oral health care system characteristics. The *socio-environmental characteristics* comprise of social, political and economic characteristics; those characteristics specific to oral health such as diet, availability of fluoridated toothpastes, and fluoridated water; and the organisation of the general health care system. The *oral health care system characteristics* include the development of modern oral health care and the organisation and financial, human and material resources of the system (Chen et al 1997, McGoldrick 1997, Sogaard 1993). Hence, the individual's oral health behaviours are influenced by more than individual characteristics. They are also directly or indirectly affected by system-level factors related to socio-environmental characteristics; socio-environmental characteristics specific to oral health; the general health care system; and the oral health care system characteristics.

The most common oral diseases, dental caries and periodontal diseases, could well be seen as behavioural diseases, because the adoption of healthy behaviour is crucial for their control. Traditionally, healthy oral health behaviour has been considered to consist of the continuous implementation of those measures which have been scientifically proven to have a positive effect on oral health (Honkala 1993).

Using oral hygiene behaviour and utilisation of oral health services, it is possible to examine, or assess and explain, the level of the oral health behaviour in the community by social groups which are differentiated by socio-demographic, socio-economic, socio-psychological, dental care delivery system, and socio-cultural factors (Burt & Eklund 1992).

This Chapter discusses the most commonly used *health belief model*; *oral hygiene behaviours* including toothbrushing, flossing, and the use of toothpicks; and *oral health service utilisation* including influencing factors and assessment of utilisation.

3.2 HEALTH BELIEF MODEL

Over the past three decades, a number of theoretical frameworks have appeared which attempt to account for individuals' health behaviour. The models differ considerably in their theoretical perspectives, in the type of health behaviour they attempt to explain, and in the terms employed to label their respective dimensions and variables. Most of these models derived from psychological and behavioural theories. Among them, probably the model most frequently employed in oral health behavioural surveys is the Health Belief Model (HBM) (Sogaard 1993). *Belief* may be defined as a statement of what people regard a true or factual and based upon empirical observation, logic, tradition, acceptance by oneself or others, or faith. *Health Belief Model* is a sociopsychological model developed in the 1950s to explain health behaviour. It postulates that an individual will not engage in various health behaviours, particularly for prevention and treatment, until he or she believes that (Chen & Andersen 1997):

- (1) *The disease will have serious consequences for himself or herself (perception of seriousness).*
- (2) *Doing something about the disease is more important than doing other things (salience).*
- (3) *The action will be of benefit for either preventing or alleviating the seriousness of the disease (benefits).*
- (4) *The action will not cause anxiety or inconvenience, or entail high cost (barriers).*

This model, to some degree, is useful in predicting and explaining adult oral health behaviour but not in children. Furthermore, most studies of the health belief model have been retrospective which may imply that it is, in reality, past behaviour which predicts actual individual and community behaviour (Rosenstock 1974, Sogaard 1993).

Fewer studies have addressed the relationship between health beliefs and oral hygiene behaviour than have examined that between health beliefs and oral health service utilisation. In Papua New Guinea, neither of them being investigated and subsequently no data available in terms of the relationship between health beliefs and oral hygiene behaviour or utilisation of oral health services.

3.3 ORAL HYGIENE BEHAVIOUR

Oral hygiene behaviour includes: toothbrushing, dental flossing and toothpick use, which are usually practiced by the individual at home or even at their place of work. They are daily habits developed from childhood and are probably related to social and culture aspects of the society (Gift 1986).

The oral health care professionals strongly recommend brushing teeth once or twice a day to control dental plaque growth. In countries where dental floss is available, they also advise using it daily to clean the proximal surfaces of the teeth (Frandsen 1986). Although few dental professionals recommend toothpicks as an appropriate device for cleaning teeth, many people use them to remove particles of food that may cause discomfort (Gift 1986, Honkala et al 1990).

3.3.1 Toothbrushing

Toothbrushing has been a traditional practice in various cultures for many decades and even centuries, and is practiced in most of the countries today. Review of studies on oral hygiene practices in some European and Western countries such as Australia, Finland, the Netherlands, New Zealand, United Kingdom and United States indicate that most subjects brushed their teeth and also, that toothbrushing is a widespread practice (Chen & Andersen 1997).

The Second International Collaborative Study (ICS II) (Chen et al 1997) showed that relatively few individuals never brushed their teeth. The frequency of brushing teeth varied considerably by: age; gender; education; income; occupation; availability of a usual source of oral health care; and health and oral health beliefs.

The ICS II (**Chen et al 1997**) reported that the proportion of persons brushing once or more per day was generally more regular and more frequent for: (1) adults than children; (2) females (girls) than males (boys); (3) those with high level of education than those with low level; (4) those with high level of income than those with low level; (5) those with a usual source of oral health care than those without; (6) those with professional occupation than those with unskilled or semi-skilled occupation including their families; (7) those who perceived oral disease is serious and benefits of brushing than those who do not; and (8) those children whose parents have high level of education, income and professional occupation than those without .

3.3.2 Dental Flossing

Although a small proportion of people floss their teeth especially in Western countries, they virtually do not floss frequently. Thus, flossing is a self-care habit that is not widely adopted or encouraged by most societies. Its use is almost limited by the lack of availability of dental floss and of knowledge about its benefits (**Chen & Andersen 1997**). Therefore, regular flossing is generally not as a common habit as brushing in most countries.

However, most studies on flossing conducted in countries in western or northern Europe or North America, indicate that females (both children and adults) consistently floss more than males; individuals in a higher social class as defined by education, income or occupation, are also more likely to use dental floss regularly (**Chen & Andersen 1997**).

The ICS II (**Chen et al 1997**) also reported that: (1) regular flossing is not as common as brushing; (2) no age group had a majority flossing once or more a day; and (3) most children and adults did not know what dental floss is or never floss, with exception of sites in USA and New Zealand.

In sites where flossing is practiced, **Chen et al (1997)** have reported that: (1) more females floss daily than males; (2) those with high education are more likely to floss daily than less educated; (3) those with high income levels are more likely to floss daily than low income level; (4) those with professional or managerial occupation tend to floss daily with their families more than unskilled or semi-skilled occupations; (5) adults with a usual source of oral health care tend to floss once or more a day, more than those without; and (6) those who believe oral disease is serious and oral health is important tend to floss more regularly than those who do not.

3.3.3 Toothpick Use

Toothpicks are usually made from wood, quill, gold or silver, and their usage can be traced to Roman times. However, currently the oral health care professionals do not recommend toothpick use as an appropriate oral hygiene measure. Instead, they strongly warn of its possible injuries on gums. Nevertheless, studies have shown a relatively high level of use in various societies. The use of toothpicks appears to be related to sociocultural traditions, for example in Japan and Native Americans adults generally are more likely to use toothpick than children (**Chen & Andersen 1997**).

3.4 ORAL HEALTH SERVICES UTILISATION

Utilisation of dental services is defined as the actual attendance by members of the public at dental treatment facilities to receive treatment (**Burt & Eklund 1992**). The utilisation of dental services only occurs when an individual and community groups receive dental care. It requires the individual to seek professional help from the oral health care provider (**Gift 1984**). Oral health professionals recommend regular use of oral health services to prevent or treat oral diseases (**Frazer 1977, Horowitz 1983**).

3.4.1 Factors Influencing Utilisation of Dental Services

There are several important factors influencing utilisation of oral health services. These factors include: socio-demographic variables, structural variables of dental care delivery system, socio-psychological variables, and socio-cultural variables.

3.4.1.1 Socio-demographic variables

It has been commonly accepted that socio-demographic variables have significant impact on the utilisation of oral health services. The socio-demographic variables include: gender, age, socio-economic status, race and ethnicity, and geographic location.

Gender - The traditional pattern is that females utilise dental services more often than males. This is very much so in many developed countries such as USA and Australia. Gender has consistently been related to patterns of health care utilisation including dental and so constant in many countries that it seems virtually universal. This may be because males and females view the sick role and evaluate health service differently or females are more concerned with their appearance than males (**Arnljot et al 1985, Burt & Eklund 1992, Barnard 1993, Chen et al 1997**).

Age - Traditional age utilisation patterns fall in an inverted U-shaped curve with the very young and very old age groups utilising dental services less than the adolescents and young adults. However, tailing off of dental services use with increasing age is changing in recent years especially in developed countries such as in Australia and USA. This is because of increasing tooth retention among adults and increase of services use by children. If this trend continues in most of the developed countries, the inverse U-shape curve will level out (Arnljot et al 1985, Dooland 1992, Spencer et al 1993, Chen et al 1997, Barnard 1993).

Socio-economic status - Socio-economic status is a composite measure of income, occupation and education. It is directly related to the use of dental services (Arnljot et al 1985, Burt & Eklund 1992, Dooland 1992, Chen et al 1997, Beal 1989).

Income has a direct and positive relationship with utilisation of dental service. As income increases so does utilisation. This may not be the result of capacity to buy dental services, but rather cultural or value differences within the income groups because when the finance barrier is removed, low income earners still indicate a low level of utilisation. Different income groups consume different types of dental services when they go for service and use different types of facilities. Low income persons tend to have fewer dental visits for preventive, more visits for dental emergencies than the higher income persons. Besides buying power, there is a fear among low income earners of losing income when taking time off from work to visit a dentist.

Occupation does have a direct relationship with the frequency of dental visit. Persons in professional or managerial occupations visit a dental facility more frequently than those in semi-professional or non-skill occupations. The semi-professional or unskilled persons may fear the loss of their job if they took time off from work to visit their dentist. Members of professional families are also more likely to go for preventive visits than members of semi-professionals or unskilled.

Education also has a direct relationship with the utilisation of dental services. It has been generally accepted that the utilisation increases as the level of education increases. The lower educated persons visit dental facilities more for emergency services and less for preventive services than educated persons.

Geographical location - More people utilise dental services more frequently in urban than rural areas. This is because of: lack of familiarity with appointments, or greater nonavailability, unacceptability or inaccessibility of dental services in rural than in urban areas. These differences are closely related to socioeconomic status, age, race and ethnicity, oral health care system and sociopsychological variables (Arnljot et al 1985, Burt & Eklund 1992).

Race and Ethnicity - A consistent finding is that a larger proportion of whites use dental services than non-whites, which is very common in countries like USA and Australia. However, race and ethnicity are not easy to interpret because of their relationship with wealth, poverty, education, culture value and residential location. In addition, racial discrimination does contribute to the differences of accessibility to the use of dental services including having a source of dental care (Arnljot et al 1985, Cormier & Levy 1981, Burt & Eklund 1992).

3.4.1.2 Structural variables of dental care delivery system

The structural variables of a dental care delivery system have significant influence on the utilisation of dental services. These variables include: organisational characteristics of the dental care delivery system; previous contact with the delivery system; delivery systems/alternatives to traditional care; accessibility to dental care; and having a regular source of care (Arnljot et al 1985, Burt & Eklund 1992, Chen et al 1997).

Previous contact with delivery system - may explain the differences in utilisation rate associated with other variables such as age and education. Persons with more recent visits are more likely to have another visit earlier in the same year. Having positive experience in their dental care may provide the persons incentive to continue to visit the dentist. In some cultures, children exposure to school dental services is not necessarily associated with continued regular dental care in adulthood (Burt & Eklund 1992).

Delivery systems/alternatives to traditional care - The traditional and predominant manner of dental care delivery is through a fee-for-service. The emergence of delivery systems/alternative to traditional care and changing payment arrangements may have an impact on the utilisation of dental services and the potential removal of some barriers. Prepayment and insurance in the dental delivery system may have impact on the utilisation of dental services and can substantially reduce the direct financial burden of dental care (**Burt & Eklund 1992**).

Accessibility of dental care - refers to the ability of potential consumers to be able to utilise the dental services. Access to dental care is not limited to a measure of the distance from the patient to the dentist, but it includes: (a) the time costs of waiting for an appointment and waiting time in the surgery; (b) availability of a dentist for treatment and special financial arrangements; and (c) transportation involved to and from the dental facility. The major barrier to improvements in the oral health of most of the people in a given community is a lack of access to timely preventive and restorative dental treatment. Thus, accessibility influences the utilisation of oral health care services (**Arnljot et al 1985, Dooland 1992, Burt & Eklund 1992, Brennan et al 1997**).

Availability of dental care services - refers to the presence of a dental services system to be used if one chooses to use them. This include the availability of the type of dental service, dental facilities, and the provider in both urban or rural areas. Therefore, the availability of dental care services influences the utilisation by individuals and the community (**Arnljot et al 1985, Burt & Eklund 1992, Dooland 1992, Brennan et al 1997**).

Acceptability of dental services - refers to the satisfaction of consumers in terms of availability and accessibility of the types of dental services, the treatment procedures involved and the provider in meeting their needs. In addition, the acceptability of dental services can also refer to the satisfaction of the providers of the oral health services. Therefore, the acceptability of dental services by consumers and providers does influence the utilisation of dental health services (**Arnljot et al 1985, Dooland 1992, Burt & Eklund 1992, Brennan et al 1997, Chen et al 1997**).

Prepayment and financial assistance - from other sources reduces out of pocket expenditure on dental care, controls costs and assists in making dental care less of a discretionary service, and thus increases utilisation. However, research indicates that persons who generally do not use the dentist except when they perceive need or feel pain, may go to the dentist immediately after the introduction of the plan, but do not appear to continue the pattern of high utilisation. Therefore, elimination or reduction of economic barriers via prepayment does not appear per se to result in equity of use of dental services. It has been generally accepted that high utilisation of dental services are seen among professionals and executives, those with high income and those who are well educated (Arnljot et al 1985, Dooland 1992, Burt & Eklund 1992, Brennan et al 1997).

3.4.1.3 Socio-psychological variables

The socio-psychological variables may include: *perceived need and potential demand* for dental care either in the presence or absence of dental symptoms. The perception of need for dental care is influenced by *attitudes and behaviours* towards: oral health, money, value of teeth, dentists, and dental care system; and *knowledge* about oral health and oral diseases.

Need and demand for dental care - influence individuals and community groups in their utilisation of dental services. *Dental need* can be categorised into: (1) *normative need* which is determined by professionals as the quantity of dental treatment to be consumed over a certain time period for people to achieve the status of being dentally healthy; (2) *perceived need* or *felt need* for dental care is determined by the patient or public whether with or without dental symptoms. A normative need for dental care exists when an individual has dental disease, although the patient may not perceive this need.

Demand for dental care is the expression by a patient or public of a desire to receive dental care to attend to their perceived needs. A demand for dental care exists when an individual perceives a need for dental care as a result of dental disease and translates that need into actively presenting for care (Burt & Eklund 1992, Block 1993).

Behaviours and attitudes - of patients play an important role in utilising dental health services. *Behaviour* refers to anything an individual does, says, thinks or feels, regardless of whether it is purposive and meaningful to the individual. *Attitude* refers to a way of feeling, thinking or behaving towards certain objects (including persons - others or oneself) or situations. The factors influencing oral health behaviours and attitudes of an individual are seen to be of two distinct kinds: (1) individual factors (personal characteristic including predisposing, and enabling variables), and (2) system factors (socioenvironmental and oral health system) as stated at the beginning of this chapter (**Chen & Andersen 1997, McGoldrick 1997, Sogaard 1993**). Therefore, the utilisation of oral health services is influenced by behaviours and attitudes as moulded by individual and system factors.

Knowledge about oral diseases and oral health - Knowledge about oral diseases and their prevention, and attaining and maintaining oral health, can have significant influence on behaviours and attitudes towards the use of dental services. Poor knowledge of oral diseases is common in that many people do not associate existing symptoms such as calculus deposits or bleeding gums. Furthermore, poor knowledge about the value of oral health attainment and maintenance will not provide an incentive to utilise dental services (**Burt & Eklund 1992**). As potential dental consumers become more knowledgeable about oral health and oral health services, their attendance at dental facilities increases (**Dooland 1992**).

3.4.1.4 Socio-cultural variables

Socio-cultural variables also influence individual and community groups behaviours and attitudes towards the utilisation of dental services. The socio-culture consist of all humanly created physical objects and patterns for thinking, feeling and behaving that are passed from generation to generation among members of a society. In all societies, health culture influences how people tend to cope with health problems, either through utilisation of services available or by alternative health care practices (**Burt & Eklund 1992, Jong 1993**).

The culture diversity exist in all societies because of the presence of socio-demographic and socio-psychological factors, thus encourage enormous differences in the utilisation of dental services. There are three broad dimensions to culture (**Burt & Eklund 1992, Jong 1993**):

Material culture such as dental instruments and dental facilities in which they become meaningful when people assign meaning to them.

Cognitive culture such as public beliefs on what is considered to be true or untrue which have great influence on the society members or groups.

Normative culture which consists of: (1) *norms* - as rules defining appropriate and inappropriate ways of behaving which are vital to the well being of a society and must be learnt and accepted by individuals and groups, and are not automatic; (2) *sanctions* - as rewards and punishments to encourage socially acceptable behaviour either by members of a community group positively or negatively (informal), or by officially designated persons such as dental personnel (formal); and (3) *values* which refers to what is good or desirable.

3.4.2 Assessment of Utilisation of Dental Services

The utilisation of dental services is assessed in terms of the number of visits made in the last 12 months, the reasons for the visits, and the level of satisfaction with the most recent dental visit by individuals and community groups. It can be expressed as:

- (1) a proportion of population who visited a dental facility for treatment within a given time, usually a year;
- (2) an average of visits per person made over one year;
- (3) an average distribution of visits among community groups;
- (4) number and percentage of place of visit (public/private);
- (5) number and percentage of visit for a type of treatment (prevention, restoration or emergency); and
- (6) number and percentage of subjects satisfied or unsatisfied with the type of treatment and the oral health system, (**Burt & Eklund 1992, Arnljot et al 1985, Chen et al 1997, Allister et al 1995, Brennan et al 1997**).

In conclusion, information on the oral hygiene practices including the frequency of using toothbrush; dental floss; and toothpicks per day, and the utilisation of dental services in terms of the number of visits made in last 12 months; the reasons for the visits; and the level of satisfaction with the most recent visit, are essential to determine the oral health behaviour of a population. These information can be obtained through well designed and constructed questionnaires for children and adults, as discussed in Chapter 5.

With the analysed behavioural information pertaining to the oral hygiene and utilisation of oral health services, current oral health programs and oral health care system should be evaluated and modified or planned for, targeting specific community groups to improve their oral health behaviours. Furthermore, the behavioural information should also provide a basis for monitoring of levels and patterns oral health behaviours in the community.

Chapter 4

ORAL QUALITY OF LIFE

4.1 INTRODUCTION

Although oral diseases are rarely life-threatening, they are very common problems affecting many people throughout the world. Subsequently, governments and health policy makers tend to give oral health a relatively low priority. However, many oral health researchers and planners argue that prevention and control of oral diseases deserve greater attention because the adverse impact of poor oral health is under-estimated (Nikias 1985, Reisine 1985, Ettinger 1987, Locker 1988, Reisin 1988a, Locker 1992).

Oral health is an aspect of overall health which is vital and yet widely overlooked (Wittenberg 1994). Many consequences of oral disease affect not only physical but also social and psychological well-being (Chen, Harmon & Andersen 1997). There are many individual consequences of poor oral health, ranging from disruption of function such as eating and speaking, through to pain or discomfort, and effects on work or social activities (Dooland 1992).

Oral quality of life is the term used to refer to the impact of oral health problems on an individual's quality of life. It is a concept that captures both the social and psychological impact of oral disease on well-being. It relates to the satisfaction of human needs for growth, well-being, self-esteem, freedom, and the pleasures of meaningful relationships and work (Gift & Redford 1992, Gift 1996, Chen et al 1997).

The definition of health-related quality of life varies, but the emerging consensus in the literature identifies three major dimensions: *physical symptoms*, *perception of well-being*, and *functional capacity*. Therefore, it is imperative that oral health research should include these dimensions with important effects on approaches to oral health. Although these dimensions of oral quality of life are all based on self-assessment, they have very different characteristics. The Second International Collaborated Study (ICS II) defines oral quality of life in terms of the number of oral health symptoms, perception of oral well-being, and social and physical functioning as affected by oral health problems (Chen et al 1997).

Previous oral health surveys in Papua New Guinea have never measured the oral quality of life. To date, there is no epidemiological oral health data available to indicate the level of oral quality of life in Papua New Guinea, including the armed forces. However, **Davies (1990)** reports that, an average villager in rural area suffers from dental caries during his life time. He states that the relief of dental pain is usually not necessary and painful episodes are usually regarded as part of life. He also states that in the absence of any attempts at control or prevention, the adults (35 years and over) tend to experience loose teeth, purulent infection, pain, dissatisfaction with their appearance due to missing teeth, and severe difficulties in mastication especially with hard food.

Inclusion of oral quality of life in oral health surveys allows better understanding of the importance of oral health to the individual's and community's well-being. It is a measure of an ultimate outcome as a result of the oral health care system and the external environment along with predisposing and enabling characteristics of individuals, their oral health behaviours, and their oral health status (**Gift 1996, Chen et al 1997**). These information are usually obtained through well designed and constructed questionnaires for children and adults.

This chapter discusses the three dimensions of oral quality of life: *perceptions of oral well-being, self reported oral disease symptoms, and social and physical functions*. The focus of the discussion will be on: social and oral health outcome variables. The *social variables* include sex, education, income, and having/not having a usual source of oral health care; while the *oral health outcome variables* include dependent and independent variables. The *dependent oral health outcome variables* include missing school for school children, and avoiding laughing and smiling for adults. The *independent oral health outcome variables* are classified as: *predisposing characteristics* such as sex, level of education and occupation, perceived general health status, and health beliefs; *enabling characteristics* including: the level of income, residence, family size and having/not having a usual source of oral health care; and *oral health status* in terms of the numbers of decayed, missing, and filled teeth and periodontal status (**Chen et al 1997**).

4.2 PERCEIVED ORAL WELL-BEING

Perceived oral well-being refers to *self assessed aesthetics* and *satisfaction with oral health* as indicators of oral well-being (Nikias 1985, Cushing et al 1986). It represents an individual's assessment of his or her oral health and of the appearance of his or her own teeth. The Second International Collaborative Study (ICS II) (Chen et al 1997) develops two indicators for perceived oral well-being:

- (1) *perceived oral health* which refers to an individual's perception of the condition of his or her teeth and gums as: excellent, very good, good, fair, poor or very poor; and
- (2) *perceived appearance of the teeth* which denotes whether an individual likes very much, quite a bit, or is generally satisfied with the way his or her teeth or dentures look, or does not like the appearance much, or does not like it at all.

Based on the above indicators for perceived oral well-being, the ICS II (Chen et al 1997) finds substantial proportions of subjects perceive their oral health to be poor or very poor, particularly more in adults than in children; and disliking the appearance of one's own teeth or denture is a common phenomena.

4.2.1 Perceived Oral Well-Being by Social Groups

Numerous studies on the oral quality of life in terms of perceived oral well-being *by social groups* have indicated that:

- (1) The differences between sexes in perceived oral well-being have not provided consistent results. For example, females are more likely than males to perceive their oral health as poor in two large United States insurance companies, whilst males are more likely to report poor oral health status in Finland (Chen, Andersen & Harmon 1997). Furthermore, ICS I (Arnljot et al 1985) finds no significant differences between boys and girls; and for adults, men tend to be more satisfied with their gums and teeth in some study sites, but in other study sites it is the women.

The ICS II (**Chen et al 1997**) also finds no consistent or significant differences in all age groups between males and females in the proportions who consider their oral health to be poor or very poor.

(2) The socioeconomic differences in satisfaction with oral health are also inconsistent. For example, those in upper socioeconomic groups tend to have a more positive view of their oral health than those in lower groups (**Reisine & Bailit 1980**). However, **Cushing et al (1986)** report no significant social class differences among adult English factory workers in perceived oral health status or perceived oral appearance. Furthermore, **Locker & Leake (1992)** state that low income and education groups are more likely to be dissatisfied with the appearance of their teeth or denture, and **Ranta et al (1987)** also state that those with higher income are more likely to be satisfied with their oral health. The ICS I (**Arnljot et al 1985**) also reports that those in higher socioeconomic groups are more likely to be satisfied with their teeth or gums than those in lower socioeconomic groups.

The ICS II finds that less educated people in all age groups are likely to perceive their oral health as poor or very poor; and the lower income groups are more likely to have poor or very poor perceived oral health than higher income groups. In all age groups, those not having a usual source of oral health care tend to have worse perceived oral health than those with a usual source of oral health care, and females are likely to dislike the appearance of their teeth more than males. Furthermore, less educated people are more likely to dislike the appearance of their teeth, including those children whose fathers had lower education levels. Those in low income groups are also significantly more likely to dislike the way their teeth look than those in the middle and high income groups. Regarding the usual source of oral health care, those without a usual source of oral health care are more likely than those with a usual source to dislike the appearance of their teeth or dentures (**Chen, Andersen & Harmon 1997**).

Therefore, the low education groups, low income groups, and the group without a usual source of oral health care tend to have a higher proportion of oral quality of life problems.

4.2.2 Perceived Oral Well-Being by Oral Health Outcome Variables

Perceived oral well-being can be influenced by the oral health outcome variables: *oral health behaviour* and *oral health status*, and *general health status*. These variables have significant impact on the quality of life. It has been reported that those with poor perceived general health are more likely to perceive poor oral well-being than those who perceived better general health. (Chen et al 1997).

Regarding the impact of *oral health behaviour* on the oral quality of life in terms of perceived oral well-being, **Reisine and Bailit (1980)** state that people with good oral hygiene habits tend to have better perceived oral health. Also, **Locker and Slade (1993)** state that those who tend to make oral health care visits only when they experience dental pain or other problems are more likely to perceive poor oral well-being than those making regular visits. Similarly, those who make regular oral health care visits tend to report better perceived oral well-being. Furthermore, those who make preventive visits are more likely to report better perceived oral well-being than those who visit for a specific treatment (**Ranta, Tuominen & Paunio 1987**).

The literature generally shows that clinical indicators of *oral health status* are significant correlates of oral quality of life. It has been accepted that poor oral health status is associated with a greater likelihood of experiencing oral pain and perceiving poor oral health (**Chen 1997**). However, some studies show that the number of decayed and missing teeth is negatively related to perceived oral health (**Brunswick & Nikias 1975, Giddon et al 1976, Reisin & Bailit 1980, Atchison et al 1993**). The number of filled teeth is related to perceived oral health or perceived appearance in some studies (**Giddon et al 1976**). Two studies (**Drake, Beck & Strauss 1990, Locker 1992**) have reported that there is no relationship between periodontal status and perceived oral health.

In addition, the ICS II (**Chen et al 1997**) findings indicate that, for children aged 12-13 years:

- (1) Sex, father's education and occupation have no significant impact on perceived oral health.
- (2) Perceived general health has a strong significant effect on perceived oral health. Those who perceived better general health are more likely to report better oral health.

(3) Health beliefs are significant predictors of perceived oral health, but perceived seriousness does not have significant independent impact. A greater level of perceived importance is significantly related to worse perceived oral health. Those children who expressed neutrality to the statement concerning the benefits of oral health care visits report better oral health than those who believed in the benefits of such visits.

(4) Perception of barriers to obtaining oral health care has a significant impact on perceived oral health. Children who perceived a greater number of barriers report worse oral health.

(5) Three enabling variables: family size, residence and usual source of oral health care have no significant impact on oral health.

(6) Frequency of toothbrushing is a significant predictor. Children who brushed once or less than once a day, or never brushed, report worse oral health than those who brushed more than once a day.

(7) The number of decayed, missing and filled teeth had an effect on perceived oral health. Those having a greater number of decayed, missing and filled teeth are likely to have worse perceived oral health.

(8) Periodontal status is also a significant predictor of perceived oral health, where those with better periodontal status tend to perceive better oral health than those with poor periodontal status.

For adults aged 35-44 years, the ICS II (**Chen et al 1997**) states that :

(1) Sex has no significant impact on perceived oral health.

(2) Education is a significant predictor where a higher education level is associated with worse perceived oral health.

(3) Occupation is a significant predictor where those with managerial or low professional and skilled occupations are more likely to report better oral health, while those with unskilled or semiskilled occupation are more likely to report worse oral health.

(4) Perceived general health has a strong significant and independent effect on perceived oral health.

(5) Perceived barriers to obtaining oral health care is a significant health belief predictor which is positively associated with worse perceived oral health.

(6) Regarding the enabling variables, income has no significant independent impact on perceived oral health; residence is a significant predictor where those in more urban areas report worse oral health; and usual source of oral health care and its use is a significant predictor where those with a source of usual oral health care and who use it for preventive visits report better oral health than those without.

(7) Brushing frequency is also significantly related to perceived oral health. Those who never brushed or brushed less than once a day tend to have lower levels of perceived oral health than those who brushed more frequently.

(8) Dentition status has strong and consistent effects on perceived oral health. A greater number of decayed, missing and filled teeth are associated with significantly worsted perceived oral health.

(9) Having a less healthy periodontal status is associated with worse perceived oral health, compared to those with healthy periodontal status.

With these findings, **Chen et al (1997)** conclude that:

(1) While most previous studies state that those in higher socioeconomic groups tend to have more positive view of their oral health than those in lower socioeconomic groups, a low education or occupation level does not predispose an individual to worse perceived oral health, just as high income does not relate to better perceived oral health.

(2) Perceived general health has a strong independent effect on perceived oral health. That is, given the same level of oral health behaviour and status, the oral health is worse in individuals with worse general health. This association relates to the fact that perceived oral health is a component of perceived general health where perception of general health influence perceptions of oral health. Therefore, oral health professionals should recognise that clients in poor general health are more likely to have poor oral health.

(3) The number of perceived barriers to obtaining oral health is also significant. The more barriers an individual perceives, the worse his or her perceived oral health. Therefore, it is warranted that public health should make an effort to reduce people's barriers.

(4) Those with a usual source of oral health care and who use it for preventive or curative reasons, tend to have significantly better perceived oral health than those with a usual source of oral health care but who do not use it. On the other hand, those without a usual source of oral health care tend to have significantly worse perceived oral health.

(5) Those with better oral hygiene habits such as, frequent brushing, tend to have better perceived oral health. Frequent brushing has significant relationships to better perceived oral health.

(6) There are significant relationships between the number of decayed, missing or filled teeth and perceived oral health. This implies that the problematic tooth, whether treated (filled), extracted (missing) or untreated (decayed), there is always poor perceived oral health. Therefore, there is a significant relationship between dentition status and perceived oral health. Likewise, there is a significant relationship between periodontal status and perceived oral health.

4.3 SELF-REPORTED ORAL DISEASE SYMPTOMS

Oral health symptoms are the direct manifestation of clinical oral health problems. However, their perception and reporting are also related to the levels of tolerance and sensitivity of the individual concerned and of the society in which he or she lives. Self reported oral disease symptoms refer to individuals indicating their experiences of oral health symptoms (**Chen, Harmon & Andersen 1997**).

Numerous studies have investigated pain and impairment due to oral health problems as indicators for oral health symptoms. It has been reported that females, less educated individuals, and lower income individuals are more likely to report symptoms of oral pain than males and individuals with higher education and income (**Cushing et al 1986, Bailit 1987, Reisine 1988b, Reisine et al 1989, Locker 1992, Soderfelt et al 1993**).

The ICS II (**Chen et al 1997**) uses the following indicators among both children and adults for the self reported oral disease symptoms:

- (1) a broken or chipped tooth or denture;
- (2) gums that hurt or bled;
- (3) sores on tongue, mouth or cheeks;
- (4) a bad taste in the mouth or bad breath;
- (5) gums that bled when brushed or flossed;
- (6) teeth that ache or throbbed;
- (7) teeth that hurt when eating or drinking hot or cold liquids or foods;
- (8) teeth that hurt when eating or drinking sweet foods or drinks; and
- (9) edentulous individuals are asked only about the first four symptoms.

It has been revealed that a high proportion of people experience at least one oral health symptom in the previous year indicating that having oral health symptoms is a fact of life and are common among majority of children and adults in all the countries (**Chen, Harmon & Andersen 1997**).

4.3.1 Self-Reported Oral Disease Symptoms by Social Groups

In the literature, females, less educated individuals and lower income individuals are more likely to report symptoms of oral pain (**Bailit 1987, Locker 1992**). Among the adults, there is no significant difference between the sexes in prevalence of experiencing discomfort and oral pain (**Cushing, Sheiham & Maizels 1986**).

The ICS II (**Chen et al 1997**) reveals that:

- (1) Females in most age groups are likely to report oral disease symptoms more than males.
- (2) There are no significant differences in the proportions of children reporting symptoms in relation to their fathers' education and few significant education differences in adults where high education groups are more likely to report one or more symptoms than the medium or low education groups.
- (3) Differences between high income and low income groups in relation to the reporting of oral disease symptoms are not significant.
- (4) There are no significant differences between those with a usual source of oral health care and those without for both children and adults.

These findings indicate that there are significant relationships between the reporting of oral disease symptoms and education, income, and having/not having a usual source of oral health care. High education and income level and having a usual source of oral health care are significantly related to the reporting of more symptoms indicating an association with a higher quality of life. This phenomenon reflects that those in higher education groups tend to report, rather than to experience, the oral disease symptoms .

4.3.2 Self-Reported Oral Disease Symptoms by Oral Health Outcome Variables

It has been reported that those with *poor perceived general health* are more likely to experience oral disease symptoms. The impact of *oral health behaviour* on oral quality of life in terms of self reported oral disease symptoms, has been shown in that those who tend to make regular oral health care visits are more likely to report less oral disease symptoms than those who do not make regular visits (Locker & Slade 1993). As clinical indicators of oral health are significant attributes of oral quality of life, it has been reported that poor *oral health status* is associated with oral pain experiences (Chen 1997). Those with more decayed, missing, and filled teeth are more likely to experience oral disease symptoms including pain than those with less decayed, missing, and filled teeth (Cushing et al 1986, Bailit 1987).

Furthermore, the ICS II (Chen et al 1997) finds that for children aged 12-13 years:

- (1) Sex is a significant predictor of the number of oral disease symptoms, where girls tend to report oral disease symptoms more than boys.
- (2) Children whose fathers have professional or skilled occupations and in higher educational groups tend to report more symptoms than those whose fathers have unskilled or semiskilled occupations and in lower education groups.
- (3) Perceived general health has a significant effect on the number of symptoms reported where better general health report less symptoms than poor general health.
- (4) Perceived barriers to obtaining oral health care is a strong predictor of the number of symptoms reported where the greater the number of perceived barriers, the more symptoms are reported. For example, perceived seriousness is a significant predictor of symptoms where those who believed that oral health problems are serious in comparison with other health matters report more symptoms. Health beliefs related to the importance of oral health matters and the benefits of brushing are not significant predictors. However, the perceived benefits of oral health service visits is a significant independent variable in that those children who disagreed that visits can prevent oral health problems tend to report more symptoms than those who agree.

(5) Enabling variables such as the family size, residence either urban or less urban areas, having/not having a usual source of oral health care, and making /not making a dental visit are not significant predictors. However, in some study sites, those children with a usual source and made a visit show significantly less symptoms than those without a usual source and who made no contact. In addition, those children from larger families report more symptoms than those from smaller families.

(6) Brushing frequency has a significant effect on the number of symptoms reported where less frequent brushers (those who never brushed or brush less than once a day) tend to report more symptoms than frequent brushers. In contrast, flossing has no significant effect.

(7) Dentition status indicators (decayed, missing and filled teeth) have significant effect on the number of symptoms reported where children with greater numbers of decayed teeth tend to report more symptoms, whilst those with a greater number of filled teeth tend to report fewer symptoms.

(8) Better periodontal status (healthy or no more than bleeding) is generally associated with fewer symptoms. However, children with bleeding status tend to report fewer symptoms.

For adults, the ICS II (Chen et al 1997) finds that:

(1) Sex is a significant predictor for reporting of oral disease symptoms, where women tend to report more symptoms than men.

(2) Education and occupation have no significant independent effect. However, in some study sites, those with skilled occupation tend to report significantly fewer symptoms than those with other occupations.

(3) Perceived general health is a significant predictor of the number of symptoms reported, where those with fair, poor or very poor perceived health tend to experience more symptoms than those with better perceived health.

(4) In terms of health beliefs, the perceived barriers to obtaining oral health care is the most consistent effect on the number of symptoms. A greater number of perceived barriers are associated with higher numbers of symptoms. Perceived seriousness is significant where those who perceived a greater level of seriousness of oral health problems in comparison with other health problems tend to report more symptoms. Perceived benefits of brushing has a significant effect where those who perceived greater benefits from brushing in preventing oral health problems tend to experience fewer symptoms. Perceived importance of oral health and perceived benefits of oral health care service visits are not significant predictors.

(5) Among enabling variables, income has a significant impact on the number of symptoms where children from high income families tend to report fewer symptoms than those from medium or low income families. Residence is a significant predictor where living in more urban areas is associated with the reporting of more symptoms.

(6) The source of oral health care and reasons for making dental visit have significant impact on the number of oral symptoms reported. Those with a usual source of care and who use it for curative reasons tend to report significantly more symptoms than those with a usual source of care and use it for preventive reasons.

(7) Frequency of brushing including flossing does not have significant impact on the number of symptoms among adults. However, it has been reported that in some areas, those who brushed less frequently tend to report more symptoms than those who brushed frequently.

(8) The dentition status is a significant predictor of the number of symptoms reported where those with untreated decayed teeth tend to report more symptoms. On the other hand, the number of missing teeth has no significant effect and the number of filled teeth has a significant impact on the number of symptoms reported.

(9) The periodontal status is a significant predictor where those with healthy or gingival bleeding scores tend to report more symptoms than those with calculus.

From the above findings, **Chen (1997)** concludes that:

- (1) Although females tend to report more oral disease symptoms, the differences between sexes are inconsistent or not significant. This suggests that certain system level factors in different countries may be responsible for the presence or absence of differences between the sexes.
- (2) Although individuals with low education tend to report oral pain more often, there is no significant effect of education in any age group after controlling other variables such as socioeconomic status, oral health behaviour, and oral health status.
- (3) Occupation (predisposing variable) and income (enabling variable) have varying effects on the number of oral disease symptoms. While clinical measures of oral health indicate that higher occupation and income levels are associated with better oral health, similarly, the high occupation and income groups tend to report more symptoms, probably, because of their natural tendency to report symptoms.
- (4) As perceived good general health increases, oral disease symptoms decrease indicating that perceived good general health is a strong predictor of the number of oral disease symptoms reported for most age groups. Therefore, there is a positive (direct and/or indirect) association of good general health on the likelihood of experiencing oral disease symptoms. However, it is possible that individuals with more oral disease problems tend to rate their general health lower.
- (5) Better oral quality of life is an attribute of higher levels of belief in the seriousness of oral disease, the importance of oral health, and the benefits of oral health behaviour; and lower levels of perceived barriers to obtaining oral health care. The most consistent findings regarding the impact of health beliefs on oral disease symptoms include: anxiety about the pain associated with treatment, being too busy to get care, and the availability of oral health care providers.

The level of oral health belief is significantly related to experiencing more oral disease symptoms which suggests that the symptoms or oral health problems may accumulate among those who perceive barriers to availability, accessibility and acceptability of oral health care. It also implies that oral health systems with higher perceived barriers have not successfully addressed the concerns of the patients, which in turn has an important policy implication.

(6) Residence in more urban or less urban area is not a significant predictor of the number of symptoms reported. Since urban residents tend to have good or better clinical oral health status than rural residents, they have greater propensity to report symptoms.

(7) In general, adults with a usual source of oral health care and who use it for preventive reasons tend to report fewer oral disease symptoms, while those with a usual source of oral health care and use it for curative reasons tend to have more symptoms. Therefore, it is necessary to promote the use of oral health services for preventive reasons.

(8) Regarding the impact of oral hygiene behaviour on the number of oral disease symptoms reported, brushing has significant effect on the oral disease symptoms, while flossing has no significant independent effect. That is, less frequent brushing is significantly related to more self-reported oral disease symptoms, while more frequent brushing is significantly related to less self-reported oral disease symptoms.

(9) Although the relationship between dentition status and oral disease symptoms varies in different countries, the ICS II data suggests that a greater number of untreated decayed teeth significantly increases the number of symptoms reported, thus reducing the quality of life in terms of pain and discomfort if left untreated. Similarly, greater numbers of missing teeth are significantly related to more symptoms and a greater number of filled teeth is significantly associated with more symptoms. In contrast, in some situations, a greater number of filled teeth is significantly related to fewer symptoms indicating that decayed teeth, if extracted or filled are unlikely to produce symptoms.

(10) Worse periodontal status among children is significantly related to a greater number of symptoms, while among the adults it is not significant. This suggests that even poor periodontal status does not necessarily lead to a greater number of symptoms.

4.4 SOCIAL AND PHYSICAL FUNCTIONING

Social and physical functioning illustrate the impact of oral health problems on various aspects of the individual's life. These may vary because of societal and individual differences. For example, in a society where laughing and smiling is considered to be an important function but individuals tend to avoid laughing or smiling because of the appearance of their teeth or gums. Similarly, in a society where school or work absenteeism is more acceptable, children may be more likely to miss school or adults miss work as a result of oral health pain (**Chen, Harmon & Andersen 1997**).

Numerous studies have measured social and physical functioning using a range of indicators including work performance (**Reisine 1985, Spencer & Lewis 1988, Rosenberg et al 1988**), school days lost and restricted activity (**Gift et al 1992**), and chewing and eating problems (**Nikias 1985, Cushing et al 1986, Rosenberg et al 1988, Locker 1992**).

4.4.1 Social Functioning

Social functioning including: talking, laughing, smiling, meeting and interacting with other people are crucial daily activities. However, oral problems can notably impair these social activities among both adults and children. Subsequently, the quality of life can be very much reduced.

For children, the social functioning indicators include: whether they avoid laughing or smiling because of the way their teeth look; whether they avoid meeting others because of the way their teeth or gums look; and whether other children joke about the way their teeth look. For adults, the social functioning indicators include: whether they avoid laughing or smiling because of unattractive teeth or gums; and whether they avoid conversation because of unattractive teeth, gums or bad breath (**Chen et al 1997**).

4.4.2 Physical Functioning

Likewise with social functioning, physical functioning is an essential aspect of life. Impairing physical functioning as a result of oral health problems can influence the quality of life. In order to measure the oral quality of life, the ICS II (**Chen et al 1997**) identifies the physical functioning indicators for children including: whether the pain or discomfort of oral health problems cause them to miss classes or school days during the previous year. For adults, the physical functioning indicators include: whether pain or discomfort as a result of oral health problems limit their usual activities; whether pain or discomfort from oral health problems affect their sleeping; and chewing of hard food. In addition, whether edentulous people experience problems when wearing dentures including: trouble in talking clearly; difficulties with eating; improper fit of dentures; and soreness from dentures.

Attending school is an integral daily function for children, yet many children in many communities tend to miss classes or entire school days because of oral problems. Pain or discomfort attributed to oral health problems tend to limit the usual activities and disturb the sleep of a relatively high proportion of adults. Chewing serves an important role in nutritional intake and digestion, and consequently in the maintenance of general health. Oral disease and poor dentition can impair chewing especially hard foods. In addition, poorly constructed or unmodified dentures can cause speech disturbances, difficulties in eating and ulceration of mucosa which are common problems among denture wearers (**Chen, Harmon & Andersen 1997**).

Generally, the impairment of physical functioning (attending school, performing usual activities, sleeping, and chewing hard foods) as a result of pain and discomfort; and social functioning (laughing, smiling, and meeting others) as a result of the appearance of teeth or gums and bad breath, have significant impact on the quality of life (**Chen et al 1997**).

4.4.3 Social and Physical Functioning by Social Group

Numerous studies have indicated inconsistent patterns concerning the impact of oral health problems on the level of functioning among social groups. In the United States (**Bailit 1987**) and England (**Cushing et al 1986**), women are more likely than men to experience difficulties in communicating with others due to oral health problems. The communication problems include talking, laughing, smiling or kissing. **Rosenberg et al (1988)** find that there are no significant sex or education level differences in terms of pain, ability to chew or engaging in conversation. Likewise, there are no significant differences in behavioural impacts of oral pain between men and women or between older and younger adults in Canada (**Locker & Grushka 1987**). However, **Locker (1992)** finds that there are significant differences in ability to chew hard foods for older adults where adult women of lower education levels and lower income groups are more likely to have problems than others, including dissatisfaction with ability to chew. Locker states that income is a strong predictor of dissatisfaction with ability to chew. In addition, dentate adult women and people in high income groups are more likely to be able to chew hard foods than dentate men and those in lower income groups.

There are many individual consequences of poor oral health, ranging from disruption of physical functioning such as eating and speaking, through to pain or discomfort and effects on work or social activities (**Dooland 1992**). For example, as an indication of the social impact of oral disease, there are more than one million days of work loss and over three million days of limited activity associated with oral disease in the Australian population in 1983 (**Spencer & Lewis 1988**).

Most individuals experience less obvious forms of disruption which contribute to a burden of silent suffering and can substantially affect the quality of life. If oral pain persists for a relatively limited period (up to several days), very frequently the individuals are affected in their everyday activities such as sleep, daily work and personal interaction. For long-term discomfort as a result of chronic oral conditions such as minor toothache (or sensitivity), periodontal conditions and ill fitting dentures, the individual's quality of life is usually reduced in terms of eating, speaking, social interaction and sleep. Furthermore, tooth loss as a result of oral disease, reduces the efficiency of chewing, affects the facial form and appearance, and can impair speech (**Dooland 1992**).

It has been reported that adults tend to be embarrassed about their speech or appearance, and subsequently avoid meeting other people because of oral problems in particular partial or complete edentulous (Slade et al 1990).

Chen, Harmon & Andersen (1997) state that:

- (1) Females are generally more likely to avoid laughing or smiling because of their teeth than males.
- (2) Although the differences in the education of fathers in the proportion of children who tend to avoid laughing or smiling are not significant, children having fathers with lower education are generally more likely to avoid laughing or smiling.
- (3) While the education differences are not significant, lower education groups of younger adults tend to avoid laughing or smiling more than higher education groups
- (4) Adults in lower income groups are more likely to avoid laughing or smiling, although the differences between income levels are not significant.
- (5) Differences between those having and those not having a usual source of oral health care are also not consistent. Children are significantly more likely to avoid laughing or smiling if they have a usual source of care than those without, while for adults, those who do not have a usual source of oral health care are significantly more likely to avoid laughing or smiling than those with a usual source of oral health care.
- (6) The differences between men and women in their ability to chew hard foods is not significant, however, among the older adults, a greater proportion of women tend to experience chewing impairment than men.
- (7) The differences between levels of education among adults are significant in that, less educated are more likely than higher education groups to have their chewing ability impaired.
- (8) The differences are significant for adults in income where those in low income group tend to have more trouble chewing hard foods than those in middle or high income groups.

(9) Adults with a usual source of oral health care tend to have fewer problems than those without a usual source. Thus, the inability to chew hard foods is significantly more common among those without a usual source of oral health care than those with a usual source.

Likewise with oral well-being, it is concluded that the significant group differences in social and physical functioning including: low education groups, low income groups and the group without a usual source of oral health care, are likely to have higher proportion of oral quality of life problems. Comparisons of social group differences in oral quality of life suggests that system level factors do affect the distribution of oral quality of life among social groups. The overall status of oral quality of life in a society may be affected not only by physical oral health of the people but also by their different perceptions of oral health problems and the different impact of oral health problems on their social and physical activities. Besides clinical oral health status, there are other factors such as social and cultural factors, and oral health care systems which tend to affect social groups in oral quality of life in terms of social and physical functioning (Chen, Harmon & Andersen 1997).

4.4.4 Social and Physical Functioning by Oral Health Outcome Variables

In terms of *oral health behaviour*, those who tend to make oral health care visit only when feeling pain or any other dental problem are likely to experience more aspects of a compromised oral quality of life than those who tend to make regular visit. These aspects include: physical disability (unclear speech, avoidance of smiling, and eating some foods); psychological disability (sleeping problems, problems with relaxing, and being depressed); and other handicaps (inability to enjoy other peoples' company, inability to function, and inability to work to full capacity) (Locker & Slade 1993). Regular oral health care positively dictates dentate adults' perceived oral health and chewing ability (Ranta et al 1987). Similarly, adults who tend to make preventive visits are least likely to be absent from work and experience lowest number of hours lost from work owing to oral health problems (Reisine 1984, Reisine, Miller 1985). However, Cushing et al (1986) state that there is no significant difference between the regularity of visits and patients' eating and communication function.

Regarding *oral health status*, it is generally accepted that clinical indicators of oral health have significant association with the oral quality of life. Studies have indicated that poor oral health status is associated with a greater likelihood of experiencing oral pain. For example, those with more decayed teeth are more likely to experience oral disease symptoms and those with more decayed, missing, and filled teeth are also likely to report more oral pain (**Cushing et al 1986, Bailit 1987**). Furthermore, a greater number of missing teeth is related to impaired chewing ability or eating function (**Cushing et al 1986, Drake et al 1990, Locker 1992**). **Bailit (1987)** reports that the individuals with a greater number of decayed, missing or filled teeth in United States are more likely to avoid conversation owing to the appearance of their teeth. However, it has been reported that there is no significant relationship between the numbers of decayed, missing, and filled teeth and social and physical functional status (**Cushing et al 1986, Rosenberg et al 1988**). Instead, there is a significant association between periodontal status and oral physical and social functioning (**Rosenberg et al 1988**).

To measure the oral quality of life in terms of social and physical functioning, the ICS II (**Chen et al 1997**) used *dependent variables*: missing school because of oral health problems for children, and avoiding laughing or smiling for adults; against *independent variables*: predisposing and enabling characteristics, oral health behaviour, and oral health status. The findings show that:

- (1) The differences between sexes is significant where girls are significantly more likely than boys to miss school.
- (2) Children with better perceived general health are significantly less likely to miss school.
- (3) Children with a usual source of oral health care, who tend to visit, and from larger families are significantly more likely to miss school, while their residence has no significant effect.
- (4) The impact of brushing frequency is significant where children who tend to brush once a day are less likely to miss school.
- (5) Dentition and periodontal status are not significant predictors for missing school.

(6) The difference between sexes is significant where the females are more likely to avoid laughing or smiling because of the appearance of their teeth and gums.

(7) Those in higher education level and unskilled or semiskilled workers are significantly more likely to avoid laughing or smiling than those in lower education level and managerial or professional occupations.

(8) Some health beliefs are significant predictors whereby, those with better perceived general health are less likely to avoid laughing or smiling, while those with more perceived barriers to obtaining oral health care are more likely to avoid laughing or smiling. Furthermore, those with a greater level of belief in the seriousness of oral health problems and a greater level of perceived importance of oral health or of the perceived benefits of brushing are more likely to avoid laughing or smiling, while those perceiving the benefits of brushing are significantly less likely to avoid laughing or smiling.

(9) Income, residence, and a usual source of oral health care and its use variables are not significant predictors of avoiding laughing or smiling.

(10) Less frequent brushing is significantly related to the increase probability of avoiding laughing or smiling, while flossing is associated with less avoidance.

(11) The greater the numbers of decayed, missing, and filled teeth, the more likelihood of avoiding laughing or smiling. There is no consistent effect of periodontal status.

Generally, children who tend to miss school are characterised as females, having an unemployed fathers, coming from large families, and having a lower perception of the benefits of brushing and using dental floss. For adults, while perceived general health is a significant predictor of the number of oral disease symptoms or perceived oral health status, it has a significant effect on the avoidance of laughing or smiling. Those who perceived oral disease to be a serious problem are more likely to avoid laughing or smiling. Similarly, a greater number of perceived barriers to obtaining oral health care is associated with the likelihood of avoiding laughing or smiling.

In addition, dentition is the most consistent predictor where worse dentition status (more decayed, missing, and filled teeth) is associated with a greater likelihood of avoiding laughing or smiling. Also, those who tend to brush less frequently are more likely to avoid laughing or smiling.

In conclusion, the oral quality of life is the ultimate outcome of the oral health care system and external environment along with predisposing and enabling characteristics of individuals, their oral health behaviours, and their oral health status. The dimensions of oral quality of life: oral well-being, oral disease symptoms and social and physical functioning; by social groups and oral health outcome variables, differ in various societies. Not only because they have varying levels of clinical oral health status and different oral health care systems, but also because they have distinct norms and values, which could result in different levels of sensitivity toward oral health symptoms and different attitudes toward oral functioning.

The profound social and psychological impacts of oral health problems on quality of life are not obvious from clinical measures of oral disease. The examination of the three dimensions of oral quality of life and the comparison with clinical oral health status should provide some insight into the social dimensions of oral health problems. Therefore, it is imperative to document the impact of oral diseases on the quality of life of individuals and community groups so that necessary planning and programming can be established to improve the oral quality of life.

Chapter 5 PROTOCOL FOR EPIDEMIOLOGICAL PATHFINDER ORAL HEALTH SURVEY IN PAPUA NEW GUINEA DEFENCE FORCE

5.1 INTRODUCTION

Good survey design is basically a matter of good planning. A major aspect of any survey is the gathering of information (**Jackson 1993**). It involves careful planning, management and administration in its development and implementation.

A survey protocol is a prerequisite of any survey (**Bowling 1997**). It is a written set of instructions in which all procedures, criteria and terms are clearly defined. Written by the investigator, the protocol becomes a comprehensive and carefully planned blue print (**Darby & Bowen 1980**), and serves as the guiding document for the execution, monitoring and evaluation of the survey. It is therefore essential to ensure that the written protocol contains all the information pertinent to an intended survey (**WHO 1997**).

This chapter will discuss the *Protocol for Epidemiological Pathfinder Oral Health Survey in Papua New Guinea Defence Force (Descriptive - Cross-Sectional)*. The protocol is based on methodology presented by the World Health Organisation (WHO) in the publications entitled: *Oral Health Surveys: Basic Methods* (**WHO 1997**) and *Comparing Oral Health Care Systems - A Second International Collaborative Study* (**Chen et al 1997**). The principle steps of the protocol include: background and problem; objectives; data and information required; population to be studied; survey procedures; data collection methods; data analysis; reporting; staff, facilities, equipment and supplies; budget and time schedule. Each step should contain specific information for the epidemiological pathfinder oral health survey in Papua New Guinea Defence Force (PNGDF).

5.2 BACKGROUND AND PROBLEM

Background and problem involve describing the problem, the reasons for undertaking the research, and the problem goals relating to the survey. Descriptive epidemiological oral health research or survey approach involves description, documentation, analysis, and interpretation of current oral health conditions of one group (cross-sectional) or two or more groups (group comparison) representing a population at a single point in time, in a most economic method (pathfinder). The information collected should provide an oral health profile of the group or groups in terms of the prevalence of the common oral diseases and conditions affecting the population, variations in disease level, severity, and treatment needs. In addition, these information can be used to determine: (1) the extent to which existing oral health services are coping with the current need for care; (2) the nature and extent of required preventive, curative and restorative services; and (3) the resources needed to establish, maintain, expand or reduce oral health care programs; and the number and type of personnel required (**Darby & Bowen 1980, Aday 1996, WHO 1997**).

In the Papua New Guinea Defence Force (PNGDF), there is evidently a lack of comprehensive information about the rapidly changing oral health outcomes including: oral health status, oral health behaviour, and oral quality of life. Subsequently, this has seriously limited the assessment of current oral health and oral health services, planning of oral health care programs, and estimation of dental workforce requirements. In addition, the lack of epidemiological oral health data makes comparisons with the national oral health outcomes impossible and leaves oral health policy makers and professionals with wide theoretical and practical gaps. In a practical sense, the PNGDF has been deprived of opportunity to evaluate its current oral health status in order to improve its own oral health outcomes including comparing itself with others to understand and learn about their strengths and weaknesses.

The urgency of the need for a PNGDF oral health survey is highlighted by the lack of baseline oral health data in terms of oral health outcomes: for estimating the present oral health status of PNGDF population and its future needs for oral health care; for monitoring changes in the levels and patterns of oral diseases and conditions, oral health behaviours, and oral quality of life; for the planning and evaluation of oral health care provision in PNGDF; and for comparison with the available national data.

5.3 SURVEY OBJECTIVES

Survey objectives are the goals to be achieved by the survey process. The objectives of the survey determine the kinds of data that will be needed and the form in which they should be collected. It is imperative to define the objectives clearly and precisely in order to guide the collection of data to those items which are relevant and the analysis of the data that will be carried out (WHO 1971, 1977, 1980, Aday 1996).

Following are the objectives of the *epidemiological pathfinder oral health survey for Papua New Guinea Defence Force*:

- (1) To establish the pattern of oral diseases and conditions in the Papua New Guinea Defence Force (PNGDF) population (armed forces personnel and dependants), and to use such data as a basis for estimating their needs for oral health care services.
- (2) To determine the prevalence and severity of common oral diseases and conditions in the PNGDF population, and to use the data as the basis for estimating target groups which should be accorded priority in the provision of oral health care and for comparison with the national oral health data.
- (3) To describe oral health outcomes including: oral health status, oral health behaviour and oral quality of life in the PNGDF population, and to use such data for estimating the level of oral health and dental fitness of the armed forces, and for planning, programming, monitoring, and evaluation of oral health care services.
- (4) To describe oral health care system including: purchaser, consumer, provider of oral health services; financing; specific oral health programs and entitlement of oral health care, and to use such data for planning, monitoring and evaluation of oral health care services and organisation in order to improve oral health in the PNGDF.

5.4 DATA AND INFORMATION REQUIRED

Based on ICS II (Chen et al 1997) and WHO (1997) methodology, the oral health outcomes to be assessed include oral health status and treatment needs, oral health behaviour and oral quality of life.

The oral health status and treatment needs parameters include: dentition status to be measured by the number of decayed, missing, and filled teeth; periodontal status to be measured by the Community Periodontal Index of Treatment Needs (CPITN); dental facial anomalies to be measured by the Dental Aesthetic Index (DAI); and assessment of other conditions such as prosthetic status; oral mucosa; temporomandibular joint; enamel opacities/hypoplasia; and dental fluorosis. The oral health behaviour variables to be measured include: the oral hygiene practices of toothbrushing and flossing, and oral health services utilisation. The oral quality of life is to be measured by the number of oral health symptoms, perception of oral well-being, and social and physical functioning as affected by oral health problems.

The survey is intended to take into account individual level variables including: personal characteristics and oral health outcomes. The *personal characteristics* are divided into *predisposing* and *enabling variables*. The former variables include: sex, level of education and occupation, perceived general health status and health beliefs. Health beliefs include: the perceived seriousness of oral disease, importance of oral health, benefits of brushing, flossing, oral health service visits, and the number of perceived barriers (fear, being too busy, lack of services) to obtaining oral health care which influence the individual's likelihood of engaging in various health behaviours. The latter variables include: the level of income, residence (urban or rural), family size and having/not having a usual source of oral health care which either facilitate or impede oral health behaviour.

5.5 POPULATION TO BE STUDIED

The population to be studied is that of the PNGDF personnel and their dependants (children and wives) who are actually residing in the PNGDF Units or Barracks and are eligible to receive free armed forces dental health services. From this population (universe or sampling frame), a probability sample of appropriate characteristics and size will be drawn for the study. Sample refers to a representative portion of the population to be observed and measured in order to obtain epidemiological and other data from which inferences can be made for whole or most of the PNGDF population.

5.5.1 Sampling

Sampling is the process or technique of selecting a sample of appropriate characteristics and size for study. The sampling reduces the cost of the investigation, the time required and the number of personnel involved. Furthermore, a sample can be covered more adequately and in more depth than a total population. It involves deciding who should be included in the survey because gathering information on everyone in a population is always beyond the scope of the limited resources. Thus, sampling makes gathering data on a population of interest more manageable and more affordable or more cost-efficient than covering the total population (WHO Western Pacific 1992, Aday 1996, Bowling 1997).

The various types of sample designs all aim at ensuring that no *bias* enters into the selection of the sample, and that the sample chosen will afford the greatest precision in the results. The only way to avoid bias is to make the selection according to some random process. The random sampling refers to every person in a population having equal chance of being selected or included in the sample. Each person of the sampling frame should have a known non-zero probability of being selected in the sample. (McArthur 1961, Weinber & Cheuk 1980, WHO Western Pacific 1992, Jackson 1993).

There are two principal types sample designs: *probability* and *non probability* designs. The basic distinction between the two designs is that the former relies on the laws of chance for selecting the sampling elements, while the latter relies on human judgment. The types of *probability sample designs* include: simple random sampling, stratified sampling, systematic random sampling, and cluster sampling. *Simple random sampling* is the method of choice where subjects are chosen independently of each other with equal opportunity for inclusion. It involves some means of identifying the entire population such as listing and the sample is randomly selected by using a table of random numbers or drawing the numbers from a hat or any other random method available. *Stratified sampling* refers to a proportionate number of subjects from each strata or subgroup, randomly selected within the strata to provide accurate representation of various characteristics of the defined population in the sample. *Systematic random sampling* is where a sample is drawn from a complete listing of the total population (sampling frame) by selecting the subjects randomly based on a sampling interval. The sampling interval is determined by dividing the total number on the list by the desired sample size. For example, if the total number is 4,000 and the sample size required is 1,000, the sampling interval is computed by dividing 4,000 by 1,000 which equals to 4. Therefore every 4th name on the population list is included in the sample. *Cluster sampling* involves dividing the sample into groups (or clusters) in order to maximise the dispersion of the sample throughout the community and to represent fully the diversity that exists there while also minimising costs (Darby & Bowen 1980, WHO Western Pacific 1992, Aday 1996, Bowling 1997).

The *stratified cluster sampling technique* will be used in the PNGDF oral health survey with the aim of including the most important population subgroups which are likely to have different oral health outcomes: oral health status, oral health behaviours, and oral quality of life.

5.5.2 Selection of Sub-Groups

In choosing the subgroups for the PNGDF oral health survey, the aim is to obtain a broad representation of the PNGDF population with diverse oral health care systems in terms of organisation and presence or absence of armed forces dental health services. The sample is to be selected from all the seven Papua New Guinea Defence Force (PNGDF) Units or Barracks, as sampling sites: (1) Murray Barracks; (2) Taurama Barracks, (3) Goldie Barracks, (4) Igam Barracks, (5) Moem Barracks, and (6) Lombrum Naval Base, and (7) Kiki Barracks - Air Force Base.

The stratified and cluster sampling methods will be used to select the sample comprising of an institutionalised PNGDF population (armed forces personnel and dependants including children and wives). The PNGDF population (sampling frame) will be based on the PNGDF Manpower Record for armed forces personnel, schools enrolment records for children, and Unit or Barracks census for wives.

5.5.3 Index Ages and Age Groups

The World Health Organization (1997) recommends the following ages and age groups of the population to be used in the survey sample: 5 years for primary teeth and 12, 15, 35-44, and 65-74 years for permanent teeth. However, different groups are more appropriate for the PNGDF population. The ages and age groups to be used for the PNGDF oral health survey include: 5-6 years for primary teeth and 12-15, 19-34, 35-44, and 45 or more years for permanent teeth.

* *5-6 years.* Children at this age should be examined to determine the prevalence and severity of caries experience in the primary dentition.

* *12-15 years.* This age group is a standard monitoring group for oral health status of children. Particularly, 12 years has been chosen as the global monitoring age for caries for international comparisons and monitoring of disease trend, while 15 years is also important for the assessment of periodontal disease indicators in adolescents. In this age group, children are expected to be at secondary school with all the permanent dentition have erupted except third molars and the sample access will be more reliable through the school system. This age group is important for the assessment of caries and periodontal prevalences and severities in permanent dentition after 3-9 years of exposure to the oral environment.

* *19-34 years.* This age group is important for the PNGDF personnel in the assessment of their oral health upon enlistment into the force and 2-15 years of exposure to the PNGDF community. In addition, this age group is the standard monitoring group for oral health outcomes of young adults.

* *35-44 years.* This age group is the standard global monitoring group for oral health status of adults. The data from this age group, including the full effects of oral health outcomes and the general effects of oral health care system, can be assessed and monitored after more than 15 years of service in the Force.

* *45 and over years.* This age group is selected to observe the prevalence of root caries, advance periodontal diseases, edentulousness and frank oral cancer.

The data obtained from these selected ages and age groups can be used for comparative studies with the existing Papua New Guinea national oral health data.

5.5.4 Sample Size

WHO (1997) recommends that for a national pathfinder survey, the size of the sample is determined by the number of subjects in each index age group ranging from a minimum of 25 to 50 for each cluster or sampling site, depending on the expected prevalence and severity of oral diseases and conditions. A total of 25 subjects, with approximately equal numbers of females and males, is sufficient only in a population where caries and periodontal disease levels are estimated to be low or very low. In the population where these oral diseases levels are known to be moderate or high (e.g. 12 year olds is 5-10% or lower), the standard size for each sample should be 40-50 subjects.

Records of previous national surveys reveal that Humphreys (1976) used the sample size of 7,949 school children with the ages ranging from approximately 6 - 13 years, while Davies (1990) examined the sample size of 750 subjects in age groups of 15-19, 35-44, and 45 + years. A national pathfinder oral health survey in Papua New Guinea (Davies 1990) reveals that the levels of prevalence and severity of dental caries ranging from low to very low and progressing at a very slow rate, while periodontal disease is substantially high and rapidly increasing.

In light of the prevalence and severity of oral diseases and conditions in Papua New Guinea (PNG) and the pathfinder survey methodology as recommended to obtain by WHO, the sample size for PNGDF oral health survey has been determined. Examinations and interviews of 50 subjects per subgroup or sampling site (7) and per age group (5) will make a total of $(50 \times 7 \times 5)$ 1,750 of subjects, with approximately equal number of males and females as detailed in Table 1 to Table 6. This sample size is large enough to obtain an acceptable precision and to produce reliable estimates for the subgroups at 95% confidence level for prevalent conditions.

Table 1: Population distribution of sample sites by social groups

Barracks	PNGDF pers	Wives	Children	Total	Pop%
Murray	790 (99)	595 (74)	1,778 (223)	3,163 (396)	22.65
Taurama	901 (113)	674 (84)	2,025 (254)	3,600 (451)	25.75
Goldie	146- (18)	110 (14)	330 (42)	586 (74)	4.19
Kiki	172- (22)	129 (16)	387 (48)	688 (86)	4.93
Igam	543 (68)	407 (51)	1,221 (153)	2,171 (272)	15.55
Moem	772 (96)	579 (73)	1,737 (218)	3,088 (387)	22.12
Lombrum	166- (21)	125 (16)	375 (47)	666 (84)	4.77
Total	3,490 (437)	2,619 (328)	7,853 (985)	13,962 (1,750)	100%

In brackets are the approximated sample size distributions by social groups as per study site.

Table 2: PNGDF personnel distribution by Ranks

Barracks	Officers	SNCO	Other Ranks	Total
Murray	127 (16)	202 (25)	461 (58)	790 (99)
Taurama	52 (6)	102 (13)	747 (94)	901 (113)
Goldie	12 (2)	40 (5)	94 (11)	146 (18)
Kiki	28 (4)	46 (6)	98 (12)	172 (22)
Igam	47 (6)	89 (11)	407 (51)	543 (68)
Moem	40 (5)	67 (8)	665 (83)	772 (96)
Lombrum	19 (2)	34 (5)	113 (14)	166 (21)
Total	325 (41)	580 (73)	2,585 (323)	3,490 (437)

In brackets are the approximated sample size distributions of PNGDF personnel by ranks.

Table 3: Population distribution of age groups by gender

Age - Years	Males	Females	Total	Pop %
5-6	742 (93)	654 (82)	1,396 (175)	10
12-15	1,483 (184)	1,309 (164)	2,792 (348)	20
19-34	2,225 (280)	1,964 (247)	4,189 (527)	30
35-44	2,225 (280)	1,964 (246)	4,189 (526)	30
45 +	742 (93)	654 (81)	1,396 (174)	10
Total	7,417 (930)	6,545 (820)	13,962 (1,750)	100

In brackets are the approximated sample size distributions of age groups by gender.

Table 4: Population distribution of barracks by age groups

Barracks	5-6	12-15	19-34	35-44	45 +	Total	Pop%
Murray	316 (40)	632 (79)	950 (119)	949 (119)	316 (39)	3,163 (396)	22.65
Taurama	360 (45)	720 (90)	1,080 (136)	1,080 (136)	360 (45)	3,600 (451)	25.79
Goldie	59 (7)	117 (14)	176 (22)	176 (22)	58 (7)	586 (74)	4.19
Kiki	69 (9)	138 (17)	206 (26)	206 (26)	69 (9)	688 (86)	4.93
Igam	217 (27)	434 (54)	651 (82)	651 (82)	218 (27)	2,171 (272)	15.55
Moem	308 (39)	618 (77)	927 (117)	927 (116)	308 (39)	3,088 (387)	22.12
Lombrum	67 (8)	133 (17)	199 (25)	200 (25)	67 (8)	666 (84)	4.77
Total	1,396 (175)	2,792 (348)	4,189 (527)	4,189 (526)	1,396 (174)	13,962 (1,750)	100.00

In brackets are the approximated sample size distributions of Barracks by age groups.

Table 5: Population distribution of barracks by gender

Barracks	Males	Females	Total	Pop %
Murray	1,680 (210)	1,483 (186)	3,163 (396)	22.65
Taurama	1,913 (240)	1,687 (211)	3,600 (451)	25.79
Goldie	311 (39)	275 (35)	586 (74)	4.19
Kiki	365 (46)	323 (40)	688 (86)	4.93
Igam	1,153 (144)	1,018 (128)	2,171 (272)	15.55
Moem	1,640 (206)	1,448 (181)	3,088 (387)	22.12
Lombrum	354 (45)	312 (39)	666 (84)	4.77
Total	7,416 (930)	6,546 (820)	13,962 (1,750)	100.00

In the brackets are the approximated sample size distributions by gender as per study site

Table 6: Population distribution of barracks by social group (adults and children)

Barracks	Adults	Children	Total	Pop %
Murray	1,385 ((173)	1,778 (223)	3,163 (396)	22.65
Taurama	1,575 (197)	2,025 (254)	3,600 (451)	25.79
Goldie	256 (32)	330 (42)	586 (74)	4.19
Kiki	301 (38)	387 (48)	688 (86)	4.93
Igam	950 (119)	1,221 (153)	2,171 (272)	15.55
Moem	1,351 (169)	1,737 (218)	3,088 (387)	22.12
Lombrum	291 (37)	375 (47)	666 (84)	4.77
TOTAL	6,109 (765)	7,853 (985)	13,962 (1,750)	100.00

In brackets are the approximated sample size distributions of Barracks by adults and children.

5.6 SURVEY PROCEDURES

The survey procedures include brief description of the: (1) operational plan for the survey; (2) composition and duties of organising committee; (3) number, types and duties of participating personnel; (4) training and calibrating plans for examiners and recorders; (5) approval from appropriate authorities; and (6) pretesting plan.

5.6.1 Operational Plan for the Survey

The actual conduct of the survey will commence in the Port Moresby area at study sites including: Murray Barracks; Taurama Barracks; Goldie Barracks; and Kiki Barracks. The survey team should then proceed to Igam Barracks, Moem Barracks, and Lombrum, as detailed under subheading 5.12. It is important that the conduct of the survey must follow the planned survey schedule accordingly in order to avoid unnecessary wastage of limited resources.

The survey will involve filling out the questionnaires and conducting clinical oral examinations of the sampled subjects at each study site. The examination of all the subjects will be conducted at the existing dental centre. In order to ensure that all the questions are answered and the questionnaires reach the principal investigator, the adults should fill out the questionnaires at the examination area, while the children should fill out theirs at the classroom, under some supervision by the survey team, just before the clinical examination. The supervision by the survey team should include: provision of explanations of questionnaire format and questions when required; and ensure that the questionnaires are filled according to the allocated time, safely collected, and returned to the principal investigator.

The survey team will be equipped to provide *emergency care* (see section 5.6.6) for the relief of pain and infection at the end of examinations and filling out of questionnaires at each site. If time permits, prosthodontic services in terms of partial acrylic dentures will be provided. *Referrals* (see section 5.6.6) to appropriate sources will also be made if the need arises.

In general, the operational plan for the survey will be in three phases: presurvey; implementation; and postsurvey. The details of these phases will be discussed under section 5.12.

5.6.2 Organising Committee

With the nature of the PNGDF Organisation, it is necessary to form two levels of organising committees: the PNGDF Headquarter; and the PNGDF Unit to oversee the planning and implementation of the first epidemiological oral health survey in PNGDF.

The first level of the organising committee should consist of representatives from the PNGDF including Chief of Personnel as chairman, Director of Health Services, and the principal investigator; Public Health Department - Co-ordinator of Oral Health Services and Biostatistician; Department of Education - First Assistant Secretary for Community Education; Medical Faculty of University of Papua New Guinea - Head of Community Medicine; and School of Dental Therapy - Principal Lecturer. This committee would be ultimately responsible for the planning and implementation of the first Epidemiological Pathfinder Oral Health Survey in the PNGDF including: approving the survey protocol; determination of the sources of finance; suggesting any further information which might be required for the PNGDF and the country as a whole; processing of data; and the preparation of the final survey report.

The second level of organising committee should consist of: the Unit Commanding Officer (CO) or his representative; Officer Commanding (OC) of Administration Company; OC of Unit Health Centre; Principal Investigator; Area Dental Officer or his representative; women group representative; and the Headmaster of the Barracks Community School. This committee is to ensure that the implementation of the survey runs smoothly as planned including all the necessary administrative arrangements and requirements prior to, and during, the actual survey period. Further responsibilities will be determined by the PNGDF Headquarter organising committee. It is important to include the principal investigator in the Unit Organising Committee to provide on the spot advice and any other assistance required.

5.6.3 Training and Calibration

It is essential that participating examiners and recorders be trained to make consistent clinical judgement, and to record observations accurately and clearly. The objectives of training and calibration include the following:

- (1) To ensure uniform interpretation, understanding and application by all examiners of the codes and criteria for various diseases and conditions to be observed and recorded.
- (2) To ensure that each examiner can examine consistently and gives the recorder clear instructions about recording data on the assessment form.
- (3) To ensure that the recorder(s) understands the meaning of the terms and the coding systems to be used so that obvious mistakes or omissions made by the examiner can be recognised, and makes clear entries in order to avoid confusion between codes.

The training will take 2 days, with a further 2-3 days for calibration. It is desirable to have an interval of at least a few days between training and calibration to allow the examiners and recorders time to assimilate knowledge of the indices and practice the procedures.

The principal investigator will be responsible for conducting training and calibration exercises for both the examiners and recorders to be held in Port Moresby at Taurama Barracks. The training and calibration programme will consist of:

- (1) A seminar at which the full protocol, the procedures for collecting and recording data, the coding system and the diagnostic criteria will be discussed in detail.
- (2) A preliminary examination of 10 subjects by each examiner. These subjects should be preselected so that they possess collectively, the full range of conditions expected to be assessed in the main survey. This should provide an opportunity to familiarise examiners and recorders with the process, diagnostic criteria and coding system; and to overcome difficulties and discrepancies in the interpretation of the criteria and the entries on the clinical assessment form.

(3) A strictly controlled calibration trial in which each examiner will examine the same 10 subjects twice on successive days, or with a time interval of at least 30 minutes between examinations. By comparing the results of two examinations, the examiner will be able to obtain an estimate of the extent and nature of their diagnostic variability. In general, an acceptable consistency should be in the range of 85-95%. The principal investigator will be responsible for interpreting the results and providing estimates of both within and between examiner consistency and reliability.

(4) A final seminar at which all the procedures will be reviewed, and difficulties discussed and hopefully resolved.

Unless the examiners can examine consistently and recorders can record accurately and clearly, Unit or group variations in disease prevalence or severity may be missed or wrongly interpreted.

5.6.4 Approval

The proposed protocol for the epidemiological pathfinder oral health survey in the PNGDF must be submitted to the first level of committee for acceptance and authority to implement. Once the proposed protocol is approved for its implementation, appropriate authorities in PNGDF, Public Health Department, and Education Department are to be consulted for their approval to examine and interview individuals and groups. Because children will be examined, it is important that the approval be obtained from local and provincial school authorities, and from parents with a written consent. It is the responsibility of the principal investigator to explain the objectives of the survey and to obtain approval to examine the subjects concerned.

5.6.5 Pretesting of Questionnaire

Pretesting is sometimes referred to as pilot testing. It refers to subjecting the developed questionnaire to selected subjects who are similar to those to be included in the study to ensure that: (1) each question is measuring what it is intended to measure; (2) the wording is understood by all respondents and the meaning is similar for all respondents; (3) the instructions on self-administered questionnaire are understood by all respondents; (4) all reasonable alternatives are available, including an appropriate response for each respondent; (5) the investigator ascertains if questions answered were interpreted correctly and is alerted to any unclear items; and (6) an adequate time is allocated for answering the questions specifically designed for adults and children (**Jackson 1993, Aday 1996, Bowling 1997**).

The value of each question is determined by the responses elicited. A poorly worded question may yield a wide variety of responses that do not relate to the question, and this leaves the researcher with unusable information. A question that appears to be appropriate and worded properly may yield a wrong response because it is interpreted differently by each respondent. Other questions that appear appropriately worded may result in respondents expressing their feelings rather than answering the question; thus such questions need to be redrafted. In addition, subjects may deliberately not respond if the question seems insulting or incomprehensible (**Greco & Walop 1987**).

The principal investigator is responsible for organising a pretesting of questionnaires. This should involve distributing the questionnaire copies to colleagues for their professional comments, and pretesting the questionnaire on a sample of 10 children and 20 adults with equal number of males and females, from the PNGDF population, preferably at Taurama Barracks. At the end of the pretesting, the principal investigator is responsible for reviewing the results and revising the questionnaire accordingly.

5.6.6 Emergency Dental Care and Referral.

The survey team will be equipped to provide emergency dental care for the relief of pain and infection, and ill fitting partial or full dentures experienced by participating subjects in the study. Such treatment will be provided at the conclusion of the examination at each location.

The survey team will be also responsible in referring those subjects with life-threatening conditions such as oral cancer, or other severe conditions with clear oral manifestation to an appropriate care facility for further treatment. It will be the responsibility of the examiner to ensure that the emergency care is provided and referral is made if needed.

5.7 DATA COLLECTION METHODS

The principal methods for data collection are determined by the objectives of the survey. The success of the survey will depend to a large extent on the suitability and appropriateness of the collection method chosen.

For this particular survey, the methods to be used at each study site are: *clinical oral examinations* and *self-administered or self enumeration questionnaires*. These methods of data collection will be used to collect necessary data in order to accomplish the predetermined objectives.

5.7.1 Clinical Oral Examination

The collection of oral health data through clinical oral examination should provide all the information required to assist in achieving the first and second objectives of the survey. A modified WHO (1997) assessment form with standard codes and criteria will be used during the clinical oral examinations. It is important to adopt the recommended codes so that WHO will be able to assist in the data processing and analysis.

5.7.1.1 Oral Health Assessment Form

The clinical oral examination will be based on the WHO Oral Health Assessment Form (WHO 1997) with slight modification (see **Appendix 1**). It is important that standard codes are used for all sections of the form. Unless this is observed, WHO standard computer program will be unable to process the data and summarise the results. On the form, each box is given an identification number and the recording codes are shown near the appropriate box. In order to minimise errors, calling out scores to recorders must be loud and clear, and all entries must be clear and unambiguous.

Above and below some boxes, two digit numbers are shown indicating specific teeth, as approved by the International Dental Federation (FDI). The first digit specifies the quadrant of the mouth and the second is the actual tooth. Therefore, the examiner must call the quadrant number and then the tooth number to designate a tooth concerned. For example, upper right second incisor must be called one - two (12) rather than twelve; lower left canine - three-three (33) rather than thirty three, for permanent dentition. Similarly, for primary dentition, the quadrant digits range from five and six for upper, and seven and eight for lower while the number designating the tooth is same.

The oral assessment form is designed for collection of all the information needed from children as well as adults. It contains the following sections:

- * survey identification information;
- * general information;
- * extra-oral examination;
- * temporomandibular joint assessment;
- * oral mucosa;
- * enamel opacities/hypoplasia;
- * dental fluorosis;
- * periodontal status - community periodontal index (CPI) formerly community periodontal index of treatment needs (CPITN);
- * loss of attachment;
- * dentition status and treatment needs;
- * prosthetic status;
- * prosthetic need;
- * dentofacial anomalies;
- * need for immediate care and referral; and
- * notes (WHO 1997).

Where only children are examined, usually, it is not necessary to record the presence of oral mucosal lesions, root caries, or prosthetic status and need. Similarly, if only adults are examined, it may be of little use to record dentofacial anomalies.

As indicated in the assessment form (see **Appendix 1**), it is essential to include necessary information in order to identify the country in which the survey is being conducted, the examiner and the subject being examined. *Boxes 1-4* are to be reserved for the WHO code for the country in which the survey is conducted and should not be filled in by the investigator or the examiner.

(1) Date of examination (boxes 5-10). Date of the examination must be written in boxes 5-8 for year and month, and boxes 9 & 10 for day as indicated on the form. The year and month will be entered into computer data file, while the day will be used by the investigator to refer back to any one day's examinations that may need to be reviewed or checked.

(2) Identification number (boxes 11-14). Identification number is the number given to each subject examined, with digits determined by the number of subjects to be examined. For example, if the total number of subjects to be examined 1750, the first subject should be numbered 0001. If two examiners are to participate in the survey, the examiner 1 should use the numbers ranging from 0001 to 875, and examiner 2 from 876 to 1,750 to ensure that each identification number is used only once. The numbers should be entered on the forms before commencing the examination session.

(3) Examiner (box 15). If more than one examiner is participating in the survey, each examiner should be assigned a specific code which should be entered in box 15. Similarly, a validating examiner should also be assigned a specific code, if he or she is participating in the survey.

(4) Original /duplicate examination (box 16). The first examination is original therefore the form should be recorded as "1". However, should the same subject be re-examined, it is duplication examination and should be coded "2" or more depending on the number of re-examination being done. For data analysis, only original examination data will be included in the analysis process.

(5) Name. The name of each subject must be written in block letters beginning with the family name in the space provided.

(6) Date of Birth (boxes 17-20). It is important that the date of birth must be entered for cross-checking purposes.

(7) Age (boxes 21 & 22). Recording of each subject's age is important item for data tabulation. The age should be recorded as age at the last birthday. For example, if in 13th year of life, the age should be recorded as 12 years old). If the subject is less than 10 years old, the age should be written "0" in box 21. For example, if the child is 7 years old, it should be entered as 07 in the boxes 21 and 22.

(8) Sex (box 23). Sex is another important item for data tabulation and analysis. Therefore, the sex of the subject must be coded accordingly (1=male, 2=female), at the time of examination.

(9) Ethnic or other group (box 24). Ethnic and other groups are identified differently in different countries, e.g. by area or country of origin, race, colour, language, religion or tribal membership. For this survey, the subgroups will be identified by social status - armed forces personnel and armed forces dependants. The codes to be used for identification of armed forces population:

0 = PNGDF personnel

1 = Dependant

(10) Occupation/Rank (box 25). The occupation/rank section will include: Officers, Senior Non Commissioned Officers (SNCO), Other Ranks (OR), civilian employment, and house wife, and student, to indicate socio-economic status, for the data analysis purposes. The codes to be used are as follow:

0 = Officer

1 = SNCO

2 = OR

3 = Civilian employment

4 = House wife

5 = Student

(11) Geographical location (box 26 & 27). Geographical location refers to the site where the examination is conducted. Usually two digit numbers ranging from 00 to 98 codes are used to identify the location, and code 99 is only used if this information is not recorded. There are seven examination sites and each site is identified accordingly with codes as follow:

- 00 = Murray Barracks
- 01 = Taurama Barracks
- 02 = Goldie Barracks
- 03 = Kiki Barracks
- 04 = Igam Barracks
- 05 = Moem Barracks
- 06 = Lombrum Barracks

(12) Location type (box 28). Location type refers to the classification of the survey site. The survey sites are usually categorised as urban, periurban or rural. Periurban refers to areas surrounding major towns which have similar characteristics to those of rural areas such as very few health facilities of any kind and usually no access to oral health care. The purpose of including these data is to obtain general information about the availability of services at each survey site. The survey sites are categorised into:

- 1 = Urban - Murray, Taurama and Kiki Barracks;
- 2 = Periurban - Igam and Moem Barracks.
- 3 = Rural - Goldie and Lombrum Barracks

(13) Other data (boxes 29 & 30). Other data includes any information about the subject examined or survey location. Information about betel-nut chewing habit and the availability of functionable dental clinic have been included to reflect the country wide practice (Betel-nut chewing), and the usual source of dental care at respective study site. These information should be recorded respectively in boxes 29 and 30.

Betel nut stain is an indication of betel nut chewing habit which can be obtained during the oral examination or recognised as soon as the subject walks in. Following codes to be used are:

- 0 - No
- 1 - Yes

The codes to be used to indicate the availability of *functionable dental clinic* are as follow:

0 - No

1 - Yes

5.7.1.2 Clinical assessment

In order to ensure that all conditions are detected and diagnosed, it is recommended that the clinical examination follows the order of the assessment form (**WHO 1997**). It would be helpful if the recorder assists the examiner with the order of examination as indicated on the assessment form.

(1) Extra-Oral Examination (box 32). Extra-oral examination involves examining the following areas in an orderly sequence:

- (1) exposed skin areas including head, neck, and limbs;
- (2) perioral skin areas including nose, cheeks, and chin;
- (3) lymph nodes around head and neck;
- (4) cutaneous parts of upper and lower lips;
- (5) vermilion border and commissures; and
- (6) regions of temporomandibular joint and parotid gland.

Following codes and criteria to be used are:

- 0 - Normal extra-oral appearance.
- 1 - Ulceration, sores, erosions, fissures-head, neck, limbs.
- 2 - Ulcerations, sores, erosions, fissures-nose, cheek, chin.
- 3 - Ulcerations, sores, erosions, fissures-commissures.
- 4 - Ulcerations, sores, erosions, fissures-vermilion border.
- 5 - Cancrum oris.
- 6 - Abnormalities of upper and lower lips (e.g. clefts).
- 7 - Enlarged lymph nodes-head, neck.
- 8 - Other swellings of the face and jaws.
- 9 - Not recorded.

(2) Temporomandibular Joint Assessment (boxes 33-36). Assessment of Temporomandibular joint involves observing the signs and symptoms based on a specified criteria and codes for recording. Following codes and criteria to be used for recording *symptoms* (box 33) are:

- 0 - No symptoms.
- 1 - Occurrence of clicking, pain, or difficulties in opening or closing the jaw once or twice per week.
- 9 - Not recorded.

Following codes and criteria to be used for recording *signs* (boxes 34-36) are:

- 0 - No signs.
- 1 - Occurrence of: clicking, tenderness on palpation or reduced jaw mobility (opening <30 mm).
- 9 - Not recorded.

Clicking of one or both temporomandibular joints (TMJ) is to be evaluated directly by an audible sharp sound or by palpation of the TMJs. *Tenderness* of the temporalis and/or masseter muscles on one or both sides should be evaluated by unilateral palpation with a firm pressure of two fingers twice on the most voluminous part of the muscle. Tenderness is only recorded if the palpation spontaneously provokes avoidance reflex. *Reduced jaw mobility* is recorded in terms of opening <30 mm. It is the distance between incisal edges of maxilla and mandibular central incisors. As a general guide, mobility is considered to be reduced if the subject is unable to open his or her jaw to the width of two fingers.

(3) Oral Mucosa (boxes 37-42). The oral mucosa and soft tissues in and around the mouth must be examined on every subject. It is important that the examination must be performed thoroughly and systematically according to the following sequence:

- (1) Labial mucosa and labial sulci (upper and lower).
- (2) Labial part of the commissures and buccal mucosa (right and left)
- (3) Tongue (dorsal and ventral surfaces, margins)
- (4) Floor of the mouth.
- (5) Hard and soft palate
- (6) Alveolar ridges/gingiva (upper and lower).

Using either two mouth mirrors or one mouth mirror and the handle of the periodontal probe, the tissues should be retracted easily. Absence, presence or suspected presence of listed conditions coded 1-7, should be recorded in *boxes 37-39*. Code 8 should be used to record a condition not on the precoded list and the tentative diagnosis should be specified in the space provided. *Boxes 40-42* should be used to record the location of the condition using codes 1-8.

Following are the codes and criteria to be used when assessing the *oral mucosa conditions*:

- 0 - No abnormal condition.
- 1 - Malignant tumour (oral cancer).
- 2 - Leukoplakia.
- 3 - Lichen planus.
- 4 - Ulceration (aphthous, herpetic, traumatic).
- 5 - Acute necrotizing gingivitis.
- 6 - Candidiasis.
- 7 - Abscess.
- 8 - Other condition (specify if possible).
- 9 - Not recorded.

The *location of oral mucosal lesion(s)* should be recorded in *boxes 40-42* as follows:

- 0 - Vermilion border.
- 1 - Commissures.
- 2 - Lips.
- 3 - Sulci.
- 4 - Buccal mucosa.
- 5 - Floor of the mouth.
- 6 - Tongue.
- 7 - Hard and soft palate.
- 8 - Alveolar ridges/gingiva.
- 9 - Not recorded.

(4) Enamel Opacities/Hypoplasia (boxes 43-52). Enamel abnormalities are classified into one of the three types on the basis of their appearance: demarcated opacity; diffuse opacity; and hypoplasia. The following codes and criteria to be used when assessing the enamel abnormalities include:

- 0 - *Normal.*
- 1 - *Demarcated opacity.* An alteration in the translucency of enamel in variable degree; with a distinct and clear boundary from an adjacent normal enamel, and appears white, cream or brown in colour.
- 2 - *Diffuse opacity.* An alteration in the translucency of the enamel in variable degree; appears white in colour, with no clear boundary between the adjacent normal enamel; and the opacity can be linear or patchy or a confluent distribution.
- 3 - *Hypoplasia.* A defect involving the surface of the enamel and associated with localised reduction in the thickness of the enamel. It can occur in the form of: (a) pits-single or multiple, shallow or deep, scattered or in rows arranged horizontally across the tooth surface; (b) grooves - single or multiple, narrow or wide (max. 2mm); or (c) partial or complete absence of enamel over a considerable area of dentine. The affected enamel may be translucent or opaque.
- 4 - *Other defects.*
- 5 - *Demarcated and diffuse opacities.*
- 6 - *Demarcated and hypoplasia.*
- 7 - *Diffuse opacity and hypoplasia.*
- 8 - *All three conditions.*
- 9 - *Not recorded.*

Ten index teeth: 14, 13, 12, 11, 21, 22, 23, 24, 36, and 46, should be examined on buccal surfaces visually or use of periodontal probe if in doubt, and coded in boxes 43-52. Any gross plaque or food debris or dietary stains should be removed before examining the teeth. Should any of these teeth be missing, the relevant box(es) must be left blank.

The tooth should be scored “normal”(code 0) if there is any doubt about the presence of an abnormality or a single abnormality less than 1mm in diameter. “Other defects” (code 4) refers to those abnormalities which can not be classified into one of the three. If more than two-third of a tooth surface is heavily restored, badly decayed or fractured, it should not be examined and be coded-9.

(5) Dental Fluorosis (box 53). Teeth affect by fluorosis are usually bilaterally symmetrical and tend to show a horizontal striated pattern. Premolars and second molars are most frequently affected, followed by upper incisors. Least affected teeth are mandibular incisors.

When assessing dental fluorosis, it is recommended to use Dean’s index criteria. The recording will be made on two teeth which are most affected: a premolar - 14 and second molar - 47. However, if these teeth are not affected, the score for the two least affected teeth: upper incisors should be recorded. When teeth are scored, the examiner should start scoring from “severe” and eliminate each score until he arrives at the condition present. If in doubt, the lower score should be given.

The codes and criteria to be used when assessing dental fluorosis conditions are as follow:

- 0 - *Normal*. The enamel surface is smooth, glossy and usually a pale creamy-white colour.
- 1 - *Questionable*. The enamel shows slight deviation from the translucency of normal enamel, ranging from a few white flecks to occasional spots.
- 2 - *Very mild*. Small, opaque, paper-white areas scattered irregularly over the tooth but involving less than 25% of the labial tooth surface.
- 3 - *Mild*. White opacity of the enamel of the teeth is more extensive than for code 2, but covers less than 50% of the tooth surface.
- 4 - *Moderate*. The enamel surfaces of the teeth show marked wear and brown stain is frequently a disfiguring feature.
- 5 - *Severe*. The enamel surfaces are badly affected and hypoplasia is so marked that the general form of the tooth may be affected. There are pitted or worn areas and brown stains are widespread; the teeth often have a corroded appearance.
- 8 - *Excluded* (e.g. a crowned tooth).
- 9 - *Not recorded*.

(6) Community Periodontal Index (CPI) (boxes 54-59)

(6.1) Indicators. The three indicators to be used for periodontal status assessment are: gingival bleeding, calculus and periodontal pocket. Specially designed CPI probe with a 0.5mm ball tip, a black band between 3.5 and 5.5mm and rings at 8.5 and 11.5mm from the ball tip, should be used to assess periodontal status.

(6.2) Sextants. The mouth is divided into six sextants defined by tooth numbers: 18-14, 13-23, 24-28, 38-34 33-43, and 44-48. A sextant should only be examined if two or more are teeth present which are not indicated for extraction.

(6.3) Index teeth. For adults aged 20 years or more, the ten teeth to be examined are: 17, 16, 11, 26, 27, 37, 36, 31, 46, and 47. The two molars in each posterior sextant are paired for recording, and if one is missing, there is no replacement. If no index teeth or tooth is present in a sextant qualified for examination, all the remaining teeth in that sextant are to be examined and the highest score is recorded as the score for the sextant. For subjects under the age of 20 years, only six index teeth: 16, 11, 26, 36, 31, and 46 are to be examined. Children under the age of 15 years are to be examined for bleeding and calculus only, excluding periodontal pockets. This is to avoid scoring deepened sulci associated with eruption as periodontal pockets.

(6.4) Sensing of Gingival Pockets and Calculus. Using the CPI probe as a “sensing” instrument to determine pocket depth; and detect subgingival calculus and bleeding response of an index tooth. The sensing force to be used should not exceed 20 grams. A practical test for establishing this force is to place the probe point under the thumb nail and press until blanching occurs.

When sensing subgingival calculus, the lightest possible force should be used to allow movement of the probe's ball tip along the tooth surface. The ball tip should be inserted following the anatomical configuration of the root surface of the tooth. During probing, if the patient feels pain, it is an indication of too much force being applied.

The probe should be inserted gently into the gingival sulcus or pocket at the disto-buccal surface of the index tooth as close as possible to the contact point with the adjacent tooth, keeping the probe parallel to the long axis of the tooth. It is then moved gently along the buccal sulcus or pocket towards the mesial surface of the same index tooth. For the lingual surfaces, a similar procedure should be carried out starting at the disto-lingual surface and working towards mesio-lingual surface of the index tooth.

(6.5) Examination and recording. The index teeth or all remaining teeth in a sextant where there is no index tooth, should be probed and the highest score should be recorded in the appropriate box. The codes and criteria to be used in the assessment of the periodontal status are:

- 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).
- 9 - Not recorded.

(7) Loss of Attachment (boxes 60-65). The loss of attachment information for an estimation of the lifetime accumulated destruction of the periodontal attachment may be obtained from the index teeth. This information allows comparisons between population groups, but is not intended to describe the full extent of the loss of attachment in an individual. Children less than 15 years old should not be examined for the loss of attachment.

In each sextant, the most reliable way of assessing loss of attachment is to record the score immediately after recording the CPI score. The highest scores for CPI and loss of attachment may not be necessarily found on the same tooth in a sextant. The extent of loss of attachment may be indicated by the pocket depths. However, this measurement is unreliable when there is gingival recession, i.e. the cemento-enamel junction (CEJ) is visible.

The loss of attachment should be recorded using the following codes and criteria:

- 0 - Loss of attachment 0-3mm (CEJ not visible and CPI score 0-3).
- 1 - Loss of attachment 4-5mm (CEJ visible, within the black band).
- 2 - Loss of attachment 6-8mm (CEJ visible, between the upper limit of the black band and the 8.5mm ring)
- 3 - Loss of attachment 9-11mm (CEJ visible between the 8.5mm and 11.5mm rings).
- 4 - Loss of attachment 12mm or more (CEJ visible beyond the 11.5mm ring)
- X - Excluded sextant (less than two teeth present).
- 9 - Not recorded (CEJ neither visible nor detectable)

(8) Dentition Status and Treatment Need (boxes 66-161). Examination for dental caries must be conducted with a plane mouth mirror. The examiner should adopt a systematic approach to the assessment of dentition status and treatment needs. The examination should proceed in an orderly manner from tooth to tooth. When any part of the tooth is visible, it should be considered as present. If both a permanent and primary tooth occupy the same tooth space, the status of the permanent tooth only should be recorded.

(8.1) Dentition Status. Boxes 66-97 are to be used for upper teeth and boxes 114-145 for lower teeth. Both letters and numbers are to be used for recording dentition status in the same boxes. In every box, an entry must be made on the status pertaining to coronal and root. In the cases for children where root status is not assessed, a code "9" (not recorded) should be entered in an appropriate box.

Codes to be used for the dentition status of primary and permanent teeth (crowns and roots) are as shown below (WHO 1997):

CODE			CONDITION/STATUS
Primary Teeth	Permanent Teeth		
Crown	Crown	Root	
A	0	0	Sound
B	1	1	Decayed
C	2	2	Filled, with decay
D	3	3	Filled, no decay
E	4	-	Missing, as a result of caries
-	5	-	Missing, any other reason
F	6	-	Fissure sealant
G	7	7	Bridge abutment, special or veneer crown
-	8	8	Unerupted tooth (crown)/unexposed root
T	T	-	Trauma (fracture)
	9	9	Not recorded

Following are criteria for diagnosis and coding (primary tooth codes are within parentheses) of the dentition status:

0 (A) *Sound crown*. A sound crown is only recorded if it shows no evidence of treated or untreated clinical caries. The crown with following defects should be recorded as sound:

- white or chalky spots;
- discoloured or rough spots that are not soft to touch with a CPI probe;
- stained pits or fissures in the enamel that do not have visual signs of undermined enamel, or softening of the floor or walls detectable with a CPI probe;
- dark, shiny, hard, pitted areas of enamel in a tooth showing signs of moderate to severe fluorosis; and
- lesions that appear to be due to abrasion.

Sound root. A sound root is recorded when it is exposed and shows no evidence of treated or untreated clinical caries. Unexposed root should be recorded “8”.

1 (B) *Decayed crown*. Caries should be recorded as present when the lesion in a pit or fissure, or on a smooth surface, has an obvious cavity, undermined enamel, or a detectably softened floor or wall. A temporary filled or fissure sealed tooth with a decay should be categorised as decayed crown. Where the crown has been destroyed by caries and only the root is left, the tooth should be recorded as decayed crown. The CPI probe can be used to confirm visual evidence of caries on the occlusal, buccal and lingual surfaces. The caries should not be recorded as present when any doubt exists.

Decayed root. Caries is recorded as present when a lesion feels soft or leathery to probing with the CPI probe and separate from the crown. However, if the single carious lesion affecting both the crown and the root, the likely site of origin should be recorded. Should the site of origin is not possible to be judged, both the crown and the root must be recorded as decayed.

2 (C) *Filled crown, with decay*. A crown is considered filled, with decay, when it has one or more permanent restorations and one or more areas are decayed.

Filled root, with decay. A root is considered filled, with decay, when it has one or more permanent restorations and one or more areas are decayed.

When restorations involving both the crown and the root with decay, the most likely site of the primary decay lesion should be recorded as filled, with decay. However, if it is not possible to judge the site of origin of the primary carious lesion, both the crown and the root should be recorded as filled, with decay.

3 (D) *Filled crown, with no decay*. A crown is considered filled, without decay, only when one or more permanent restorations are present, and there is no decay any where on the crown. A tooth that has been crowned because of previous decay is recorded as filled, without decay.

Filled root, with no decay. A root is considered filled, without decay, only when one or more permanent restorations are present and there is no caries any where on the root.

When any restoration involving both the crown and the root, the site of origin of the primary lesion must be recorded as filled, with no decay. However, if the judgement for its origin is difficult, both the crown and the root should be recorded as filled, with no decay.

4 (E) *Missing, as a result of caries*. This code should be recorded under crown status only for permanent or primary teeth that have been extracted because of caries. However, for primary teeth, this code should be used only when the age for normal exfoliation would not be a sufficient explanation for missing primary teeth.

5 (-) *Permanent tooth missing, for any other reason*. This code should be recorded under crown only for missing permanent teeth as a result of congenital, or extraction for orthodontic reasons or periodontal disease or trauma, etc. In cases of fully edentulous arches, a line may be drawn linking two entries of code "5".

6 (F) *Fissure sealant*. This code should be recorded under crown for teeth in which a fissure sealant has been placed on the occlusal fissure; or a composite material has been placed in a prepared occlusal fissure.

7 (G) *Bridge abutment, special crown or veneer*. A tooth in which it forms part of a fixed bridge as an abutment should be indicated by using this code under coronal status. This code can be used for crowns placed for reasons other than caries and for veneers or laminated labial surfaces of a tooth on which there is no evidence of caries or a restoration. However, missing teeth replaced by bridge pontics should be coded 4 or 5 under coronal status, while root status is to be coded 9. Just in case an *implant* is located, this same code can be used under root status to indicate its presence as an abutment.

8 (-) *Unerupted crown/unexposed root*. This code should be used only for a tooth space with an unerupted permanent tooth but without a primary tooth. Teeth to be scored as unerupted should exclude missing as a result of caries, congenitally missing or teeth lost as a result of trauma. See code 5, for differential diagnosis between missing and unerupted. This code can be also used to indicate *unexposed root*, that is, no gingival recession beyond the CEJ.

T (T) *Trauma (fracture)*. This code should be used to score a crown with its surface missing as a result of trauma and no evidence of caries.

9 (-) *Not recorded*. This code should be used under crown for any erupted permanent tooth that cannot be examined for any reason, e.g. orthodontic bands, severe hypoplasia. This same code can be used also under root status to indicate either that the tooth has been extracted or that calculus is present to such an extent that a root examination is not possible.

(8.2) *Treatment Needs of Individual Teeth*. Data on treatment needs provide a basis for estimating personnel requirements and costings of oral health programmes at local and national levels. It is therefore important to take into account the levels of demand for oral treatment. Thus, examiners are encouraged to use their own clinical judgement when making decisions on the type of treatment that would be most appropriate, based on the probable treatment for an average person in the community.

Immediately after recording the status of the tooth, the treatment requirement should be assessed and then recorded accordingly in the *boxes 98-113 and 146-161*, before proceeding to the next tooth or tooth space. This is to avoid omitting any essential data for analysis purposes. The codes and criteria to be used in determining the treatment needs are as follow:

0 - *No treatment needed*.

P - *Preventive, caries-arresting care*.

F - *Fissure sealant*.

1 - *One surface filling*.

2 - *Two or more surface fillings*.

One of the codes 0, P, F, 1, and 2 should be used to indicate the treatment required to:

- treat initial, primary or secondary caries;
- treat discolouration of a tooth, or a development defect;
- treat lesions due to trauma, abrasion, erosion or attrition; and
- replace unsatisfactory fillings or sealants.

3 - *Crown for any reason*.

4 - *Veneer or laminate* (may be recommended for aesthetic purposes).

5 - *Pulp care and restoration*. This code should be used to indicate that a tooth needs pulp care prior to restoration in terms of fillings or crown as a result of deep and extensive caries, or tooth mutilation or trauma. It is important to note that a probe should *never* be inserted into the depth of the cavity to confirm the presence of a suspected pulp exposure.

6 - *Extraction*. A tooth can be indicated for extraction when:

- * caries has destroyed the tooth so much that it cannot be restored;
- * it is loose, painful or functionless and cannot be restored to a functional state, as a result of an advance periodontitis;
- * a way has to be made for prosthetic requirement; or
- * there is a need for orthodontic or cosmetic purposes or because of impaction.

7/8 - *Need for other care*. The examiner should specify the types of treatment required.

9 - *Not recorded*.

(9) Prosthetic Status (boxes 162 & 163). The presence of prostheses should be recorded for each jaw (box 162 - upper jaw; box 163 - lower jaw). Following are the codes to indicate prosthetic status:

- 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.

(10) Prosthetic need (boxes 164 & 165). Each jaw (box 164 - upper jaw; box 165 - lower jaw) should be recorded on the perceived need for prostheses, according to the following codings:

- 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 prosthesis.
- 4 - Need for full prosthesis (replacement of all teeth).
- 9 - Not recorded.

(11) Dentofacial anomalies (boxes 166-176). Dentofacial anomalies should be assessed based on Dental Aesthetic Index (DAI), for subjects from 12 years, in which there are no longer primary teeth present. The dentofacial anomalies are determined by the following codes and criteria:

(11.1) Missing incisor, canine and premolar (boxes 166 & 167). The number of missing permanent incisor, canine and premolar teeth in the upper and lower arches should be counted and entered in their respective boxes (*box 166*-upper arch; *box 167*-lower arch). There should be 10 teeth present in each arch, counting from right second premolar to left second premolar. The difference between 10 and the teeth present per arch is the number of missing teeth. A history of missing anterior teeth should be recorded in the space provided, to determine whether the extractions were performed for aesthetic reasons. If a primary tooth is still in position and its successor has not yet erupted or if prosthesis has been in place to close the space, the permanent tooth should not be recorded as missing.

(11.2) Crowding in the incisal segments (box 168). Crowding in the incisal segment is the condition in which the available space between the right and left canine teeth is usually insufficient to accommodate all four incisors in normal alignment. Thus, the teeth may be rotated or displaced out of normal alignment in the arch. Therefore, both the upper and lower incisal segments should be examined for crowding according to the following codes and criteria:

- 0 - No crowding.
- 1 - One segment crowded.
- 2 - Two segment crowded.

(11.3) Spacing in the incisal segments (box 169). Spacing in the incisal segments for both upper and lower arches is the condition in which the amount of space available between the right and left canine teeth exceeds that required to accommodate all four incisors in normal alignment. The segment should be recorded as having space if one or more incisors are not in contact at the proximal surfaces. Therefore, the spacing should be recorded using the following codes and criteria:

- 0 - No spacing.
- 1 - One segment spaced.
- 2 - Two segment spaced.

(11.4) *Diastema (box 170)*. Diastema measurement should be recorded to the nearest millimetre(mm), between the mesial surfaces of the central incisors at any level.

(11.5) *Largest anterior maxillary irregularity (box 171)*. Irregularities may be either rotations out of, or displacements from, normal alignment. Once the greatest irregularity is established, the measurement is then taken between the irregular tooth and the adjacent tooth using a specially designed CPI probe, as described under sub-paragraph 6.1. The irregularity can be estimated from the markings on the probe by placing the tip of the probe on the labial surface of the displaced or rotated incisor, while the probe is held at right angles to the normal arch line and in parallel to the occlusal plane. The measurement is then recorded in box 171, in the nearest millimetre.

(11.6) *Largest anterior mandibular irregularity (172)*. Similar to the upper arch, the largest anterior mandibular irregularity should be located and measured as described above.

(11.7) *Anterior maxillary overjet (box 173)*. The anterior maxillary overjet is the horizontal relationship of the upper and lower incisors with the teeth in centric occlusion. It is the distance from the labial-incisal edge of the most prominent upper incisor to the labial surface of the corresponding lower incisor. This distance should be measured using the CPI probe by placing it in parallel to the occlusal plane, and recorded to the nearest rounded millimetre. The anterior maxillary overjet should not be recorded if all the upper incisors are missing or in lingual crossbite. If the incisors occlude edge to edge, the score should be zero.

(11.8) *Anterior mandibular overjet (box 174)*. This condition should be recorded only when any lower anterior incisor protrudes anteriorly or labially to the opposing upper incisor (crossbite). The largest anterior mandibular overjet or crossbite should be recorded to the nearest whole millimetre, in a similar manner as for anterior maxillary overjet. However, should a lower incisor be rotated so that one part of the incisal edge is in crossbite (i.e. labial to the upper incisor) but another part of the incisal edge is not, this condition should not be recorded as mandibular overjet.

(11.9) *Vertical anterior openbite (box 175)*. This condition should be recorded if there is a lack of vertical overlap between any of the opposing pairs of incisors (openbite). Using CPI probe, the amount of openbite must be measured and recorded to the nearest whole millimetre.

(11.10) *Antero-posterior molar relation (box 176)*. This assessment is most often based on the relation of the permanent upper and lower first molars. However, if one or both of the first molars are absent, not fully erupted, or out of shape due to an extensive decay or fillings, the relations of the permanent canines and premolars should be assessed. Both left and right sides should be assessed with the teeth in occlusion and only the largest deviation from normal molar (or canine and premolar) relation is recorded. When indicating the antero-posterior molar relation, the following codes should be used:

0 - Normal.

1 - Half cusp (the lower first molar is half a cusp mesial or distal to its normal relation).

2 - Full cusp (the lower first molar is one cusp or more mesial or distal to its normal relation).

Illustrations on measuring: (1) anterior maxillary and mandibular irregularities; (2) anterior maxillary overjet; (3) anterior mandibular overjet; (4) vertical anterior openbite; and (5) antero-posterior molar relation, will be made available at the time of examinations for quick reference source.

(12) *Need for immediate care and referral (boxes 177-180)*. During the clinical examination, it is possible to encounter conditions that would require immediate attention as a result of or likely to cause pain, infection or serious ill. Such conditions should be classified as *life-threatening (box 177)* including oral cancer, or precancerous lesions; *pain or infection (box 178)* including periapical abscess, acute necrotizing ulcerative gingivitis, gross caries, and chronic alveolar abscesses; and *other conditions (box 179)*. The codes to be used in indicating the need for immediate care are:

0 = Absent.

1 = Present.

9 = Not recorded.

The subject should be also assessed on the condition(s) presented and recorded accordingly for *referral (box 180)* by using the following codes:

0 = No.

1 = Yes.

9 = Not recorded.

Finally, the examiner/recorder should note for reference in the space provided, any additional information pertinent to the subject being examined.

5.7.2 Questionnaires

Questionnaires for children and adults (see **Appendices 2 & 3**) are developed in English in order to ensure high reliability and quality of the data collected. Based on the Second International Collaborative Study (ICS II) (**Chen et al 1997**), the questions are designed to elicit information on the primary data in terms of the oral health behaviour and the oral quality of life as described in section 5.4.

The prepared questionnaires are to be discussed extensively by the organising committee and examination team, to review and solve differences in translation and associated meanings of each question, in order to achieve conceptual equivalence between questions. A measurement is only conceptually equivalent if it satisfies: (1) its validity for each study site; and (2) its reliability or comparability between sites.

The questionnaires are to be pretested at Taurama Barracks as described in subsection 5.6.6, with the aim of resolving difficulties arising from language, interpretations, and any specific problems related to general data flow management and administration of the instrument.

There are two sets of questionnaires in which selected children and adults will be asked to complete the questionnaires by self administration with some guidance by the examination team, prior to the clinical examinations. Such guidance may include directing the subjects to appropriate questions as indicated in respective questionnaire, ensuring that all the questions are answered within an allocated time, and the questionnaires reach the principal investigator safely. The questionnaire for children containing 61 questions, should be self administered and filled out at school. For adults, the questionnaire containing 168 questions, should be self administered and filled out at the examination area.

5.7.3 Other Sources

Other sources of information include: books and articles; published and/or unpublished reports from: Department of Defence, Headquarter of Papua New Guinea Defence Force, Directorate of Health Services, Barracks Administration and Health Centre; and oral health providers. Information from these sources should provide secondary data on the socioenvironmental characteristics and oral health care system in the PNGDF.

5.8 DATA PROCESSING, ANALYSIS AND INTERPRETATION

Data processing involves a multistage sequence of checking (detecting errors or missing data), cleaning (correcting errors) and imputation (deciding on missing data) of all the data collected for completeness and accuracy in order to ensure a high level of consistency, quality and comparability. The *data analysis* involves: (1) organising data from the lowest to highest scores; (2) constructing a frequency distribution tables; (3) grouping and regrouping data on the basis of relevant variables; (4) tabulating the scores derived from measuring the variables of interest; (5) applying the appropriate descriptive and inferential statistical methods; and (6) constructing tables and graphs for efficient communication of obtained results. The *interpretation* of the data follows after data analysis where the meaning of survey findings are explained as well as identifying the possible influential factors (Darby & Bowen 1980, Jackson 1993, Aday 1996).

The principal investigator will be responsible for the processing, analysis and interpretation of the data collected. World Health Organization (WHO) will be contacted to assist in the processing and analysis of the data collected. This would involve sending copies of the clinical assessment and questionnaire forms with data entered onto a diskette using a standard data-entry program and the recommended survey summary form. While waiting for a technical report from WHO, the principal investigator should also conduct a preliminary processing and analysis of the data with the help of local sources, focusing on the three sets of oral health outcomes: oral health behaviour, oral health status and treatment needs, and oral quality of life.

5.9 REPORTING

It is appropriate and essential to report the results of the survey to the survey committees and other appropriate authorities in PNGDF, Department of Health, Department of Education, University of Papua New Guinea, School of Dental Therapy, and Papua New Guinea Medical Research Institute. Initially, a preliminary report containing a simple summary of the survey method, sampled subjects being examined and questioned, and findings will be compiled and distributed. A full technical report will follow when it is available, containing the following information:

- (1) Statement of the purpose of the survey.
- (2) Materials and methods including:
 - * Area and population surveyed;
 - * The nature of the information collected and methods used;
 - * Sampling method;
 - * Personnel and physical arrangements;
 - * Statistical analysis and computational procedure;
 - * Cost analysis; and
 - * Reliability and reproducibility of the results.
- (3) Results.
- (4) Discussion and conclusions.
- (5) Summary or abstract.
- (6) Acknowledgments
- (7) References.
- (8) Appendices.

In addition, a summary of the final report of the survey should be also presented orally to: (1) PNGDF population (armed forces personnel and dependants); (2) other Armed Forces in International Armed Forces Conferences; (3) National and International Dental Health Conferences; and (4) PNG Dental and Medical Associations, when ever the opportunities arise. Furthermore, the report should be also refined and an article (s) prepared for publication in a scientific journal

5.10 PARTICIPATING PERSONNEL, FACILITIES/CONDITIONS, EQUIPMENT, SUPPLIES NEEDED

Adequate and appropriate participating personnel, facilities, equipment and supplies are essential for the survey.

5.10.1 Participating Personnel

The participating personnel for the epidemiological pathfinder oral health survey in PNGDF will consist of: a principal investigator; 2 x examiners; 1 x recorder; and 2 x support staff. The *principal investigator* will be Dr (Major) DT Stepana who has a legal and ethical responsibility: to assure safety to human subjects involved; for following all necessary procedures for obtaining informed consent and oral health information from the examined and interviewed subjects; for analysing the risk-benefit ratio; for maintaining confidentiality of all the records; and for obtaining necessary approvals prior to the conduct of the survey. Dr Stepana will be also responsible for the preparation and analysis of data collected, and writing and dissemination of the oral health survey report. In addition, Dr Stepana will be jointly responsible for the actions of examiners, recorders, supportive staff and the subjects to be examined and interviewed.

Clinical examination will be conducted by PNGDF Dental Officers: Dr (Major) Niemperry for Southern Barracks (Murray, Taurama, Goldie, Maori Kiki), and Dr (Capt) Sasolan for Northern Barracks (Igam, Moem and Lombrum). The PNGDF Dental Auxiliaries from Taurama Barracks will include: a Dental Therapist as a *recorder*, and a Dental Technician and a Dental Assistant as *support staff* for the provision of emergency dental services and necessary general administrations pertinent to the oral health survey.

5.10.2 Examination Facilities and Conditions

The existing dental facilities at each study site will be used to examine the subjects. A portable electrical over-head light should be available as backup if the existing dental light at the dental centre is malfunctioning. If electricity supply does not exist, battery operated torches should be used. However, if both the electricity and battery operated lights are not available, the natural light should be used by ensuring that the patient is positioned so as to receive maximum illumination.

The recording clerk should sit close enough to the examiner so that instructions and codes can be easily heard and the examiner can see that findings are being recorded correctly. This will also enable the recorder to check that the score recorded relates to the region or tooth being examined.

The examiner should ensure sufficient supply of assessment forms and necessary instruments and supplies are readily available to avoid unnecessary interruptions during the examination period. It is also advisable to have copies of recording instructions, coding lists and measurement criteria available when required.

Movement of subjects into and out of the examination area, and loud conversations in the waiting area should be controlled to avoid unnecessary disturbances to the examiner and the recorder.

5.10.3 Instruments and Supplies

The principal investigator and the examiners are responsible for adequate instruments and supplies being available to avoid unnecessary interruptions of the examination and/or emergency care provisions. Therefore, the examiners are to ensure that sufficient numbers of instruments should be available for use on every subject while waiting for the used ones being sterilized.

Following instruments and supplies are required for *each examiner*:

- * 50 x plane mouth mirrors;
- * 50 x Community Periodontal Index (CPI) probes;
- * 50 x tweezers;
- * 2 x pans or containers (one for used instruments and one for sterilizing instruments);
- * 2 x wash basins;
- * 10 x cloth towels or 5 x paper hand towel rolls;
- * 10 x gauze square packets;
- * 5 x concentrated sterilizing solution bottles;
- * 5 x boxes of disposal rubber gloves;
- * 5 x boxes of disposal face masks;
- * 6 x bottles of hand soap solution;
- * 50 x plastic or metal tumblers;
- * complete emergency care kit:
 - 1 x box size 15 surgical blades;
 - 2 x surgical blade handles, size 3;
 - 1 x box size 3/0 BBS sutures with eyeless needles;
 - 2 x local anaesthetic syringes;
 - 5 x boxes of local anaesthetic cartridges;
 - 2 x pairs of extracting forceps for each upper & lower sets;
 - 1 x complete set of elavators;
 - 5 x boxes of cotton wool rolls;
 - 3 x boxes of cotton wool balls or pellets;
 - appropriate sedative dressings;
 - 6 x excavators at different sizes;
 - 3 x bottles of topical antiseptic;
 - 2 x tubes or bottles of topical anaesthetic (gel or spray);
- * 1 x copy of WHO Oral Health Surveys - Basic Methods, 4th edn;
- * 1,000 x PNGDF Oral Health Survey Forms;
- * 1,000 x copies of questionnaires for each group (adults & children); and
- * pens, pencils and erasers at 5 dozens each.

The examiners are responsible for maintaining adequate infection control in survey procedures. Thus, used instruments should be disinfected in cold sterilizing solution, then washed and drained well before sterilization.

An official vehicle, preferably an open back (Dyna or Utility) should be made available to the survey team by each respective Barracks during the designated period of the survey. The principal investigator will be responsible for the arrangement of the vehicle.

5.11 BUDGET

A budget should include all the resources required including: personnel, consultant, travel, equipment, supplies, printing and other services. All the costs should be itemised accordingly, taking into account the survey period. This survey should be funded by Department of Defence with some financial assistance from Department of Public Health. Funding of the PNGDF oral health survey is one of the important aspects of the survey and its significance cannot be re-emphasised any further. Therefore, it is imperative to secure the specified amount of the finance for the survey at the initial stage of the planning process.

5.11.1 Itemised Costings

(1) *Salaries and Allowances.* The salaries and allowances of Dental personnel participating in the survey will be normal as employers of Papua New Guinea Defence Force.

(2) *Accommodation.* The study sites should provide accommodation for the survey team at no cost.

(3) *Transport.* Both air and land types of transport required should be provided by the PNGDF. However, should neither land nor air transport be available, civil sources will be used which including:

* Hire of a vehicle (dyna or utility) at approximately K100 per day x seven(7) days x seven(7) study sites which adds up to **PGK4,900-00.**

* Five Air Niugini tickets and excess cargo at the following estimated costs (**Air Niugini 1998**):

From Port Moresby to Manus - 5 Pers x PGK329-00 = PGK1,645-00.

From Manus to Wewak - 5 Pers x PGK192-00 = PGK 960-00.

From Wewak to Lae - 5 Pers x PGK200-00 = PGK1,000-00.

From Lae to Port Moresby - 5 Pers x PGK153-00 = PGK 765-00.

Excess cargo - 20 Kg x 4 routes x PGK14-00/route = PGK 560-00.

TOTAL = PGK4,930-00.

(4) *Dental Equipment and Supplies*. Although most of the required equipment and supplies will be obtained from existing dental centres, their availability should not be guaranteed. Therefore, it is imperative to allocate a total of approximately **PGK15,000-00**, in order to ensure that all the necessary items as listed under section 9 is available specifically for the survey.

(5) *Stationery*. The stationery requirements includes: blank papers, pens, pencils, erasers, envelopes, and stamps at the cost of approximately **PGK5,000-00**.

(6) *Lap top computer, Laser printer and accessories*. These items are essential for the data processing, analysis, and reporting of the survey results, at the approximated cost of **PGK15,000-00**.

(7) *Consultation (statisticians, epidemiologists and WHO) costs, and air freight costs* of the survey data to WHO for data analysis at approximately **PGK5,000-00**.

Taking into account all the necessary requirements for the survey, excluding the salaries and allowances, the total cost of the survey would be approximately **PGK50,000-00 (Fifty thousand kina)**.

5.12 TIME SCHEDULE

One of the most important aspects of survey planning is the preparation of a schedule for *pre-survey*, *implementation of the survey*, and *post-survey phases*. Every phase of the survey must be scheduled so that much time, finance, and effort can be saved. Taking into account the Papua New Guinea Government's financial system, the epidemiological pathfinder oral health survey in the Papua New Guinea Defence Force (PNGDF) must be budgeted for, if it has to be conducted in the following year. Therefore, the proposed oral health survey must be approved and included in the budget estimate by July 2000 for its implementation in 2001.

5.12.1 Pre-survey Phase

Adequate time must be allocated for the presurvey phase which involves: planning; consultation; formation of organising committee; approval from national and local authorities; securing the finance; and preparation of the survey team personnel, essential equipment and supplies. The success or failure of the implementation and postsurvey phases will be determined by the presurvey phase. At least six months or more should be devoted to the presurvey phase to ensure that the survey is adequately planned for and organised before the implementation phase.

5.12.2 Implementation Phase

Providing the proposed PNGDF oral health survey is approved and budgeted for, for 2001, the implementation phase is expected to be conducted from 16th April to 31st May 2001 inclusively. With seven (7) weeks in total, a week will be spent in each study site for data collection and to allow sufficient time for emergency care. At each study site, the conduct of the survey must be according to the allocated timings per activity, per day. These should be explained further in tables 7- 9.

Table 7: Survey schedule per study site by dates

STUDY SITE - UNIT	DATE OF ARRIVAL Year-2001	DATE OF DEPARTURE Year-2001
Murray	15 April	22 April
Taurama	22 April	29 April
Goldie	29 April	6 May
Kiki	6 May	13 May
Igam	13 May	20 May
Moem	20 May	27 May
Lombrum	27 May	03 June

Table 8: Daily activities per study site

UNIT	MON	TUE	WED	THUR	FRI	SAT	SUN
Murray	conference & prep	data collection	data collection	data collection	emergency care	emergency care	Departure/ Arrival
Taurama	conference & prep	data collection	data collection	data collection	emergency care	emergency care	Departure/ Arrival
Goldie	conference & prep	data collection	data collection	data collection	emergency care	emergency care	Departure/ Arrival
Kiki	conference & prep	data collection	data collection	data collection	emergency care	emergency care	Departure/ Arrival
Igam	conference & prep	data collection	data collection	data collection	emergency care	emergency care	Departure/ Arrival
Moem	conference & prep	data collection	data collection	data collection	emergency care	emergency care	Departure/ Arrival
Lombrum	conference & prep	data collection	data collection	data collection	emergency care	emergency care	Departure/ Arrival

Every Monday at each study site will be devoted to: (1) courtesy call to the Area Commander; (2) conference with local organising committee; (3) discussions with community groups (PNGDF personnel, wives and school children); and (4) preparation and organisation of the examination area and supplies. Collection of data will be devoted to three days, where the children will be examined and questioned on Tuesdays, while adults will be on Wednesdays and Thursdays. Fridays and Saturdays will be specifically for the provision of emergency care. On Sundays, the survey team is expected to depart for the next study site.

Table 9: Time schedule per activity per day

TIME	MON	TUE	WED	THUR	FRI	SAT	SUN
8-9 am	CO	quests.	quests.	quests.	e-care	e-care	ETD/A
9-10 am	confer.	examin.	quests.	examin.	e-care	e-care	ETD/A
10-11 am	dis-wives	examin.	examin.	examin.	e-care	e-care	ETD/A
11-12 am	dis-wives	examin.	examin.	examin.	e-care	e-care	ETD/A
12-1 pm	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	ETD/A
1-2 pm	dis-child	examin.	examin.	examin.	e-care	e-care	ETD/A
2-3 pm	dis-child	examin.	examin.	examin.	e-care	e-care	ETD/A
3-4 pm	Break	examin.	examin.	examin.	e-care	packup	ETD/A
7-10 pm	PNGDF personnel	check data	check data	check data	check data	packup	ETD/A

As indicated in the above table, on Mondays at each study site, the principal investigator and the examiner should pay a courtesy call to the Commanding Officer (CO) of the barracks, followed by a conference with the barracks oral health survey committee, from 8-10 am. Immediately after the conference, the principal investigator should meet the wives to discuss about the survey. From 1-3 pm, the team should visit the school children and teachers. The survey team should meet the PNGDF personnel from 7-10 pm to discuss matters pertaining to the survey. Every Tuesday to Thursday, the questionnaires will be administered from 8-10 am and the clinical examinations will be conducted from 10 am to 4 pm. At the end of each day, as from 7 pm to 10 pm, the principal investigator should conduct data processing including: checking, cleaning and entering of data into a computer for analysis stage at the end of the survey. As from 8 am on Fridays and Saturdays, emergency care only will be provided to identified subjects and prepare for departure (EDT) on Sundays for the next study site (ETA) as indicated in Table 8.

5.12.3 Post-Survey Phase

The post-survey phase should involve: (1) sending a letter of appreciation and acknowledgment to all study sites authorities and participants; (2) sending the survey data to the World Health Organization for analysis; (3) compiling preliminary report on the survey findings for distribution to all relevant authorities; (4) circulation of full technical report; (5) submission to appropriate organisations for publication in scientific journals; and (6) presentations of the survey findings to relevant local and international organisations.

The preliminary report as discussed under section 5.9, should be made available 2 to 3 weeks after the survey. A full technical report should follow after two or three months time. This is to allow adequate time for the receipt of analysed and interpreted data from the World Health Organization, and writing and printing of the full technical report for distribution and publications.

Chapter 6

DISCUSSION

In dentistry, the need for planning to improve oral health care is particularly important. Almost all countries, regions, and communities in the world have some oral health services for meeting the needs of their population. These services are usually insufficient to fulfil these needs in terms of preventive, curative and restorative approaches. In addition, there is virtually universal recognition by the consumers, providers and purchasers, for the need to improve oral health care in order to fulfil the oral health needs. According to the World Health Organization, it has been shown worldwide that it is not sufficient to have numerical increase in oral health facilities, units, services, manpower and financial resources, to achieve adequate oral health care (WHO 1980).

The actual situation in each country, region, or community varies so much that it is not practical to provide ready made oral health programmes for implementation in all situations. Therefore, each country, region, or community must develop its own plans and programmes to meet the needs of its population. Planning of oral health services should be based on a specific situation analysis. An analysis of the situation in which programme planning and subsequent implementation will take place is essential to obtain an idea of the current oral health situation, the performance of the oral health service delivery system, and to document the development of and possible changes in these features. It involves collection of epidemiological oral health and other relevant data from which inferences can be made for the whole or most of the population for the purpose of improving oral health and oral health care (WHO 1976, 1980).

The collection of epidemiological data on oral health and oral health care can be achieved through a combination of clinical and sociological surveys. The former calls for a basic oral health survey to provide a sound basis for an estimation of the present oral health status of a population and its future needs for oral health care. It provides a baseline of data for planning and evaluation of oral health services and monitoring of changes in levels and patterns of oral diseases in a given population. The clinical oral health assessment involves an examination of sampled subjects using the recommended World Health Organization oral health assessment form (WHO 1997) with standard codes and criteria, as discussed in Chapter 5.

The sociological survey involves personal interviews and questionnaires (self-enumeration) to collect information on the impact of the oral health care system, socioenvironmental and personal characteristics of the population served, in terms of their oral health behaviour, oral health status and oral quality of life. The questions for adults and children should be designed and constructed to ensure that the data collected are relevant to the objectives of the survey.

In the Papua New Guinea Defence Force (PNGDF), there is a lack of comprehensive baseline oral health data which makes it very difficult to plan, evaluate, and monitor the oral health and oral health care. It is therefore imperative to develop a protocol for a pathfinder oral health survey to assess the oral health outcomes including: oral health status and treatment needs; oral health behaviour; and oral quality of life, of the defence force personnel and their dependants. In this way, it is possible to collect information about the oral health outcomes of the PNGDF population, and subsequently, to: (1) monitor changes in levels and patterns of oral diseases and conditions; (2) assess the appropriateness and effectiveness of the oral health services being provided; and (3) plan or modify oral health services in order to improve oral health. In addition, the PNGDF oral health data obtained may be used to compare with the existing Papua New Guinea national oral health data.

In order to develop a protocol for descriptive - cross-sectional pathfinder oral health survey for PNGDF, it is essential to discuss the oral health outcomes: oral health status and treatment needs; oral health behaviour; and oral quality of life; which are the focus of this thesis.

6.1 ORAL HEALTH STATUS AND TREATMENT NEEDS

Central to the knowledge of oral health status and treatment needs of the population is the need for epidemiological data on oral diseases and conditions. These data include: two major oral diseases - dental caries and periodontal diseases; and other oral conditions - extra oral lesions, temporomandibular joint, dental fluorosis, prosthetic status and need, dentofacial anomalies, oral mucosa lesions and enamel opacities/hypoplasia.

6.1.1 Dentition Status and Treatment Need

Dental caries status refers to the occurrence of dental caries in the teeth present at the time of the clinical examination, including primary (untreated) caries or decay (D or d) and restored (filled) caries (F or f), but excluding teeth missing (M or m) as a result of extraction due to caries. Therefore, a person can be classified as either having a positive (with caries), or negative (no caries) status. The *dental caries prevalence or experience* refers to the total accumulated number of teeth affected by dental caries, including decayed (D or d), filled (F or f), and missing (M or m) because of dental caries, at the time of the clinical examination.

During the epidemiological oral health survey of a given population sample, the examiner assesses individual teeth present using mouth mirror and probe. Although, radiographic examination would be an ideal to include proximal incipient caries lesions, it is not economical. Thus, the detection of primary and secondary dental caries is based on visual judgement only.

The indices used to quantify a person's lifetime caries experience include: D or d (decayed); F or f (filled); and M or m (missing). DMFT or dmft indices are the quantitative expression of the dental caries prevalence or experience in the permanent or primary teeth respectively. These indices are used to measure the prevalence, incidence and intensity of dental caries in a population.

At an individual level, decayed (D or d) teeth reflect an unawareness or neglect of existing disease; missing (M or m) teeth denote tooth mortality reflecting neglect or treatment resulting in extraction; and filled (F or f) teeth reflects the result of treatment. At the community level, the DMFT or dmft represents the cumulative impact of caries. The mean DMFT or dmft score indicates the overall impact of the oral health care system, caries prevention and treatment measures, and other social, cultural and economical factors. The codes and criteria for dental caries status are discussed in chapter 5 under subsection 5.7

An ultimate outcome of the dental caries diagnosis is the decision concerning the need for treatment. The treatment needs for dental caries are determined by the dentition status and the treatment requirements of individual teeth including both coronal and root surfaces. The codes and criteria for treatment needs assessment are discussed in chapter 5 under subsection 5.7.

6.1.2 Periodontal Diseases

Periodontal diseases are those chronic inflammatory conditions of bacterial origin which begin with inflammation of gingiva and, in time, lead to loss of attachment and bony support for the tooth. The periodontal diseases include: gingivitis, adult periodontitis, prepubertal or juvenile periodontitis, and necrotising periodontitis (FDI 1984).

A *periodontal index* that has grown in popularity with researchers over the past decade is the Community Periodontal Index (CPI). Using the CPI probe, this index is designed specifically to assess pocket depths (adults only >20 years), gingival bleeding, and calculus deposits which are the common indicators for periodontal status. The CPI index is used to determine the periodontal status with scores ranging from “0” to “4” codes for each of the six sextants with identified index teeth, as discussed in chapter 5, under subsection 5.7. These codes are then converted into treatment needs which are referred to as Community Periodontal Index of Treatment Needs (CPITN). The CPITN is designed to assess periodontal treatment needs rather than periodontal status. However, the CPITN has been accepted as a global standard for the assessment of both the periodontal diseases prevalence and treatment needs of a given population: (WHO 1978, FDI 1985, Jong 1993, Chen et al 1997).

6.1.3 Other Oral Conditions

The *other oral conditions* include: extra oral lesions; temporomandibular joint status; enamel opacities/hypoplasia; dental fluorosis; oral mucosa; prosthetic status and treatment needs; and dentofacial anomalies. It is essential to include these conditions in epidemiological studies in order to provide a more complete assessment of oral health status and treatment needs of the population. Respective details of these oral conditions, and their assessment codes and criteria are discussed in chapters 2 and 5.

6.2 ORAL HEALTH BEHAVIOUR

As discussed in chapter 3, the oral health behaviour of an individual and/or community groups is influenced by personal, oral health system and socioenvironmental characteristics. Although these characteristics have significant impact on the oral health behaviour, numerous studies have been undertaken concerning personal characteristics.

Personal characteristics are categorised into predisposing and enabling variables. *Predisposing variables* include: sex, gender, level of education and occupation, perceived general health status, and health beliefs. The health beliefs in terms of: perceived seriousness of oral disease; importance of oral health; benefits of brushing, flossing, oral health service visits; and perceived barriers such as fear, being too busy, and lack of services, to obtaining oral health care. These variables can influence an individual's likelihood of engaging in various oral health behaviours. *Enabling variables* include: the level of income, residence or geographical location, family size, and having or not having a source of oral health care. These variables can facilitate or impede individual's oral health behaviour.

The oral health behaviours comprise of *oral hygiene practices* including toothbrushing, flossing, and toothpick use; and *utilisation of oral health services*. Using these oral health behaviours, it is possible to examine or assess and explain the level of the oral health beliefs and behaviours of an individual and community groups. With analysed oral health behaviour information pertinent to the oral hygiene practices and utilisation of oral health services, appropriate oral health programs may be developed to improve oral health behaviours and subsequently improve oral health in the community.

6.3 ORAL QUALITY OF LIFE

Oral health is an aspect of overall health which is vital and yet widely overlooked. Although oral diseases and conditions are rarely life-threatening, they are very common problems affecting many people throughout the world. Many consequences of oral diseases and conditions affect not only physical but also social and psychological well-being.

As discussed in chapter 4, oral quality of life is an impact of oral health problems on an individual's quality of life. It is a concept that captures both social and psychological impact of oral diseases and conditions on the satisfaction of human needs for growth, well-being, freedom, and the pleasures of meaningful relationships and work.

The oral quality of life is based on self-assessment, through questionnaire, encompassing three major dimensions: perceived oral well-being; self-reported oral disease symptoms; and social and physical functioning, as affected by oral health problems. In light of ICS II's (Chen et al 1997) experience, the oral quality of life of individuals and community groups can be assessed under these dimensions which are influenced by social and oral health outcome variables as discussed in chapter 4.

The *social variables* include: sex, education, income, and having/not having a usual source of oral health care. The *oral health outcome variables* include: *dependent variables* such as missing school for children, and missing work, avoiding laughing and smiling for adults; *independent variables* including predisposing and enabling characteristics; and *oral health status*.

6.3.1 Perceived Oral Well-Being

Perceived oral well-being refers to self assessed aesthetics and satisfaction with oral health and the appearance of his or her own teeth. The indicators for perceived oral well-being are: perceived oral health in terms of the condition of his or her teeth and gums; and perceived appearance of the teeth. Accordingly, the subjects should be asked to indicate their perception of their oral health and the appearance of their teeth in order to document the level of perceived oral well-being in the community.

6.3.2 Self Reported Oral Disease Symptoms

Self reported oral disease symptoms refers to individuals indicating their experiences of oral health symptoms as a result of oral health problems. Experiencing oral health symptoms is a fact of life and very common among the majority of the people in every country in the world. The self reported oral disease symptoms are significantly related to social variables, and oral health outcome variables including oral health behaviours and oral health status. For example, (1) females, less educated and lower income individuals are more likely to report oral disease symptoms; (2) those with poor perceived oral health are more likely to experience oral disease symptoms; (3) those who tend to make regular oral care visits are more likely to report less oral disease symptoms; and (4) those with more decayed, missing, filled teeth are more likely to experience oral disease symptoms.

Information on the self reported oral disease symptoms provides the general understanding of the experiences of the oral disease symptoms, prevailing in the community.

6.3.3 Social and Physical Functioning

Social and physical functioning illustrates the impact of oral health problems on various aspects of the individual's life. The social functioning may include laughing, smiling, and interacting with other people; while the physical functioning may include missing classes for children, missing work for adults, sleepless nights, not able to chew hard food, and many others. The oral health problems which have significant impact on the individual's social and physical functioning may include: oral pain or tooth ache; tooth or teeth loss; ill fitting full or partial dentures; bad breath; unacceptable appearance of teeth or gums; and many others.

Disruption of the social and physical functioning as a result of oral health problems, is also associated with the social variables, and oral health outcome variables including oral health behaviour and oral health status. The overall status of oral quality of life in a community is affected not only by physical oral health of the people, but also by their perception of oral health problems and the different impact of oral health problems on their social and physical activities.

The social and cultural factors, and the oral health care system also affect the individual and community groups in oral quality of life in terms of social and physical functioning. By obtaining some information about the experiences of social and physical functioning as a result of oral health problems, it is possible to estimate the level of oral quality of life in the community. Indeed, the information on the oral quality of life provides better understanding of the importance of oral health to the individual's and community's well-being. The oral quality of life measures the ultimate outcome of the oral health care system; and predisposing and enabling characteristics of individuals and groups, with their oral health behaviours and oral health status.

The profound social and psychological impacts of oral health problems on the quality of life are not obvious from clinical measures of oral disease. However, examination of the above dimensions of oral quality of life and the comparison with clinical oral health status should provide some insight into the social and psychological dimensions of oral health problem. It is therefore imperative to document the impact of the oral diseases and conditions on the quality of life of individuals and community groups so that necessary planning and programming can be developed and implemented to improve the oral quality of life within the community.

6.4 PROTOCOL FOR EPIDEMIOLOGICAL PATHFINDER ORAL HEALTH SURVEY IN PAPUA NEW GUINEA DEFENCE FORCE

As discussed in chapter 5, a survey protocol is one of the prerequisites in designing a survey. It is a comprehensive and carefully planned and written blue print containing a set of instructions in which all the procedures, criteria and terms are clearly defined. It should serve as a guide for the execution, monitoring and evaluation of the survey. The protocol for the epidemiological pathfinder oral health survey for Papua New Guinea Defence Force contains the following: background and problem; objectives; data required; population to be studied, survey procedures; data collection methods; data analysis; reporting; survey staff, facilities, equipment and supplies; budget; and time schedule.

6.4.1 Background and Problem

Development of the survey protocol has been highlighted by the lack of comprehensive baseline oral health data on the oral health status and treatment needs, oral health behaviour, and oral quality of life. Subsequently, the assessment of current oral health and oral health services, the planning of oral health services has been seriously limited. The information collected should provide oral health profile of the PNGDF community and be used as a baseline information for situation analysis and subsequent planning, monitoring, and evaluation of oral health and oral health services in the PNGDF community.

6.4.2 Survey Objectives

There are four objectives of the epidemiological pathfinder oral health survey in the PNGDF as detailed in chapter 5, under subsection 5.3. The objectives determine the kinds of data that will be needed and the form in which they should be collected.

6.4.3 Data and Information Required

As dictated by the four objectives of the survey, essential data and information to be collect include: oral health status and treatment needs; oral health behaviour; and oral quality of life. The oral health status and treatment needs should provide data to establish the pattern, prevalence, and severity of oral diseases and conditions, and to determine the treatment needs. The data and information on oral hygiene practices and the utilisation of oral health care are essential to determine the oral health behaviours and beliefs of individuals and community groups. The data and information on perceived oral well-being, self reported oral disease symptoms, and social and physical functioning as affected by oral health problems are also essential in order to assess the oral quality of life of individuals and community groups.

6.4.4 Population to be Studied

The survey is designed to study the Papua New Guinea Defence Force (PNGDF) population which consist of defence force personnel and their dependants (wives and children). From this population as a universe or sampling frame, a probability sample will be drawn using stratified cluster sampling technique for the survey. To obtain a broad representation of the PNGDF population, the subgroups chosen will include all the seven defence force barracks with different oral health care systems in terms of organisation and presence or absence of armed forces dental health services. Thus, these subgroups are likely to have different oral health outcomes including: oral health status and treatment needs; oral health behaviour; and oral quality of life.

For the purpose of this survey, index ages and age groups selected are: 5-6 years for primary teeth; and 12-15, 19-34, 35-44, and 45 and above years for permanent teeth. These ages and age groups are selected because of their global recognition as standard monitoring groups, particularly the 12 and 35-44 year olds, and their inclusion in previous national oral health surveys in Papua New Guinea, in determining the prevalence and severity of oral diseases and conditions. Besides establishing baseline oral health data of the PNGDF population, the data obtained for these age groups will be used for comparative studies with the available national oral health data.

In order to identify significant differences among Barracks and between socioeconomic groups, and to obtain an acceptable precision of the population, the sample size calculation for the study is based on World Health Organization's recommendation (**WHO 1997**). In light of low to very low levels of dental caries prevalence and severity, progressing at a very low rate, and substantially high and rapidly increasing of periodontal diseases in Papua New Guinea (**Davies 1990**), 50 subjects are to be examined and questioned from each cluster or sampling sites of 7, and from 5 index age groups in the population. The total sample size is $50 \times 7 \times 5 = 1,750$.

6.4.5 Survey Procedures

This oral health survey will involve filling out questionnaires and clinical oral examinations of the sampled subjects in all selected study sites. It should also include provision of emergency dental care for the relief of pain and infection, provision of acrylic partial dentures, and referrals for further treatment if the need arises. In order to assist in the planning and implementation of the survey, it is essential to establish an organising committees at both headquarter and barracks levels.

Before the actual conduct of the survey, it is essential:

- (i) To conduct training and calibration for the examiners and recorders to ensure consistent examination and accurate and clear recording.
- (ii) To obtain an approval for the survey and from appropriate authorities for the examination and questioning of human subjects.
- (iii) To pretest the developed questionnaires among professional colleagues and selected subjects similar to those in the study to ensure that each question is measuring what is intended to measure; that respondents understood and interpret questions correctly; and where necessary, adjust the questions.

6.4.6 Data Collection Methods

The epidemiological pathfinder oral health survey in the PNGDF involves clinical oral health assessment - based on World Health Organization methodology (WHO 1997); and questionnaires based on the Second International Collaborative Study (ICS II) (Chen et al 1997). This survey approach is designed to describe, document, analyse, and interpret the current oral health outcomes including: oral health status and treatment needs; oral health behaviour; and oral quality of life in the PNGDF, as determined by the objectives of the survey.

Using the WHO Oral Health Assessment Form (WHO 1997) with slight modification, and same standard codes and criteria, the data to be obtained from clinical examination should provide a sound basis for estimating the present oral health status of the PNGDF population and its needs for oral health care, and for monitoring changes in the levels and patterns of oral diseases and conditions.

Based on ICS II experience, the questionnaires for adults and children are designed to collect information on the oral health behaviours and oral quality of life of the PNGDF population. These information to be collected should provide a basis for estimating the levels and patterns of oral health behaviours and oral quality of life, and for development of oral health programs in order to improve oral health and oral health care.

6.4.7 Data Processing/Analysis/Interpretation

Data collected from oral examinations and questionnaires must be processed, analysed and interpreted in order to obtain comprehensive oral health and oral health care profile of the population. The data processing involves checking, cleaning, and imputation for completeness and accuracy in order to ensure a high level of consistency, quality, and comparability of the data. The data analysis involves organisation of data, construction of frequency distribution tables and graphs on the basis of relevant variables, and application of an appropriate descriptive and inferential statistical methods for efficient communication of the results obtained. The interpretation of the data involves explanation of the processed and analysed data to reflect the oral health and oral health care in the PNGDF.

6.4.8 Reporting

Reporting of the survey involves preparation of preliminary and final reports. The preliminary report should contain a simple summary of the subjects and numbers examined and interviewed. This report should be distributed to study sites authorities and members of the organising committee. The final report should be more technical in nature containing the purpose of the survey, materials and methods used, results obtained, and discussion and conclusion. At this stage, the technical report should be distributed to appropriate authorities, presented to appropriate individuals and organisations, and forwarded to appropriate local and international associations for publication.

6.4.9 Staff, Facilities, Equipment and Supplies

It is also important to specify the participating personnel including their responsibilities; examination and interview facilities and conditions; and essential equipment and supplies required for the survey. The requirements for these has been detailed in Chapter 5, under subsection 5.10.

6.4.10 Budget

A budget process involves itemising the cost of the survey including: salaries and allowances; accommodation; air/land transport; dental equipment and supplies; stationeries; and consultations. The survey will never be implemented if the money budgeted for, is not made available from the PNGDF and other sources. Therefore, it is important that the approximated total cost of the survey as budgeted for, be made available in order to implement the survey.

6.4.11 Time Schedule

Time schedule of the survey should include the schedule for presurvey, implementation period, and postsurvey phases. The presurvey phase involves planning, organising essential survey requirements and consulting appropriate authorities for approval and assistance. The implementation phase is the actual conduct of the survey; while the postsurvey phase involves data analysis and reporting the results of the survey. Adequate time must be allocate to every phase of the survey, particularly the presurvey and implementation phases in order to avoid wastages of time, effort and financial resources. Therefore, it is important that the estimated timings for each phase is observed accordingly.

Chapter 7

CONCLUSION

The need for planning and development of oral health programmes to overcome the most significant oral health problems and to improve oral health and oral health care system is critically important. One of the essential steps required in the planning of oral health services is the collection of epidemiological oral health and other relevant data for a situation analysis from which inferences can be made for the whole or most of population.

The collection of epidemiological data on oral health and oral health care systems involves a combination of clinical oral examinations and questionnaires of a sampled population. The former involves a basic oral health survey to determine the *oral health status and treatment needs*. Data collected forms the basis for planning and evaluation of oral health services, and for monitoring of changes in levels and patterns of oral diseases in the community. The latter involves self administered questionnaires to collect information on the impact of oral health care system, socio-environmental and personal characteristics in *oral health outcomes* including: oral health status and treatment needs; oral health behaviour; and oral quality of life.

Lack of comprehensive baseline oral health and oral health care data has seriously limited the ability of the PNGDF to plan, evaluate, and monitor oral health and oral health care. It is therefore imperative to review the oral health outcomes: oral health status and treatment needs, oral health behaviour, and oral quality of life; and develop a protocol for pathfinder oral health survey; which are the aims of this thesis. The oral health outcomes provide the basis for the protocol of oral health survey.

Central to the knowledge of *oral health status and treatment needs* of the population is the need for epidemiological data on oral diseases and conditions. These data includes: dental caries status, periodontal diseases/attachment, oral mucosa lesions, enamel opacities/hypoplasia, dental fluorosis, dentofacial anomalies, and prosthetic status; and their treatment needs.

The *oral health behaviour* of an individual is influenced by personal, oral health care system, and socio-environmental characteristics. Although all of these characteristics have significant impact on the oral health behaviour, numerous studies have been undertaken concerning personal characteristics. Personal characteristics are categorised into predisposing and enabling variables. Predisposing variables including: sex; gender; level of education and occupation; perceived general health status; and oral health beliefs, can influence individual's likelihood of engaging in various oral health behaviours. Enabling variables including: the level of income; residential or geographical location; family size; and having or not having a usual source of oral health care, can facilitate or impede an individual's oral health behaviour. The oral health behaviour of the target population is assessed by such indicators as oral hygiene practices including toothbrushing, flossing, and toothpick use; and utilisation of oral health services. With these information, appropriate oral health programmes will be developed to improve oral health behaviours and subsequently oral health.

The *oral quality of life* is an impact of oral health problems on an individual's life. It is a concept that captures both social and psychological impact of oral diseases and conditions. The oral quality of life is an ultimate outcome of oral health behaviour and oral health status. It involves self-assessment based on three dimensions: perceived oral well-being; self reported oral disease symptoms; and social and physical functioning. Perceived oral well-being refers to self assessed aesthetics and satisfaction with oral health and appearance of teeth and gums. Self reported oral disease symptoms refers to individual experience of oral health symptoms as a result of oral health problems. Social and physical functioning reflects the impact of oral health problems on various functions in life. Information on the self assessed oral quality of life dimensions should provide basis for planning and programming of oral health services to improve the population's oral quality of life.

A protocol for the epidemiological oral health survey in Papua New Guinea Defence Force has been designed to assess the oral health outcomes including: oral health status and treatment needs; oral health behaviour; and oral quality of life of the PNGDF population (armed forces personnel and their dependants), and to provide a baseline oral health data for planning, evaluation, and monitoring of oral health and oral health services. As discussed in chapter 5, the protocol for the survey contains background and problem; objectives of the survey; types of data and information required; population to be studied; survey procedures; data collection methods; data processing, analysis and interpretations; reporting of the survey findings; staff, facilities, equipment and supplies requirements; survey budget; and time schedule for the survey.

Chapter 8

RECOMMENDATIONS

Planning, evaluation, and monitoring of oral health and oral health care system are essentially based on a comprehensive baseline of epidemiological and other relevant data for a situation analysis from which inferences can be made for the whole or most of the population. Therefore, it is imperative to collect epidemiological and other relevant data pertinent to oral health and the oral health care system: to provide a sound basis for planning, evaluation, and monitoring purposes.

In the Papua New Guinea Defence Force (PNGDF), the planning, evaluation, and monitoring of oral health and oral health care have been seriously limited as a result of lack of comprehensive oral health data. Subsequently, this thesis has discussed the oral health outcomes including: oral health status and treatment needs; oral health behaviour; and oral quality of life. It has developed a detailed protocol for an oral health survey to assess these oral health outcomes in the PNGDF. The collection of epidemiological and other relevant data involve a combination of clinical oral examinations and self administered questionnaires, specifically designed to achieve predetermined objectives.

It is therefore recommended that:

- 1 The developed protocol for an epidemiological pathfinder oral health survey be adopted and subsequently implemented to collect epidemiological and other relevant data for situation analysis.
- 2 The survey should focus on the assessment of oral health outcomes including: oral health status and treatment needs; oral health behaviour; and oral quality of life prevailing in the PNGDF population.
- 3 As well as dental caries and periodontal diseases, it is important to include other oral conditions such as: oral mucosa lesions; enamel opacities/hypoplasia; dental fluorosis; prosthetic status; and dentofacial anomalies in order to provide a complete assessment of oral health status and treatment needs of the population.

4 By investigating the oral health behaviours including: oral hygiene practices such as toothbrushing, flossing and toothpick use; and utilisation of oral health services, it is possible to assess and explain the level of oral health beliefs and behaviours prevailing in the community.

5 By investigating the oral quality of life in terms of: perceived oral well-being regarding the appearance of teeth and gums; self reported oral disease symptoms as a result of oral problems experienced; and social and physical functioning as a result of oral health problems, it is possible to estimate the level of oral quality of life in the community.

6 Data on the oral health outcome variables should be collected through a combination of clinical oral examinations and questionnaires to provide the baseline data for planning, evaluation, and monitoring of oral health and oral health care in the PNGDF.

7 World Health Organization's Survey Methodology and the Second International Collaborative Study's questionnaire design should be used in the development of PNGDF oral health survey protocol and subsequent implementation.

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APPENDICES

Appendix 1	Oral health assessment form
Appendix 2	Questionnaire for children
Appendix 3	Questionnaire for adults

APPENDIX 1

PAPUA NEW GUINEA DEFENCE FORCE ORAL HEALTH SURVEY (.....)

ORAL HEALTH ASSESSMENT FORM

(Modified WHO Oral Health Assessment Form-1997)

Country.....

Leave blank	Year	Month	Day	Identification number	Examiner	Original/duplicate
(1)□□□□(4)	(5)□□□□(8)	(9)□□(10)	(11)□□□□(14)	(15)□	(16)□	

GENERAL INFORMATION

Name.....

Date of birth	Year	Month	Occupation/Rank
(17)□□□□(20)	(21)□□(22)	(23)□	□(25)

Age in years	Sex (M = 1, F = 2)	Occupation/Rank
(21)□□(22)	□(23)	0 = Offr 1 = SNCO 2 = OR 3 = House wife 4 = Student 5 = Civil employment

Ethnic group	Geographical location
0 = PNGDF pers 1 = Dependant Location type 1 = Urban 2 = Periurban 3 = Rural	(24)□ (26)□□(27) Mu = 00 Ta = 01 Go = 02 Ki = 03 Ig = 04 Mo = 05 Lo = 06

OTHER DATA

BETEL-NUT STAIN □(29)
0 = No
1 = Yes

ELEMENT □(30)
0 = Army
1 = Navy
2 = Air

CONTRAINDICATION TO EXAMINATION
Reason.....□(31)
.....0 = No
.....1 =Yes

CLINICAL ASSESSMENT

EXTRA-ORAL EXAMINATION
0 = Normal extra-oral appearance
1 = Ulceration, sores, erosions, fissures (head, neck, limbs)
2 = Ulceration, sores, erosions, fissures (nose,cheeks, chin)
3 = Ulcerations, sores, erosions, fissures (commissures) □(32)
4 = Ulceration, sores, erosions, fissures (vermilion border)
5 = Cancrum oris
6 = Abnormalities of upper and lower lips
7 = Enlarged lymph nodes (head, nec)
8 = Other swellings of face and jaws
9 = Not recorded

TEMPOROMANDIBULAR JOINT ASSESSMENT

SYMPTOMS	SIGNS
0 = No 1 = Yes 9 = Not recorded □(33)	0 = No 1 = Yes 9 = Not recorded Clicking □(34) Tenderness (on palpation) □(35) Reduced jaw mobility (< 30mm opening) □(36)

ORAL MUCOSA

CONDITION

- 0 = No abnormal condition
- 1 = Malignant tumour (oral cancer)
- 2 = Leukoplakia (37) ☐ ☐ (40)
- 3 = Lichen planus
- 4 = Ulceration, (aphthous, herpetic, trauma) (38) ☐ ☐ (41)
- 5 = Acute necrotizing gingivitis
- 6 = Candidiasis (39) ☐ ☐ (42)
- 7 = Abscess
- 8 = Other condition (specify if possible)
- 9 = Not recorded

LOCATION

- 0 = Vermilion border
- 1 = Commissures
- 2 = Lips
- 3 = Sulci
- 4 = Buccal mucosa
- 5 = Floor of mouth
- 6 = Tongue
- 7 = Hard and/or soft palate
- 8 = Alveolar ridges/gingiva
- 9 = Not recorded

ENAMEL OPACITIES/HYPOPLASIA

- Permanent teeth
- | | | | | | | | | | |
|---------------------------------------|------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------|
| | 14 | 13 | 12 | 11 | 21 | 22 | 23 | 24 | |
| 0 = Normal | (43) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (50) |
| 1 = Demacated opacity | (51) | ☐ | | | | | | ☐ | (52) |
| 2 = Diffuse opacity | | 46 | | | | | | 36 | |
| 3 = Hypoplasia | | | | | | | | | |
| 4 = Other effects | | | | | | | | | |
| 5 = Demarcated and diffuse opacities | | | | | | | | | |
| 6 = Demarcated opacity and hypoplasia | | | | | | | | | |
| 7 = Diffuse opacity and hypoplasia | | | | | | | | | |
| 8 = All three conditions | | | | | | | | | |
| 9 = Not recorded | | | | | | | | | |

DENTAL FLUOROSIS

- 0 = Normal
- 1 = Questionable
- 2 = Very mild ☐ (53)
- 3 = Mild
- 4 = Moderate
- 5 = Severe
- 8 = Excluded
- 9 = Not recorded

COMMUNITY PERIODONTAL INDEX (CPI)

- | | | | |
|--|-------|--------------------------|-------------------------------|
| 0 = Healthy | 17/16 | 11 | 26/27 |
| 1 = Bleeding | (54) | ☐ | ☐ (56) |
| 2 = Calculus | (57) | ☐ | ☐ (59) |
| 3 = Pocket 4-5 mm (black band on probe partially visible)* | | | |
| 4 = Pocket 6 mm or more (black band on probe not visible)* | | | |
| x = Excluded sextant | | | |
| 9 = Not recorded | | | |

* Not recorded under 15 years of age

LOSS OF ATTACHMENT *

- | | | | |
|---|-------|--------------------------|-------------------------------|
| 0 = 0-3 mm | 17/16 | 11 | 26/27 |
| 1 = 4-5 mm | (60) | ☐ | ☐ (62 |
| (cemento enamel | (63) | ☐ | ☐ (65) |
| junction (CEJ) with black band) | | | |
| 2 = 6-8mm (CEJ between upper limit | | | |
| of black band and 8.5mm rings) | | | |
| 3 = 9-11mm (CEJ 8.5mm & 11.5mm rings) | | | |
| 4 = 12mm or more (CEJ beyond 11.5mm ring) | | | |
| x = Excluded | | | |
| 9 = Not recorded | | | |

* Not recorded under 15 years of age

DENTITION STATUS AND TREATMENT NEED

Primary teeth crown	Permanent teeth crown/root		STATUS	TREATMENT
A	0	0	Sound	0 = None
B	1	1	Decayed	P = Preventive, caries arresting care
C	2	2	Filled, with decay	F = Fissure sealant
D	3	3	Filled, no decay	1 = One surface filling
E	4	--	Missing, as a result of caries	2 = Two or more surface fillings
--	5	--	Missing, any other reason	3 = Crown for any reason
F	6	--	Fissure sealant	4 = Veneer or laminate
G	7	7	Bridge abutment, special crown or veneer/implant	5 = Pulp care and restoration
--	8	8	Unerupted tooth (crown)/ unexposed root	6 = Extraction
T	T	--	Trauma (fracture)	7 = Need for other care (specify)
--	9	9	Not recorded	8 = Need for other care (specify)
				9 = Not recorded

		55	54	53	52	51	61	62	63	64	65						
		18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
Crown	(66)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	(81)
Root	(82)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	(97)
Treatment	(98)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	(113)

		85	84	83	82	81	71	72	73	74	75						
		48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
Crown	(114)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	(129)
Root	(130)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	(145)
Treatment	(146)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	(161)

PROSTHETIC STATUS

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

Upper Lower

(162)☐☐ (163)

PROSTHETIC NEED

0 = No prosthesis neede

1 = Need for one unit prosthesis

2 = Need for multi-unit prosthesis

3 = Need for a combination of one and/or multi-unit prosthesis

4 = Need for full prosthesis (replacement of all teeth)

9 = Not recorded

Upper Lower

(164)☐☐ (165)

DENTOFACIAL ANOMALIES

DENTITION

(166) ☐ (167) ☐ Missing incisor, canine and premolar teeth - maxillary and mandibular - enter number of teeth

SPACE

☐ (168) Crowding in the incisal segments:	☐ (169) Spacing in the incisal segments:	☐ (170) Diastema in mm	☐ (171) Largest anterior maxillary irregularity in mm	☐ (172) Largest anterior mandibular irregularity in mm
--	---	--	---	---

0 = No crowding	0 = No spacing
1 = One segment crowded	1 = One segment spaced
2 = Two segments crowded	2 = Two segments spaced

OCCLUSION

☐ (173) Anterior maxillary overjet in mm	☐ (174) Anterior mandibular overjet in mm	☐ (175) Vertical anterior openbite in mm	☐ (176) Antero-posterior molar relation:
---	--	---	---

0 = Normal
1 = Half cusp
2 = Full cusp

NEED FOR IMMEDIATE CARE AND REFERRAL

Life-threatening condition	☐ (177)	0 = Absent 1 = Present 9 = Not recorded
Pain or infection	☐ (178)	
Other condition (specify)	☐ (179)	

Referral	☐ (180)
0 = No	
1 = Yes	
9 = Not recorded	

NOTES

APPENDIX 2

QUESTIONNAIRE FOR CHILDREN

PATHFINDER ORAL HEALTH SURVEY IN PAPUA NEW DEFENCE FORCE

(Sponsored by Papua New Guinea Defence Force and other Agencies)

Purpose

The purpose of these questions is to collect information about the ways in which dental care might be improved. The answers you give will help the dentists provide good dental care to people in Papua New Guinea Defence Force.

How to answer this questionnaire

It is important that you answer all the questions. Read all the instructions carefully and answer each question as best you can. Read each question carefully, give us your opinion and go on to the next question.

If you do not understand the instructions or are puzzled about a particular question, raise your hand and the interviewer will come to help you.

Circle the number next to the answer you want to give.

About yourself

- 1 Are you...
Male.....1
Female.....2
- 2 How long have you lived in this area?
1 year or less.....1
More than 1 and up to 2 years...2
More than 2 and up to 5 years...3
More than 5 and up to 10 years.4
More than 10 years.....5
- 3 How long have you been at this school?
Less than 1 year.....1
1-2 years.....2
More than 2 and up to 3 years....3
More than 3 and up to 4 years....4
More than 4 and up to 5 years....5
More than 5 years.....6
- 4 How old are you?
-----years

- 5 How many children (16 years of age and under) live in your house? (include yourself, brothers, sisters, cousins, or any other children wh live with you)
Write in number-----
- 6 Are you the oldest child in your house?
Yes.....1
No.....2
I am the only child.....3
- 7 Which of the following adults live with you in your house?
Father.....1
Mother.....2
Older brother/sister/cousins 3
Grandfather.....4
Grandmother.....5
Aunt or uncle.....6

8 All together, including yourself and total adults, how many people live in your house?

Write in number-----

9 What was the highest level of education your father or male guardian completed?

- Sixth grade or less.....1
- Some high school.....2
- Completed high school.....3
- Completed college.....4
- Completed University.....5
- No father or male guardian living with me.....6
- Don't know.....7

10 What was the highest level of education your mother or female guardian completed?

- Sixth grade or less.....1
- Some high school.....2
- Completed high school.....3
- Some college.....4
- Completed college.....5
- No mother or female guardian living with me.....6
- Don't know.....7

11 What kind of work does your father or male guardian do?

- Army.....1
- Navy.....2
- Airforce.....3

12 What rank is your father or guardian?

- Officer.....1
- WO.....2
- SGT.....3
- CPL.....4
- Private.....5
- I have no father or male guardian..6
- Don't know.....7

13 What kind of work your mother or female guardian do?

- House wife.....1
- Teacher, nurse.....2
- Secretarial, clerical or office work3
- Shop assistant.....4

- I have no mother or female guardian.....5
- Don't know.....6

Your Visits For Dental Care

14 Have you ever visited a dentist?

- Yes.....1
- No.....2

15 Is there any one place you usually go to see the dentist?

- Yes.....1
- No.....2

16 Where do you usually go to see the dentist?

- PNGDF dental clinic.....1
- Public dental clinic.....2
- Private dental clinic.....3

17 Did any of the following reasons ever keep you from visiting a dentist?

(Kept me from visiting - Yes..1)

(Did not keep me from visiting - No..2)

Yes No

* My parents did not have any money for a dentist.....1 or 2

* My parents did not know any dentist to take me to for dental care..1 or 2

* I was afraid the treatment might be painful or dentist might hurt me.....1 or 2

* My parents did not think the dental problem I had was serious to go to the dentist.....1 or 2

* I did not think the dental problem I had was serious enough to go to the dentist.....1 or 2

* I thought the dental problem I had would go away.....1 or 2

* The dental clinic was too far away..1 or 2

* I would have had to miss some classes.....1 or 2

* My parents did not have time to take me to the dentist.....1 or 2

* I did not have anyone to take me to the dentist.....1 or 2

If you never been to a dentist, go to Question 34

18 Do you wear braces on your teeth?

Yes.....1

No.....2 Go to Q 20

19 Do your braces cause

yes no

Your teeth to ache.....1 2

Your gums to bleed or feel sore.1 2

Other problems (describe below)

20 Most of the time, who decides that you need to go to the dental clinic?

My mother.....1

My father.....2

Both my mother and father.....3

Myself.....4

21 How many times have visited a dental clinic in the past twelve months?

One time.....1

Two times.....2

Three times.....3

Four times.....4

More than four times.....5

I have not gone to the dentist in the past twelve months.....6

Don't know.....8

If you have not been to a dentist in the past twelve months, go to Question 34.

22 The last time you went to the dentist, did.....

Your parents make an appointment.....1

You make your own appointment.....2

You have regular appointment.....3

You have a followup appointment.....4

You just go in with no appointment.....5

Don't know.....8

23 What did dentist or dental therapist do to you on your last visit to the dental clinic?

Yes No

Filled a tooth.....1....2

Cleaned my teeth.....1....2

Pulled a tooth.....1....2

Check-up/examined my teeth.....1....2

Worked on my gums.....1....2

Took some X-rays.....1....2

Fixed broken tooth.....1....2

Put sealants on my teeth.....1....2

Put on or adjusted my braces.....1....2

Check my teeth for straightening.....1....2

Put fluoride on my teeth.....1....2

Told me to take care of my teeth.....1....2

24 How did you get to the dental clinic the last time you went?

I walked.....1

I taken by a family car.....2

I went by public bus.....3

I went by PNGDF bus.....4

25 Who went with you on your last visit to the dental clinic?

I went alone.....1

I went with my mother.....2

I went with my father.....3

My mother and father went with me.....4

My brother or sister went with me.....5

A friend went with me.....6

26 The last time you went for dental care, did one of your parents have to take time off work to go with you?

Yes.....1

No.....2

27 About how long did it take you to get to the dental clinic the last time you went?

Less than 15 minutes.....1

About15 minutes, but less than 30 minutes2

About 30 minutes, but less than 1 hour....3

About 1 hour or more.....4

Don't know.....5

28 Was the amount of time it took to get to the dental clinic....

Too long.....1

Not too long.....2

- 29 At your last visit for dental care, how long did you have to wait before you got to sit in the dental chair?
- I did not have to wait at all.....1
- Less than 15 minutes.....2
- More than 15 minutes, but less than 30 minutes 3
- At least 30 minutes, but less than 1 hour...4
- One hour or more.....5
- Don't know.....8
- 30 Once you were at dental clinic, was the time you had to wait to see the dentist....
- Too long.....1
- Not too long.....2
- 31 Did the dentist explain to you what he was doing to your teeth?
- Yes.....1
- No.....2
- 32 Did you want to know more about what the dentist was doing to your teeth?
- Yes.....1
- No.....2
- 33 How satisfied were you with your visit to the dentist?
- Very satisfied.....1
- Satisfied.....2
- Dissatisfied.....3
- Very dissatisfied.....4
- Taking Care of Your Teeth**
- 34 How often do you brush your teeth?
- Never.....1
- A few (2-3) times a month.....2
- Once a week.....3
- A few times (2-3) times a week.....4
- Once a day.....5
- Two or more times a day.....6
- 35 Do you use a toothpaste containing containing fluoride?
- Yes 1
- No.....2
- Don't know what fluoride is.....3

- 36 Apart from fluoride in toothpaste or in the water supply, do you use fluoride in any other way, for example, in tablets or in a mouth rinse?
- Yes.....1
- No.....2
- Don't know what that is.....3
- 37 How often do you use dental floss on your teeth?
- Never.....1
- A few (2-3) times a month.....2
- Once a week.....3
- A few (2-3) times a week.....4
- Once a day.....5
- Two or more times a day.....6
- Don't know what that is.....8
- 38 Do you use any of the following to clean your teeth or gums?
- | | Yes | No |
|-----------------------------|-----|----|
| Wooden toothpick.....1 | 1 | 2 |
| Stem of a plant or grass..1 | 1 | 2 |
| Betel-nut skin.....1 | 1 | 2 |
- 39 How often do you eat something in between your regular meals?
- About 3 times a day or more.....1
- About 2 times a day.....2
- About 1 time a day.....3
- Sometimes, not every day.....4
- Never eat between meals.....5
- 40 Yesterday, did you eat any of the foods listed below?
- | | Yes | No |
|------------------------------|-----|----|
| Bread.....1 | 1 | 2 |
| Fruit (apples or oranges)..1 | 1 | 2 |
| Biscuits, cakes, pies.....1 | 1 | 2 |
| Soft drinks or lolly water.1 | 1 | 2 |
| Cheese.....1 | 1 | 2 |
| Jam or honey.....1 | 1 | 2 |
| PK or Bubble gum.....1 | 1 | 2 |
| Lollies or chocolate.....1 | 1 | 2 |

41 Do your parents go to the dentist regularly (at least once a year)?

- Yes.....1
- No.....2
- One does, one don't.....3
- Don't know.....8

42 Do your parents usually brush their teeth every day?

- Yes.....1
- No.....2
- One does, one doesn't.....3
- Don't know.....8

43 Have you learned about your teeth and how to take care of them from any of the following sources?

- Friends.....1
- Parents.....2
- Teachers.....3
- Television/radio.....4
- Newspapers/magazines.....5
- Dentist.....6
- A dentist's helper.....7
- Doctor.....8
- Nurse.....9
- None above.....10

44 Do your parents or anyone else living in your house use any kind of tobacco such cigarettes, brus, mutrus, pipes, or cigars?

- Yes.....1
- No.....2

45 Do you use any kind of tobacco such as cigarettes, mutrus, brus, pipes, or cigars?

- Yes.....1
- No.....2

Your General Health and Dental Health

46 How would you describe your general health?

- Excellent.....1
- Very good.....2
- Good.....3
- Poor.....4
- Very poor.....5

47 How would you describe the health of your teeth and gums?

- Excellent.....1
- Very good.....2
- Good.....3
- Poor.....4
- Very poor.....5

48 If you went to a dentist for an examination, what do you think the dentist would say? (Circle 1 if yes, circle 2 if no). The dentist would say....

- | | Yes | No |
|--|-----|----|
| You need to brush your teeth better.. | 1 | 2 |
| You need to have your teeth cleaned. | 1 | 2 |
| You need fillings..... | 1 | 2 |
| You need to have a tooth pulled..... | 1 | 2 |
| You need to have your teeth
straightened..... | 1 | 2 |
| You need sealants placed on your
teeth..... | 1 | 2 |
| Your teeth are good, nothing is
wrong..... | 1 | 2 |

49 In the past 12 months, have you had any of the following problems? (Circle 1 if yes, circle 2 if no).

- | | Yes | No |
|---|-----|----|
| A broken tooth..... | 1 | 2 |
| Gums that hurt or bleed..... | 1 | 2 |
| Gums that bled when you brushed.... | 1 | 2 |
| Teeth that hurt when you ate or
drank hot or cold liquids or foods.... | 1 | 2 |
| Sores on your tongue or on the
inside of your mouth or cheeks..... | 1 | 2 |
| A bad taste in your mouth or bad
breath..... | 1 | 2 |

50 Has the pain or discomfort of dental problems caused you to miss classes or school days during the past year?

- Yes.....1
- No.....2

51 How much pain or discomfort from dental problems did you have during the last 12 months?

- A lot.....1
- Some.....2
- Not much.....3
- None.....4
- Don't know.....5

52 Have you ever avoided meeting people because of the way your teeth or gums looked?

- Yes.....1
- No.....2

53 How much do you like the way your teeth look?

- Very much.....1
- Quite a bit.....2
- They look OK.....3
- Not much.....4
- Not at all.....5

54 Do you think it is important to have your teeth look good?

- Yes.....1
- No.....2

55 Compared to your classmates and friends how do you think your teeth look?

- Among the nicest.....1
- Better than average.....2
- Average.....3
- Below average.....4
- Among the worst.....5

56 Have you ever avoided laughing or smiling because of the way your teeth or look?

- Yes.....1
- No.....2

57 Do other students and friends make jokes about the way your teeth look?

- Yes.....1
- No.....2

Beliefs About Dental Care

58 Read each statement and decide whether you agree or disagree.

Agree Disagree Don't know

- * Tooth decay can make me look bad.....1.....2.....8
- * Dental disease is a serious problem.....1.....2.....8
- * Poor teeth will affect my school work.....1.....2.....8
- * Having dental problems can cause other health problems.....1.....2.....8
- * It is important to keep natural teeth.....1.....2.....8
- * False teeth are less bother than natural teeth.....1.....2.....8

59 How do you feel about going to a dentist?

Agree Disagree Don't know

- * I am afraid of dental visits because of pain.....1.....2.....8
- * The cost of visiting the dentist is too expensive.....1.....2.....8
- * Going to the dentist regularly will keep me from having trouble with my teeth and gums.....1.....2.....8

60 What do you think about taking care of your teeth?

Agree Disagree Don't know

- * Brushing my teeth with a fluoride toothpaste will help prevent tooth decay....1.....2.....8
- * Brushing teeth will help prevent gum problems.....1.....2.....8
- * Using dental floss on my teeth will not help prevent gum disease....1.....2.....8
- * Eating sweet foods does not cause tooth decay.....1.....2.....8
- * Drinking fluoridated water helps prevent tooth decay.....1.....2.....8
- * Using fluoride is a harmless way of preventing tooth decay.....1.....2.....8

61 How do you feel about dentists? Do you agree or disagree with the following statements?

Agree Disagree Don't know

- * Dentists explain patient's problems to them.....1.....2.....8
- * Dentists always spend enough time with their patients.....1.....2.....8
- * Dentists are able to help people with most dental problems they.....1.....2.....8
- * Dentists should do more to keep people from having problems with their teeth.....1.....2.....8
- * Dentists are careful to check everything when examining their patients.....1.....2.....8
- * Dentists prefer to fix up teeth, rather than teach their patients to avoid problems.....1.....2.....8

THANK YOU VERY MUCH FOR YOUR HELP.

APPENDIX 3

PAPUA NEW GUINEA DEFENCE FORCE ORAL HEALTH SURVEY

QUESTIONNAIRE FOR ADULTS

(Sponsored by Papua New Guinea Defence Force and Other Agencies)

This oral health survey is sponsored by the Papua New Guinea Defence Force (PNGDF) and other agents, to collect essential information that will be helpful in the planning, evaluation and monitoring of oral health and oral health services in PNGDF. The information you provide is **strictly confidential** and will be used for statistical purpose only.

Please respond *completely* and *honestly* to all of the following questions by placing a circle (O) beside your answer. Remember that the only right answer to the question is the one which best describes and expresses your own opinion and experience.

Oral Health Status and Hygiene

1 Would you describe your general health as excellent, very good, good, poor, or very poor?

- Excellent.....1
- Very good.....2
- Good.....3
- Fair.....4
- Poor.....5
- Very poor.....6

2 Would you describe the health of your teeth and gums as excellent, very good, good, fair, poor, or very poor?

- Excellent.....1
- Very good.....2
- Good.....3
- Fair.....4
- Poor.....5
- Very poor.....6

3 During the past twelve (12) months, did your teeth or gums cause any pain or discomfort?

- Yes.....1
- No.....2 Go to Q.7
- Don't know...8 Go to Q.6
- No answer.....9 Go to Q.6

4 During the past twelve (12) months, has the pain or discomfort of dental problems caused you to limit any of your usual activities?

- Yes.....1
- No.....2 Go to Q.6
- Don't know...8 Go to Q.6
- No answer.....9 Go to Q.6

5 How many days during the past twelve (12) months have you had to limit your usual activities because of the dental pain or discomfort from dental problem?

Enter Number-----

6 How often do you have trouble sleeping because of pain or discomfort from dental problem?

- Very often.....1
- Fairly often.....2
- Sometimes.....3
- Never.....4

7 How often do you avoid laughing or smiling because of unattractive teeth or gums?

- Very often.....1
- Fairly often.....2
- Sometimes.....3
- Never.....4

8 How often do you avoid conversation because of unattractive teeth or gums or bad breath?

- Very often.....1
Fairly often.....2
Sometimes.....3
Never.....4

9 Are you able to chew hard food such as biscuits or apple?

- Yes.....1
No.....2

For Qs.10-13: Did you have any of the following dental problems during the last twelve (12) months?

10 A broken or chipped tooth?

- Yes.....1
No.....2

11 Gums that hurt or bled?

- Yes.....1
No.....2

12 Sores on your tongue or on the inside of your mouth or cheeks?

- Yes.....1
No.....2

13 A bad taste in your mouth or bad breath?

- Yes.....1
No.....2

14 Do you have any natural teeth at all?

- Yes.....1
No.....2 Go to Q.37

For Q.15-18: Have you had any of the following dental problems in the last twelve (12) months?

15 Gums that frequently bled when brushed or flossed?

- Yes.....1
No.....2

16 Teeth that hurt when you ate or drank hot or cold foods or liquids?

- Yes.....1
No.....2

17 Teeth that ache or throbbed?

- Yes.....1
No.....2

18 Teeth that hurt when you ate or drank sweet things?

- Yes.....1
No.....2

19 How much do you like the way your teeth look?

- Very much.....1
Quite a bite.....2
They look OK.....3
Not much.....4
Not at all.....5

For Qs.20-25: If had a dental examination tomorrow, do you think the dentist would say to you...

20 "You need to brush your teeth better?"

- Yes.....1
No.....2

21 "You need to have your teeth cleaned?"

- Yes.....1
No.....2

22 "You need fillings?"

- Yes.....1
No.....2

23 "You need to have a tooth pulled out?"

- Yes.....1
No.....2

24 "You need to have your teeth straightened?"

- Yes.....1
No.....2

- 25 “Your teeth are good, nothing is wrong?”
Yes.....1
No.....2
- 26 Do you brush your teeth?
Yes.....1
No.....2 Go to Q.29
Don’t know...8 Go to Q.29
- 27 How often do you brush your teeth?
Once a month.....1
A few (2-3) times a month....2
Once a week.....3
A few (2-6) times a week.....4
Once a day.....5
Two or more times a day.....6
- 28 Do you use tooth paste containing fluoride?
Yes.....1
No.....2
Don’t use toothpaste.....3
Don’t know what fluoride is...4
- 29 Do you have any physical problems that make it difficult for you to brush your teeth such as opening your mouth or moving your hand?
Yes.....1
No.....2
- 30 Apart from fluoride in toothpaste or in the water supply, do you use fluoride in any other way, that is, tablets or in a mouth wash?
Yes.....1
No.....2
- 31 Do you use dental floss to clean areas between your teeth?
Yes.....1
No.....2 Go to Q.33
Don’t know what that is.....
.....8 Go to Qs.34-36
No answer...9 Go to Qs.34-36
- 32 How often do you use dental floss to clean areas between your teeth?

- Once a month.....1
A few (2-3) times a month.....2
Once a week.....3
A few (2-6) times a week.....4
Once a day.....5
Two or more times a day.....6
- 33 Do you have any physical problems that make it difficult for you to use dental floss such as opening your mouth or moving your hand?
Yes.....1
No.....2
- For Qs.34&35: Do you use any following to clean the spaces between your teeth?
- 34 Wooden toothpick?
Yes.....1
No.....2
- 35 Stem of a plant or grass?
Yes.....1
No.....2
- 36 How often you eat something in between your main meal?
More than three times a day...1
About twice a day.....2
About once a day.....3
Occasionally, not every day..4
Rarely or never.....5
- For Qs. 37-43: Yesterday, did you eat any of the following foods?
- 37 Bread?
Yes.....1
No.....2
- 38 Fresh fruit (apples or oranges)?
Yes.....1
No.....2

39 Pastry such as biscuits, cakes, pie, doughnuts?

- Yes.....1
- No.....2

40 Soft drinks, for example, coca cola, fanta and other drinks (excluding diet coke)?

- Yes.....1
- No.....2

41 Jams or honey?

- Yes.....1
- No.....2

42 Chewing gum containing sugar?

- Yes.....1
- No.....2

43 Candy (chocolate, lollies etc.)?

- Yes.....1
- No.....2

44 Do you smoke?

- Yes.....1
- No.....2..... Go to Qs.48

For Qs.44-46: Do you smoke any of the following types of smoke?

44 Cigarettes?

- Yes.....1
- No.....2

45 Mutrus?

- Yes.....1
- No.....2

46 Brus?

- Yes.....1
- No.....2

47 Do you use pipes?

- Yes.....1
- No.....2

For Qs.48-54: Taking care of your teeth. Indicate whether you strongly agree, agree,

disagree, or strongly disagree with the following statements.

48 Brushing teeth with a fluoride toothpaste helps prevent tooth decay.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly.....4
- Don't know what fluoride is..5

49 Brushing teeth helps prevent gum problems.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

50 Using dental floss does not help prevent gum disease.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly.....4

51 Eating sweet food does not cause tooth decay.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

52 Drinking fluoridated water helps prevent tooth decay.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

53 Using fluoride is a harmless way of preventing tooth decay.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

54 Going to the dentist will keep me from having trouble with my teeth.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

Dentures/False Teeth

55 Do you have any false teeth or denture which you can remove?

- Yes.....1
- No.....2 Go to Qs.66-72
- Don't know..8 Go to Qs.66-72
- No answer....9 Go to Qs.66-72

For Qs.56-58: Do you have...

56 A partial denture?

- Yes.....1
- No.....2

57 A full upper denture?

- Yes.....1
- No.....2

58 A full lower denture?

- Yes.....1
- No.....2

59 Where did you get your false teeth or denture from?

- PNGDF dental clinic.....1
- Private dental clinic.....2
- Public dental clinic.....3

60 How many years ago did you get your last false teeth or denture?

Number of years-----

For Qs.61-64: When you wear your false teeth/denture, do you have any problems....

61 Talking clearly?

- Yes.....1
- No.....2

62 Eating?

- Yes.....1

No.....2

63 The way the false teeth/denture fit?

- Yes.....1
- No.....2

64 Soreness?

- Yes.....1
- No.....2

65 How much do you like the way your false/dentures look?

- Very much.....1
- Quite a bit.....2
- They look OK.....3
- Not much.....4
- Not at all.....5

For Qs.66-72: What do you think about the following statements?

66 Tooth decay can make people look bad.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

67 Dental problems can be serious.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

68 Poor teeth can affect people's work or other aspects of their everyday life.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

69 Dental disease is less important than other health problems.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

70 I place great value on my dental health.
 Strongly agree.....1
 Agree.....2
 Disagree.....3
 Strongly disagree.....4

71 It is not important to keep natural teeth.
 Strongly agree.....1
 Agree.....2
 Disagree.....3
 Strongly disagree.....4

72 Having dental problems can cause other health problems.
 Strongly.....1
 Agree.....2
 Disagree.....3
 Strongly disagree.....4

Sources of Dental Care

73 Is there a PNGDF dental clinic that you usually go to for dental care?
 Yes.....1
 No.....2 Go to Q.75
 Don't know.....8 Go to Q.75
 No answer.....9 Go to Q.75

74 How long have you last gone to that dental clinic for dental care?
 1 year or less.....1
 More than 1 year and up to 2 years.....2
 More than 2 years and up to 5 years.....3
 More than 5 years and up to 10 years.....4
 More than 10 years.....5
 Don't remember.....8
 No answer.....9

75 If you needed dental care, would you go to PNGDF dental clinic?
 Yes.....1 Go to Q.79
 No.....2
 Don't know.....3
 No answer.....4

76 What is the name of the other dental clinic where you usually go or would go for dental care?
 Public dental clinic.....1
 Private dental clinic.....2

77 Do any of the following sources cover any of your dental costs?
 Private dental insurance from your employer.....1
 Private dental insurance you pay for yourself.....2
 PNGDF.....3
 From your own pocket.....4

78 What is the main reason that you continue to use other sources for dental care?
 Only available source.....1
 High quality care.....2
 Don't know.....8
 No answer.....9

79 Whom do you see when you go there?
 Dentist.....1
 Dental Therapist.....2
 Dental Assistant.....3

80 Which of the following best describes PNGDF dental care?
 Not available.....1
 Low quality dental work.....2
 Don't know.....8
 No answer.....9

81 How long ago did you receive your last dental care?
 Less than 6 months.....1 Go to Q.83
 6 months to 1 year.....2 Go to Q.83
 More than 1 year, up to 2 years 3 Go to Q.83
 More than 2 years, up to 5 years 4
 More than 5 years.....5
 Never received dental care.....6

82 What was the main reason you did not visit a dentist in the last two years?

- Cannot afford cost.....1
- Don't want to spend money on dental care.....2
- Afraid or don't like dentist.....3
- Bad experiences with previous dental care.....4
- Too busy.....5
- Nothing wrong.....6
- Dental problems not serious enough.....7
- Expected dental problems to go away.....8
- Dental clinic too far away.....9
- Don't know.....10
- No answer.....11

83 At your most recent visit, did you go to the dental clinic you usually go to for dental care?

- Yes.....1
- No.....2
- No usual source of care.....3

84 What was the reason you made your most recent (last) visit to a dentist?

- Dental problem.....1
- Time for checkup or cleaning..2
- Dentist asked me go for checkup or cleaning.....3
- Part of a course of treatment...4

For Qs.85-91: At your recent visit to the dentist, did you receive.....

85 An examination?

- Yes.....1
- No.....2

86 Cleaning?

- Yes.....1
- No.....2

87 Fillings?

- Yes.....1
- No.....2

88 Crown/cap work?

- Yes.....1
- No.....2

89 Root canal work?

- Yes.....1
- No.....2

90 Denture work?

- Yes.....1
- No.....2

91 Orthodontic work?

- Yes.....1
- No.....2

92 Instruction in taking care of your teeth and gums?

- Yes.....1
- No.....2

93 Dental x-rays?

- Yes.....1
- No.....2

94 Inlay work (gold filling)?

- Yes.....1
- No.....2

95 Extraction (pulling out teeth)?

- Yes.....1
- No.....2

96 Bridge work?

- Yes.....1
- No.....2

97 Periodontal/gum treatment?

- Yes.....1
- No.....2

98 Fluoride treatment?

- Yes.....1
- No.....2

99 Any other treatment?

- Yes.....1
- If yes: SPECIFY-----
- No.....2

100 In the past twelve(12) months, did you make any visit to the dentist?

Yes.....1
No.....2
Don't know.....8
No answer.....9

101 How many visits?

Once.....1
More than once.....2
Don't know.....8
No answer.....9

102 Did you go to your usual dental clinic for care?

Yes.....1
No.....2
No usual source of care.....3

For Qs. 103-118: During your visit in the last 12 months, did you receive....

103 An examination/checkup?

Yes.....1
No.....2

104 Cleaning?

Yes.....1
No.....2

105 Fillings?

Yes.....1
No.....2

106 Crown/cap work?

Yes.....1
No.....2

107 Root canal work?

Yes.....1
No.....2

108 Denture work?

Yes.....1
No.....2

109 Orthodontic work?

Yes.....1
No.....2

110 Instruction in taking care of your teeth and gums?

Yes.....1
No.....2

111 X-rays?

Yes.....1
No.....2

112 Inlay work?

Yes.....1
No.....2

113 Extraction/pulling out?

Yes.....1
No.....2

114 Bridge work?

Yes.....1
No.....2

115 Periodontal/gum treatment?

Yes.....1
No.....2

116 Fluoride treatment?

Yes.....1
No.....2

117 Any other treatment?

Yes.....1
SPECIFY-----
No.....2

118 For your last visit to a dentist, did you have to take time off work?

Yes.....1
No.....2

119 For your last dental visit, how did you travel to the dental clinic?

Walking.....1
Family car.....2
Someone's car.....3
PNGDF vehicle.....4
Public bus.....5

120 At your last dental visit, how long did it take you to get to the dental clinic?

Record:---- hours &---- minutes

121 At your last dental visit, how long did you have to wait before you got to sit in the dentist's chair?

Record: -----hours &----minutes

122 During your last visit to the dentist, how long did your treatment take?

Record:----hours & -----minutes

123 For your last visit to the dentist, did you....

- Make an appointment.....1
- Have a follow-up appointment...2
- Just go in with no appointment...3
- Don't know.....8
- No answer.....9

124 How many days were there between the day you made the appointment and the day you actually received dental services?

Record days-----

125 Did you have to pay anything directly (out-of your pocket costs) for this last visit?

- Yes.....1
- No.....2 Go to Qs127-132
- Don't know...3 Go to Qs 127-132

126 Why did you choose to get care where it cost you from your own pocket? Record up to three.

- It was emergency.....1
- Quality care.....2
- Convenient location.....3
- I like the dentist.....4
- I don't want to look for another source.....5

For questions 127-:132:
During your last dental visit were you very satisfied, satisfied, dissatisfied, or very dissatisfied with....

127 Getting an appointment when you wanted it?

- Very satisfied.....1
- Satisfied.....2
- Dissatisfied.....3
- Very dissatisfied.....4

128 The time it took to get there?

- Very satisfied.....1
- Satisfied.....2
- Dissatisfied.....3
- Very dissatisfied.....4

129 The area where the dental clinic is located?

- Very satisfied.....1
- Satisfied.....2
- Dissatisfied.....3
- Very dissatisfied.....4

130 The way you were made to feel welcome by the dental staff?

- Very satisfied.....1
- Satisfied.....2
- Dissatisfied.....3
- Very dissatisfied.....4

131 The way you were made to feel welcome by the dentist?

- Very satisfied.....1
- Satisfied.....2
- Dissatisfied.....3
- Very dissatisfied.....4

132 The way you were made to feel welcome by the dental therapist?

- Very satisfied.....1
- Satisfied.....2
- Dissatisfied.....3
- Very dissatisfied.....4

For questions 133-139:
During your last dental visit, were you very satisfied, satisfied, dissatisfied or very dissatisfied with.....

- 133 The information given you about what was wrong with your teeth?
- Very satisfied.....1
 - Satisfied.....2
 - Dissatisfied.....3
 - Very dissatisfied.....4

- 134 The information given you about what treatment was provided for you?
- Very satisfied.....1
 - Satisfied.....2
 - Dissatisfied.....3
 - Very dissatisfied.....4

- 135 The quality of dental care provided?
- Very satisfied.....1
 - Satisfied.....2
 - Dissatisfied.....3
 - Very dissatisfied.....4

- 136 How up to date the dental equipment seems?
- Very satisfied.....1
 - Satisfied.....2
 - Dissatisfied.....3
 - Very dissatisfied.....4

- 137 The amount of time you waited to see the dentist?
- Very satisfied.....1
 - Satisfied.....2
 - Dissatisfied.....3
 - Very dissatisfied.....4

- 138 The cleanliness and neatness of the dental clinic?
- Very satisfied.....1
 - Satisfied.....2
 - Dissatisfied.....3
 - Very dissatisfied.....4

- 139 The cost of your last dental visit (your own pocket)?
- Very satisfied.....1

- Satisfied.....2
- Dissatisfied.....3
- Very dissatisfied.....4

- 140 In the last 2 years, was there any dental service recommended to you by a dentist that you were not sure you needed?
- Yes.....1
 - No.....2 Go to Qs144-148
 - Don't know....3 Go to Qs144-148
 - No answer.....4 Go to Qs144-148

- 141 What was that dental service?
Code up to three only
- Examination.....1
 - Cleaning.....2
 - Fillings.....3
 - Crown/cap work.....4
 - Root canal work.....5
 - Denture work.....6
 - Orthodontic work.....7
 - X-rays.....8
 - Inlay.....9
 - Extraction/pulling.....10
 - Bridge work.....11
 - Periodontal/gum work.....12
 - Fluoride treatment.....13
 - Instruction in taking care of teeth and gums.....14
 - Other.....15

- 142 Did you receive the dental service recommended?
- Yes.....1 Go to Qs144-147
 - No.....2

143 What was the main reason you did not get the service recommended to you? Code one only.

- Cannot afford it.....1
- Don't want to spend money on dental care.....2
- Afraid or don't like dentists.....3
- Too busy.....4
- I did not think anything was wrong.....5
- Dental problem not serious enough.....6
- Expected dental problems to go away.....7
- Dental clinic is too far away...8
- Another dentist recommended not to do it.....9
- Other.....10

Dentists & Dental Care:

Questions 144-147:

Do you strongly agree, agree, disagree or strongly disagree with each of the following statements?

144 Dentists are able to relieve or cure most dental problems that patients have.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

145 I am afraid of dental visits because of possible pain.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

146 I will visit the dentist when I have dental problems no matter how busy I am.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

147 Dentists are not always available when I have dental problems.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

Public Dental Care Delivery System

Public Dentists: Questions: 148-151
Your opinion about public dentist...

148 Public dentists explain a patient's problems to him or her.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

149 Public dentists always spend enough time with the patients.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

150 Public dentists are very careful to check everything when examining patients.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

151 Public dentists prefer to fix up teeth rather than teach their patients to avoid problems.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

Private Dental Care Delivery System

Your opinion about Dentists in Private Sector: Questions 152-156

152 Private dentists explain a patient's problems to him or her.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

153 Private dentists always spend enough time with the patients.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

154 Private dentists are very careful to check everything when examining patients.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

155 Private dentists prefer to fix up teeth rather than teach their patients to avoid problems.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

156 The cost of visiting a private dentist is too expensive for me.

- Strongly agree.....1
- Agree.....2
- Disagree.....3
- Strongly disagree.....4

Background Information

About you and your family

157 Which of these best describes your current situation?

- Married.....1
- Widowed.....2
- Divorced.....3
- Separated.....4
- Never married.....5

158 How long have you been living at this address?

- 1 year or less.....1
- More than 1 to 2 years.....2
- More than 2 to 5 years.....3
- More than 5 to 10 years.....4
- More than 10 years.....5

159 Which of these groups do you belong?

- PNGDF personnel.....1
- Dependant.....2

160 What level of education you have completed?

- Primary.....1
- Secondary.....2
- Tertiary.....3

161 Which of the following best describes your current employment situation?

- Employed by PNGDF..
.....1 Go to Qs162-163
- Employed by Government
Department.....2 Go to Q.164
- Employed by private firm..3 Go
to Q.164
- House wife.....4
- Full-time student.....5

162 What is your current rank in PNGDF?

- Officer.....1
- Senior NCO.....2
- Other Rank.....3

163..What is your current PNGDF Element?

- Land.....1 Go to Q.165
- Sea.....2 Go to Q.165
- Air.....3 Go to Q.165

164 What type of work you do?

- Specify

165 Indicate the category of your total family income, before taxes and other deductions for the last twelve months.

- Less than K5 000
- Between K5 000 and K9 999
- Between K10 000 and K19 999
- Between K20 000 and K29 999
- Between K30 000 and K39 999
- Between K40 000 and K49 999
- More than K50 000
- Refused

166 If you are married, how many people (excluding yourself) living in your house?
Record number-----

167 Which age group do you belong?
19 to 34 years.....1
35 to 44 years.....2
45 years and above.....3

168 What sex group do you belong?
Male.....1
Female.....2

169 Do you chew betel-nut with lime and mastard?
Yes.....1
No.....2 Go to Q 171

170 How often do you chew betel-nut with lime and mastard?
Once a month 1
A few (2-3) times a month 2
Once a week 3
A few (2-6) times a week 4
Once a day 5
Two or more times a day 6

171 Chewing betel-nut with lime and mastard causes cancer.
Strongly agree 1
Agree 2
Disagree 3
Strongly disagree 4

172 Stained teeth as a result of chewing betel-nut, lime and mastard makes your teeth unattractive.

- Strongly agree 1
- Agree 2
- Disagree 3
- Strongly disagree.....4

THANK YOU VERY MUCH.